

Factors affecting the regional pig meat productivity of commercial pig units in Greece

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Abstract

The effect of characteristics of pig enterprise and its owner, along with management applied in farms on regional pig meat productivity of commercial pig units in Greece was examined. The results showed that most of the enterprises were family operated, belonging to a sole owner of old age and low educational level, whose children were not involved or plan to get involved with the enterprise. The analysis of a generalised linear model showed that only the "Age of farm's equipment" and "Size class of sow herd" were significant in explaining the variation of pig meat productivity.

Keywords: *Regional pig productivity; Pig units; Management; Size class; Farm's equipment; Greece.*

Introduction

Pig production in Greece started to grow significantly during the 60s owing to the increased demand for pig meat by the consumers who at that time enjoyed a higher level of economic prosperity in comparison to the previous decade. The production of pig meat was the answer to the increased demand for meat by the consumers, since ruminants and poultry could not satisfy this demand. The pig units that appeared in Greece during this decade were family operated with a herd size of 10-20 sows which were able to cover the pig meat demand, which otherwise was low at the time (Apostolopoulos, 1997; Apostolopoulos et al., 1998).

The industrialised, indoor type pig production in Greece grew during the 70s when many pig enterprises with herds of more than 20 sows and up to 500 sows were created due to government incentives and increased demand for pork meat in the Greek market (Kharouf et al., 1991). Nevertheless, the growth of pig meat production was not equivalent with the growth of demand for meat and the Greek pig industry could only produce 30% of the total local meat production and cover only 60% of the local demand for pig meat. On the other hand, the prospect for the future growth of the pig industry in Greece is favourable, since the average per capita annual consumption of pig meat in Greece is 23 Kg/person while in EU is 42 Kg/person (Apostolopoulos, 1997; Apostolopoulos and Stoforos, 1997).

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Previous studies have examined the current state of the pig industry in Greece (Apostolopoulos, 1997; Papatheodorou and Papavasiliou, 1994), but none has focused on the role of the pig enterprise and its owner as well as the role of the management applied in the farm on the pig meat productivity of commercial pig units in Greece.

The objective of the present study was to examine how the characteristics of the pig enterprise and its owner, along with the management applied in the farm affect the regional pig meat productivity of commercial pig units in Greece measured as meat production per breeding pig. For this reason, by using empirical social research methods, sample data were collected on the characteristics of pig enterprises and their owners along with their farm management in the 13 administrative regions of Greece (Table 1).

On the basis of these data the profile of the pig enterprise and the pig enterprise owner in Greece today was constructed. Also, a generalised linear model was used to study the effect of these characteristics on the meat production per breeding pig in the various regions of Greece.

Methodology

The statistical frame of the survey was based on the census of industrialised pig enterprises of more than 20 sows registered with the Greek Federation of Swine Producers Associations (1998) which included 920 pig enterprises distributed in the 13 administrative regions of Greece (Table 1).

A stratified random sampling of pig enterprises by size class of sow herd and administrative region of farm's location was used. Specifically, the total population of 920 registered pig enterprises in Greece were classified into three groups based on the size of their sow herd. The first group comprised of pig enterprises with 20-150 sows, the second group comprised of pig enterprises with 151-300 sows, and the third group comprised of pig enterprises with more than 301 sows. The size of the sample used in the study was 93 pig enterprises, which covered 10% of the total population of registered pig enterprises in Greece (Table 1).

Data on the characteristics of pig enterprises and pig farm owners in Greece along with their farm management were collected through a questionnaire survey during the spring of 2000. Investigators on location completed the questionnaires by visiting pig farms registered with the Greek Federation of Swine Producers Associations and directly interviewing the owners in order to avoid misunderstanding in the completion of the questionnaires.

The data on the regional pig meat productivity of commercial pig units in Greece measured as meat production per breeding pig were supplied by the National Statistical Service of Greece (1999).

