ECONOMIC BULLETIN

No 38

BANK OF GREECE

EUROSYSTEM

ECONOMIC BULLETIN

No 38

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INDIRECT TAX INCREASES AND THEIR IMPACT ON INFLATION OVER 2010-2012

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In 2010, after Greece's borrowing difficulties became apparent and the country was subject to the Memorandum of Understanding and the loan agreement, drastic fiscal measures were taken. These measures included hikes in indirect taxes, both in the Value Added Tax (VAT) and in excise taxes ("special consumption taxes"). Indirect taxes were increased again in 2011, although less strongly, and in 2012, even less strongly. The result was a significant increase in the average level of prices.

This article[1] attempts to assess the extent to which inflation is attributable to the impact of indirect tax increases and, most importantly, to identify the actual size of VAT pass-through to final consumption. This would enable us to draw conclusions on the evolution of inflation and its determinants.

1 VALUE ADDED TAX AND EXCISE TAXES

In order to assess how indirect taxes, which are imposed by government decisions and apply to goods and services at the consumer level, influence the rate of inflation, it is necessary to properly measure the size of the relevant measures. Indirect taxes with relevance to inflation are the Value Added Tax (VAT) and the Special Consumption Tax (SCT), which is levied on goods and services that form part of household final consumption expenditure.

VAT is an indirect tax levied as a percentage of the final price of goods and services acquired for consumption and applies to almost all items included in the consumer basket. In particular, it applies to goods and services accounting for 85%-90% of household consumption expenditure. The SCT, on the other hand, is based on the pre-tax value or price of an item and is computed as a fixed amount or percentage per physical or monetary unit. The SCT does not depend on the final price of a product, but is a component of this price and represents a quasi cost element. Its base accounts for some 20% of consumption expenditure and includes selected items, such as alcoholic beverages, tobacco, fuel (heating oil and motor fuel), electricity (as of May 2010), natural gas (as of September 2011), cars, motorcycles, mobile telephony and served alcoholic beverages. It should be noted that the items subject to SCT continue to be taxed with VAT.

The SCT is fully passed through to final consumption irrespective of the demand for a product, unlike VAT that is levied on the final price (that is, including SCT), and the size of this pass-through is directly related to final consumption and overall economic conditions.

In 2010 and 2011, in the context of the fiscal programme aimed at reducing deficits, significant increases of indirect taxes were introduced, in terms of both VAT (see Table 1) and SCT.

For the purposes of our analysis, in a first step we used ELSTAT data, including the Harmonised Index of Consumer Prices (HICP), as well as the HICP at constant tax rates[2] (HICP-CT).[3] The two indices have the same coverage, if computed using the same methodology, weights and composition. The only difference

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1 The views expressed in this paper are those of the authors and do not necessarily reflect the views of the Bank of Greece. Any mistakes are those of the authors alone.
2 The indirect taxes that fall within the scope of the HICP-CT account for at least 90% of total indirect tax income from products included in the consumer "basket".
3 Both indices are released simultaneously on a monthly basis by ELSTAT.

Table I Evolution of VAT rates, 2005-2011

VAT rates	2005		2010		2011	
	March	April	March	July	January	September
Standard rate	18%	19%	21%	23%	23%	23%
Reduced rate	8%	9%	10%	11%	13%	13%
Super-reduced rate	4%	4.5%	5%	5.5%	6.5%	6.5%

between the HICP and the HICP-CT lies in the manner and timing of taxation of the items covered by each index: the HICP captures final consumer prices, i.e. prices including the applicable indirect taxes (VAT and SCT), while the HICP-CT captures final consumer prices for each month, except that the current indirect tax rates, as included in the HICP, are mechanistically replaced by those in effect in December of the previous year. By this process, a new series of indices is obtained, which simulates a constant tax regime for statistical purposes over the reviewed period. By comparing the changes in the two indices (HICP and HICP-CT), the effect of indirect tax changes on price developments can be identified. Thus, if during a given year there is no change in indirect taxation relative to December last year, then the HICP and the HICP-CT will provide identical monthly readings.