The questionnaire comprised three sections, namely description of pig enterprise, characteristics of owner, and management of the pig farm.

The data collected were analysed by using descriptive statistics for calculating the means and standard deviations of continuous variables and the frequencies and percentages of discrete variables.

The measurements on the regional pig meat productivity were analysed against three major groups of continuous variables. The first group consisted of

variables indicating the description of the pig enterprise (Years of farm's operation, Age of farm's equipment, Number of employees in the farm, Size class of sow herd).

Table 1. Number of pig enterprises in Greece and 10% sample by size class of sow herd and administrative region

Administrative region	Size class of sow herd (Number of sows)						Total	
	Small (-150)		Medium (151-300)		Large (301-)		Greece	Sample
	Greece	Sample	Greece	Sample	Greece	Sample	Greece	Sample
East Macedonia and Thrace	33	3	7	1	5	1	45	5
Central Macedonia	139	14	23	2	6	1	168	17
West Macedonia	18	2	4	0	0	0	22	2
Epirus	72	7	26	3	15	2	113	12
Thessalia	159	16	21	2	13	1	193	19
Ionian Islands	9	1	1	0	0	0	10	1
West Greece	45	5	15	2	13	1	73	8
Central Greece	55	6	17	2	20	2	92	10
Attica	37	4	13	1	5	1	55	6
Peloponnissos	34	3	12	1	9	1	55	5
North Aegean Islands	2	0	0	0	0	0	2	0
South Aegean Islands	22	2	1	0	0	0	23	2
Crete	58	6	1	0	2	0	61	6
Total	683	69	141	14	88	10	912	93

The second group consisted of variables indicating the characteristics of pig enterprise owners (Age, Number of children, Number of adult children occupied in the farm, Number of immature children to be occupied in the farm). The third group consisted of variables indicating the management of the pig farm (Weaning age of piglets, Frequency of visits to the pig farm by a veterinarian).

The measurements on the regional pig meat productivity were distributed closely to normal probability law and therefore were analysed by a regression model having regional pig meat productivity as the depended variable and all others as independent. These variables were analysed for their significance in the model using two sided student t-tests. The final model formed by backwards selection was examined for its capacity to explain the variations of the depended variable Y_i (pig meat production per breeding pig) (Neter, 1980; Agresti et al., 1979) as follows:

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \varepsilon_i \quad (1)$$

Y_i : Depended variable = Regional pig meat productivity (Total pig meat production of region in tons / total number of breeding pigs in the region), $i = 1-13$ administrative regions of Greece.

$\beta_0, \beta_1, \beta_2$: Regression model parameters

X_{1i} : Age of farm's equipment

X_{2i} : Size class of sow herd

ε_i : Error term

The model parameters were estimated as $\beta_0=693$, $\beta_1=-23.4$, $\beta_2=306$, where the overall capacity of the model to explain regional variations in pig meat productivity was measured to be 65% ($R^2=0.655$). Furthermore, the model was tested against the basic assumptions. The ε_i were found to be identically and independently distributed according to normal law $N(0, \sigma^2)$, while no signs of heteroscedasticity and multicollinearity were detected.

All phases of analysis were conducted by using *MINITAB for Windows, Release 12*.

Results

According to the census by the Greek Federation of Swine Producers Associations (1998) there were 141,430 sows belonging to 912 industrialised, indoor type pig farms distributed in the 13 administrative regions of Greece (Table 1). The legal status of these pig farm enterprises is presented in Table 2.

Table 2. Legal status of pig enterprises.

Legal status	N	Proportion (%)
Limited company (S.A.)	7	8
Limited liability company (Ltd)	2	2
General partnership	1	1
Limited partnership	3	3
Firm (Family operated)	80	86
Total	93	100

The majority of the pig enterprises were family operated (86%) belonging to a sole owner (90%). The mean age of operation of the pig farms was 25 years and the mean age of their equipment was 15 years. A computer was used in 21% of the pig farms and only 3% of the pig farms had access to Internet.

The number of employees in the pig enterprises was low (0–16 employees). Specifically, small size pig enterprises (20–150 sows) did not employ full or part time administrative personnel, but employed up to three full time workers paid on a daily or monthly basis and up to one part time workers paid on daily basis. Up to two of these workers were foreign immigrants. Medium size pig enterprises (151–300 sows) employed up to two full time and no part time administrative personnel, up to four full time workers paid on a monthly basis, up to three full time workers paid on a daily basis, and up to one part time worker paid on a daily basis. Up to three of these workers were foreign immigrants. Finally, large size pig enterprises (more than 301 sows) employed up to four full time and no

part time administrative personnel, up to 14 full time workers paid on a monthly basis, up to 16 full time workers paid on a daily basis, and up to four part time workers paid on a daily basis. Up to 16 of these workers were foreign immigrants.

Only a small number of pig enterprise owners (5-11 owners) were able or willing to supply information on the financial and economic state of their enterprise. No pig enterprise was involved in the business of exporting pig meat or processed pig meat products.

The majority of the pig enterprises (90%) had one owner, while 5% of them had two owners, 3% had three owners, and 4% had four or more owners.

The majority of the pig enterprise owners were men (99%). Most of the owners (74%) were 45-64 years old, while 12% of them were 30-44 years old, 10% were more than 65 years old, and only 4% were 25-29 years old. Also, most of the pig enterprise owners were married (93%) and only 7% were single. The educational level of the pig enterprise owners was mostly elementary school (55%), while for 22% was middle school, for 15% was high school, and for 8% was college or university level.

The average number of children of the pig enterprise owners was 1.8, but only 0.4 children were involved with their parents' enterprise and only 0.2 children plan to be involved with their parents' enterprise when they grow up.

Table 3. Average size class of sow herds, age of farm's equipment, and pig meat productivity in the 13 administrative regions of Greece

Administrative region	Size class of sow herd (1-3) *	Age of farm's equipment (years)*	Pig meat productivity (Total pig meat production of region in tons / total number of breeding pigs in the region)**
East Macedonia and Thrace	1.60	9.80	885.17
Central Macedonia	1.20	14.90	718.36
West Macedonia	1.00	8.00	934.67
Epirus	1.60	16.20	915.12
Thessalia	1.20	13.70	725.52
Ionian Islands	1.00	25.00	401.74
West Greece	1.50	10.25	794.34
Central Greece	1.60	16.40	1,072.42
Attica	1.50	20.50	562.20
Peloponissos	1.60	11.60	789.52
North Aegean Islands	-	-	-
South Aegean Islands	1.00	15.00	634.52
Crete	1.00	20.80	462.12

* Data from own measurements

** Data from National Statistical Service of Greece (1999)

The analysis of the general linear model showed that of all the continuous variables examined only the “Age of farm’s equipment” and “Size class of sow herd” were significant in explaining the variation of pig meat productivity between the various regions of Greece. Specifically, the regional pig meat productivity increased as the age of the farm’s equipment decreased ($p=0.018$) and the size class of the sow herd increased ($p=0.075$) (Table 3, Figures 1 and 2).

Figure 1. Regression line between regional pig meat productivity and age of farm’s equipment.