This mechanistic recording of prices by ELSTAT, which is applied in the context of a harmonised practice supported by the European Union (Eurostat) for statistical purposes, is based on the assumption that tax changes are passed on instantaneously and fully to final consumption. Therefore, a comparison between the two indices and, in particular the difference between their annual growth rates, indicates the maximum theoretical impact of indirect tax changes on inflation for each year (see Chart 1 and Table 2).

On the basis of data in Table 2, in 2010, which was the first year of implementation of new VAT rates after 2005, the average impact of indirect taxes on HICP inflation was 3.32 per-

Chart I Annual HICP inflation and indirect taxes
(Jan. 2009-Dec. 2012)

Note: The shaded area represents the impact of indirect taxes in percentage points.

centage points. As a result, headline HICP inflation for some months of that year persisted at levels exceeding even 5% year-on-year. The impact of indirect taxes on inflation peaked in January 2011, when it reached a historic high of 4.74 percentage points, which was also the highest for the 2010-12 period. This development was partly due to the additional increases in tax rates implemented that month, most notably an increase in the reduced VAT rate from 11% to 13%. However, despite the tax hike, inflation for that month declined to

Table 2 Annual HICP inflation with and without the impact of indirect taxes (VAT and special consumption taxes) over the 2010-2012 period

	HICP inflation (annual % changes)	Impact of changes in indirect taxes on annual inflation (in percentage points)	Inflation rate net of the impact of indirect taxes (annual % changes)
2010 Jan.	2.3	0.59	1.72
Feb.	2.9	1.13	1.73
March	3.9	2.32	1.60
Apr.	4.7	2.69	2.05
May	5.3	3.28	2.02
June	5.2	3.28	1.91
July	5.5	4.32	1.20
Aug.	5.6	4.58	1.05
Sept.	5.7	4.54	1.12
Oct.	5.2	4.50	0.73
Nov.	4.8	4.28	0.51
Dec.	5.2	4.29	1.86
2011 Jan.	4.9	4.74	0.19
Feb.	4.2	4.18	-0.02
March	4.3	2.59	1.70
Apr.	3.7	2.43	1.26
May	3.1	1.85	1.28
June	3.1	1.84	1.25
July	2.1	0.56	1.55
Aug.	1.4	0.26	1.15
Sept.	2.9	1.20	1.69
Oct.	2.9	1.37	1.49
Nov.	2.8	1.38	1.47
Dec.	2.2	1.39	0.78
2012 Jan.	2.1	0.94	1.11
Feb.	1.7	0.95	0.72
March	1.4	1.11	0.25
Apr.	1.5	1.10	0.43
May	0.9	1.10	-0.15
June	1.0	1.11	-0.15
July	0.9	1.09	-0.19
Aug.	1.2	1.10	0.05
Sept.	0.3	0.20	0.08
Oct.	0.9	0.74	0.18
Nov.	0.4	0.74	-0.32
Dec.	0.3	0.71	-0.39
2010	**4.7**	**3.32**	*1.38*
2011	**3.1**	**1.98**	*1.15*
2012	**1.0**	**0.91**	*0.14*

Table 3 Impact of indirect taxes (VAT and special consumption taxes) on inflation and its basic components over the 2010-2012 period

(percentage points)

	HICP inflation (annual % changes)	Impact of indirect taxes					
		Total	Unprocessed food	Processed food	Non-energy industrial goods	Energy	Services
2010 Jan.	2.3	0.59	0.00	0.21	0.00	0.30	0.10
Feb.	2.9	1.13	0.00	0.23	0.00	0.83	0.11
March	3.9	2.32	0.08	0.16	0.44	1.32	0.45
Apr.	4.7	2.69	0.08	0.31	0.65	1.29	0.45
May	5.3	3.28	0.07	0.37	0.85	1.59	0.48
June	5.2	3.28	0.07	0.37	0.85	1.54	0.48
July	5.5	4.32	0.15	0.47	1.29	1.41	1.03
Aug.	5.6	4.58	0.16	0.74	1.31	1.39	1.00
Sept.	5.7	4.54	0.16	0.74	1.29	1.40	0.97
Oct.	5.2	4.50	0.15	0.74	1.29	1.37	0.94
Nov.	4.8	4.28	0.15	0.74	1.08	1.36	0.93
Dec.	5.2	4.29	0.16	0.74	1.08	1.38	0.93
2011 Jan.	4.9	4.74	0.30	0.82	1.04	1.68	1.18
Feb.	4.2	4.18	0.30	0.79	1.00	0.99	1.17
March	4.3	2.59	0.22	0.65	0.61	0.40	0.69
Apr.	3.7	2.43	0.23	0.48	0.61	0.43	0.69
May	3.1	1.85	0.23	0.42	0.42	0.08	0.66
June	3.1	1.84	0.23	0.42	0.41	0.07	0.65
July	2.1	0.56	0.15	0.32	-0.02	-0.10	0.13
Aug.	1.4	0.26	0.15	0.05	-0.02	-0.11	0.13
Sept.	2.9	1.20	0.15	0.08	-0.01	-0.10	1.00
Oct.	2.9	1.37	0.15	0.08	-0.01	0.08	1.00
Nov.	2.8	1.38	0.15	0.09	-0.01	0.10	1.01
Dec.	2.2	1.39	0.15	0.09	-0.01	0.14	1.03
2012 Jan.	2.1	0.94	0.00	0.03	-0.02	0.15	0.78
Feb.	1.7	0.95	0.00	0.03	0.00	0.15	0.77
March	1.4	1.11	0.00	0.04	0.00	0.15	0.91
Apr.	1.5	1.10	0.00	0.04	0.00	0.15	0.91
May	0.9	1.10	0.00	0.04	0.00	0.15	0.91
June	1.0	1.11	0.00	0.04	0.00	0.15	0.91
July	0.9	1.09	0.00	0.04	0.00	0.15	0.91
Aug.	1.2	1.10	0.00	0.04	0.00	0.15	0.92
Sept.	0.3	0.20	0.00	0.00	0.00	0.14	0.03
Oct.	0.9	0.74	0.00	0.00	0.00	0.71	0.02
Nov.	0.4	0.74	0.00	0.00	0.00	0.71	0.02
Dec.	0.3	0.71	0.00	0.00	0.00	0.71	0.00
2010	**4.7**	**3.32**	**0.10**	**0.49**	**0.85**	**1.27**	**0.66**
2011	**3.1**	**1.98**	**0.20**	**0.36**	**0.33**	**0.31**	**0.78**
2012	**1.0**	**0.91**	**0.00**	**0.02**	**0.00**	**0.29**	**0.59**

Table 4 Impact of indirect taxes (VAT and special consumption taxes) on selected goods over the 2010-2012 period

(percentage points)