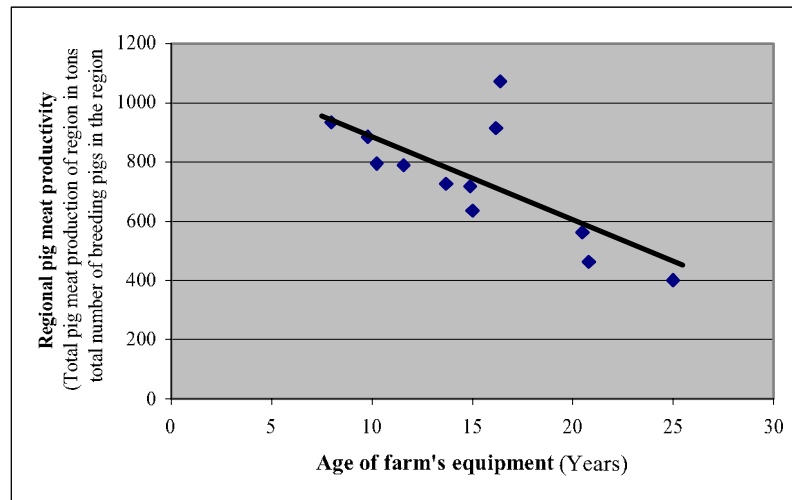
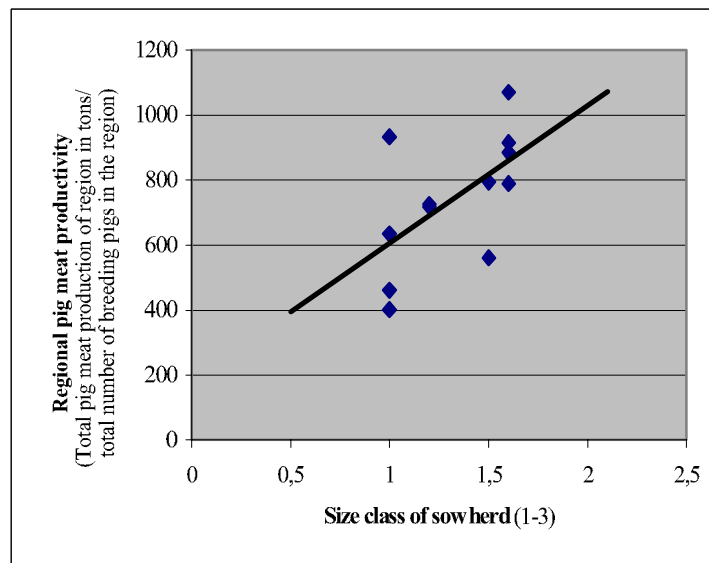


Figure 2. Regression line between regional pig meat productivity and size class of sow herd.



These two variables were able to explain 65.5% of the variation of pig meat productivity between the various regions of Greece ($R^2=0.655$). However, it should be noted that the regional pig meat productivity data, compared to the data for the other variables in the study, were available at a higher aggregation level. Therefore, the regression model concerning the pig meat productivity used highly aggregated data at the regional level, which could not capture the detailed variability of the independent variables and embed it in the model. These aggregated data might have resulted in the absence (selection failure) of other independent variables in the final model, which nevertheless may explain the variability of the dependent variable.

Conclusions

Various factors have been identified in previous studies as responsible for the poor financial state of the Greek pig industry during the last years. Such factors are the negative Monetary Compensatory Payments imposed by EU in previous years, the inefficient use of by-products resulting in increased production cost, the low demand for processed meat products in Greece (delicatessen, canned pig meat, etc), the competition from imported pig meat, the high cost of investment and financing, and the lack of sufficient know-how (Apostolopoulos, 1997; Mergos 1996).

In the present study, two additional factors related to the characteristics of the pig enterprise, the age of the farm's equipment and the size class of the sow herd, were found to affect the regional pig meat productivity which is the source of income for the operation of the farms and the live hood of the pig farm families. Apparently, new equipments achieve a favourable exploitation of the livestock capital while pig enterprises with large size class of sow herds achieve economics of scale and are more productive.

Two other important observations made in the present study were first that overall, most of the pig enterprise owners were of old age and low educational level and second that their children were not involved or plan to get involved with their parents' pig enterprise. These two factors are ominous for the future of the pig industry in Greece, since pig enterprise owners of old age and low educational level will not be able or have the time to adapt their enterprises to the future demands of globalisation in the pig market, while the people of the new generation are not willing to become the pig entrepreneurs of the future.

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