	HICP inflation (annual % changes)	Alcoholic beverages (non-served)	Tobacco	Electricity	Heating oil	Cars	Fuels-lubricants
2010 Jan.	2.3	0.02	0.19	0.00	0.00	0.00	0.30
Feb.	2.9	0.05	0.19	0.00	0.00	0.00	0.85
March	3.9	0.07	0.00	0.01	0.05	0.07	1.27
Apr.	4.7	0.07	0.16	0.01	0.05	0.28	1.24
May	5.3	0.13	0.16	0.07	0.05	0.49	1.45
June	5.2	0.13	0.16	0.07	0.05	0.50	1.37
July	5.5	0.14	0.16	0.08	0.10	0.57	1.20
Aug.	5.6	0.14	0.44	0.08	0.10	0.57	1.16
Sept.	5.7	0.14	0.44	0.08	0.10	0.57	1.19
Oct.	5.2	0.14	0.44	0.08	0.08	0.57	1.20
Nov.	4.8	0.14	0.44	0.08	0.08	0.34	1.18
Dec.	5.2	0.14	0.44	0.08	0.09	0.34	1.20
2011 Jan.	4.9	0.16	0.39	0.05	0.11	0.33	1.59
Feb.	4.2	0.13	0.40	0.05	0.12	0.30	0.82
March	4.3	0.07	0.40	0.04	0.06	0.24	0.30
Apr.	3.7	0.07	0.18	0.04	0.06	0.24	0.33
May	3.1	0.01	0.18	-0.02	0.06	0.05	0.06
June	3.1	0.01	0.18	-0.02	0.06	0.05	0.04
July	2.1	0.00	0.18	-0.03	0.00	-0.02	-0.06
Aug.	1.4	0.00	-0.10	-0.03	0.00	-0.02	-0.07
Sept.	2.9	0.00	-0.12	-0.03	0.00	-0.02	-0.07
Oct.	2.9	0.00	-0.12	-0.03	0.18	-0.02	-0.07
Nov.	2.8	0.00	-0.11	-0.03	0.18	-0.02	-0.05
Dec.	2.2	0.00	-0.11	-0.03	0.17	-0.02	0.00
2012 Jan.	2.1	0.00	-0.01	0.00	0.13	-0.02	0.00
Feb.	1.7	0.00	-0.01	0.00	0.13	0.00	0.00
March	1.4	0.00	-0.01	0.00	0.12	0.00	0.00
Apr.	1.5	0.00	-0.01	0.00	0.12	0.00	0.00
May	0.9	0.00	-0.01	0.00	0.12	0.00	0.00
June	1.0	0.00	-0.01	0.00	0.12	0.00	0.00
July	0.9	0.00	-0.01	0.00	0.12	0.00	0.00
Aug.	1.2	0.00	-0.01	0.00	0.12	0.00	0.00
Sept.	0.3	0.00	0.00	0.00	0.12	0.00	0.00
Oct.	0.9	0.00	0.00	0.00	0.72	0.00	0.00
Nov.	0.4	0.00	0.00	0.00	0.71	0.00	0.00
Dec.	0.3	0.00	0.00	0.00	0.71	0.00	0.00
2010	**4.7**	**0.11**	**0.27**	**0.05**	**0.06**	**0.36**	**1.13**
2011	**3.1**	**0.04**	**0.11**	**-0.01**	**0.08**	**0.09**	**0.24**
2012	**1.0**	**0.00**	**0.00**	**0.00**	**0.27**	**0.00**	**0.00**

4.9% year-on-year, down from its September 2010 peak of 5.7%. This reflected the fact that some items, such as pharmaceuticals and hotel accommodation services, were reclassified to the reduced VAT rate (6.5%) in the same period, as well as subdued developments in inflation net of the impact of indirect taxation.

From February 2011 through to August 2011, the contribution of indirect taxes to inflation gradually fell and, as a result, so did headline HICP inflation. Particularly in August 2011, both the effect of indirect taxes (0.26 percentage points) and annual inflation (1.4%) reached two-year lows. Indirect tax dynamics becomes more clearly visible when headline inflation is calculated net of the impact of indirect taxes (see Table 2, last column). Net of this impact, inflation declined to 0.19% in January, turned slightly negative in February (-0.02%) and finally reached 1.15% year-on-year in August 2011, after minor fluctuations depending on the different lags in the pass-through of past indirect tax increases to prices.

Thereafter, the impact of indirect taxes seems more pronounced and upward trending, although at much lower levels compared with the respective period of 2010, due to the increase of VAT on restaurants and cafes and some food items. However, reflecting a primary fall in prices, mostly in non-energy industrial goods, the effect of indirect tax increases was partly offset; as a result, HICP-CT fell in December 2011 to 0.78% year-on-year.

In 2012, the impact of indirect taxes moderated even more, to 0.91 percentage point, and largely reflected a carry-over effect from past tax increases, as well as the significant increase in the SCT on heating oil in the last quarter of the year. As a result of the continued dampening effect of indirect taxes on inflation, average HICP-CT inflation receded to 0.14% on an annual basis in 2012 (see Table 2).

The strongest inflationary effect of indirect taxes was seen in HICP components such as processed food, non-energy industrial goods and energy (see Table 3). These components include goods subject to "double" taxation, namely VAT and SCT.

A further analysis of data in Table 3 focusing on those products that are also subject to SCT, such as tobacco, cars, motor fuels, heating oil, electricity and alcoholic beverages, which account for about 16% of household expenditure, shows that the combined impact of both taxes (VAT and SCT) becomes even stronger, exerting a similar upward effect on headline inflation (see Table 4).

2 VAT PASS-THROUGH TO FINAL CONSUMER PRICES

While the mechanistic impact of indirect taxes on inflation becomes readily evident from a comparison between the two indices compiled by ELSTAT (HICP and HICP-CT), as reflected in Tables 2, 3 and 4, the actual impact varies depending on the extent and timing of pass-through of changes in indirect taxes, especially VAT,[4] on final consumer prices. Identifying the actual pass-through to final consumer prices is a quite difficult task, particularly in times of economic crisis, as it depends on many factors, including elasticity of demand, competition, pricing policies, consumers' purchasing power, price adjustment costs, seasonal patterns of consumption, etc. These factors influence both the duration and the size of indirect tax change pass-through. Such pass-through may take from one month to one year to materialise and is not necessarily simultaneous or automatic as assumed by ELSTAT. The actual size of pass-through may differ from that implied by the mechanistic impact, as it cannot be ruled out that some producers could decide not to change their prices despite a tax increase.

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4 No particular mention of special consumption taxes is made, as we consider them to be by definition a quasi cost element (an administrative intervention beyond the control of the producer) fully integrated in the final price of a product. Although special consumption taxes are applicable to very few products, they have a considerable effect on inflation, due to their high contribution to the cost of these products.

In the present research, we have tried to explore whether businesses have passed the VAT increase to the final consumer or have absorbed in whole or in part the VAT change at the expense of their profit margins. To answer this question, in addition to using the HICP-CT released by ELSTAT, we have developed a new index which is derived from the HICP and excludes, under certain conditions, the effect of VAT: the HICPwVAT (HICP without the effect of VAT). Thus, the differential between the HICP and the HICPwVAT rates of change will provide a measure of the full size of the VAT only that has been mechanistically/theoretically passed on to final consumer prices, as opposed to the differential between HICP and HICP-CT computed by ELSTAT, which is based on the mechanistic assumption that all indirect taxes (i.e. VAT and SCT) are passed fully and automatically to final prices.

In a second step, using filters we re-estimated ELSTAT's HICP, by developing the HICP-aVAT (HICP with actual VAT) to identify the actual size of VAT affecting final prices. A comparison between the growth rate of HICP-aVAT and that of HICPwVAT provides the percentage or degree of VAT pass-through that actually affected final prices.

To develop the HICPaVAT, various types of filters were used in order to isolate, to the extent possible, the changes in prices related to the change in VAT from the typical trends of prices over the reviewed period. In particular, some ad hoc assumptions were made regarding the price increases observed, ceteris paribus, immediately after a change in VAT rates. These assumptions derive from the general notion that VAT changes represent an upward shift in the cost curve of businesses resulting from an administrative intervention beyond the control of businesses. In practice, price adjustments to VAT changes are not carried out in full or simultaneously by all enterprises, for the reasons mentioned above, and are even made irrespective of the obligation of businesses to pay VAT. The effect on prices

from changes in VAT rates was found to be gradual and to fade out after a full year from the time of VAT changes.

The measurement of VAT pass-through[5] to final consumer prices was based on the following assumptions:

a) Final price increases equal to or greater than the VAT change were considered as cases of full VAT pass-through to final consumer prices.

b) Price increases lower than the VAT change were considered as cases of partial pass-through, i.e. the price increase covered a part of the VAT change and the remainder was borne by the enterprises.

c) Price reductions combined with a simultaneous VAT increase were considered as cases where the burden of the VAT change was equally shared between the consumer and the enterprise. The basic argument in this assumption is that, since the VAT change is an irrevocable exogenous cost factor of administrative nature that increases the cost of a product, it is an across-the-board burden for all producers who, even in conditions of perfect competition, are able to pass it on to final consumers, without necessarily disturbing market equilibrium. Therefore, we consider that on the side of businesses the reduction in nominal prices would have been larger, ceteris paribus, but it was contained to a certain extent by the VAT rise. In this case, the VAT change has not been passed through fully nor has it been effectively absorbed by businesses. Also, from a consumer perspective, we consider that the benefit to consumers from the price reduction would have been larger, but was mitigated by the VAT rise. Alternative scenarios of VAT pass-through or no-pass-through that were considered in cases of price reductions associated with a simultaneous VAT increase did

5 It is noted that the terms "degree of pass-through" and "pass-through rate" are interchangeable in the present survey and are deemed to be conceptually equivalent.

not lead to significantly different results. Thus, we adopted a middle-of-the-road approach, taking the equal sharing of the VAT increase between the producer and the consumer as the most representative case.

d) In the rare cases of VAT reductions, e.g. that of January 2011, when the VAT rate on pharmaceuticals and hotel accommodation was reduced to 6.5%, we considered that assumptions (b) and (c) are reversed, as the case may be.

Tables 5, 6 and 7 summarise the main components of inflation, the total burden of indirect taxes and how this can be decomposed into the effect of VAT (mechanistic and actual) and the effect of special consumption taxes, as well as the degree of VAT pass-through to final consumer prices.

In particular, Table 5 shows that for 2010 the rate of VAT increase pass-through to final consumer prices in the energy component (fuel and electricity) is the highest among other categories of goods and services and exceeds 90%. The specific features of the energy market and the inelasticity of demand for energy products limits and practically eliminates any chance for businesses to absorb the effect of VAT

increases. For processed food (including tobacco and alcoholic beverages) the percentage of pass-through is also high, slightly above 80%. For unprocessed food it is 75% and for non-energy industrial goods it is 74%. The smallest VAT pass-through can be seen in services (54%).

The total actual impact of VAT on headline inflation in 2010 was 1.18 percentage points, against 1.68 percentage points on the basis of the mechanistic assumption of full pass-through. In other words, out of the total increase in VAT rates in 2010, only about 70% was on average passed on to final consumer prices, while the remainder was absorbed by the firms themselves. This analysis shows that the actual contribution of total indirect taxes (VAT and SCTs) to inflation for that year was 2.82 (=1.18+1.64) percentage points, compared with 3.32 percentage points under ELSTAT's mechanistic method. Broadly similar results, with some fluctuations, are shown in Table 6 for 2011. VAT pass-through increased further to 96.7% in energy. By contrast, it fell to 73% in processed food, 55.9% in non-energy industrial goods, 53.8% in unprocessed food and 51.8%, which is the lowest, in services. The total actual impact of VAT on headline inflation in 2011 was 0.99 percentage point, against 1.65 per-

Table 5 Inflation and indirect taxes (VAT and special consumption taxes), 2010

	Inflation (% per annum)	Total impact of indirect taxes (VAT and special consumption taxes) on inflation (in percentage points)	Impact of special consumption taxes on inflation (in percentage points)	VAT (*mechanistic* impact or full pass-through in percentage points)	VAT (actual impact in percentage points)	VAT pass-through*
HICP (overall index)	**4.7**	**3.32**	**1.64**	**1.68**	**1.18**	**70.2%**
Unprocessed food	0.2	0.10	0.00	0.10	0.08	75.3%
Processed food	5.0	0.49	0.26	0.22	0.18	81.2%
Non-energy industrial goods	1.9	0.85	0.26	0.58	0.43	74.1%
Energy	30.4	1.27	1.07	0.20	0.18	92.2%
Services	3.1	0.66	0.08	0.58	0.31	54.1%

* The VAT pass-through is measured as the ratio of VAT actual impact to VAT *mechanistic* impact.

Table 6 Inflation and indirect taxes (VAT and special consumption taxes), 2011

	Inflation (% per annum)	Total impact of indirect taxes (VAT and special consumption taxes) on inflation (in percentage points)	Impact of special consumption taxes on inflation (in percentage points)	VAT (*Mechanistic* impact or full pass-through in percentage points)	VAT (actual impact in percentage points)	VAT pass-through*
HICP (overall index)	**3.1**	**1.98**	**0.33**	**1.65**	**0.99**	**60.0%**
Unprocessed food	3.4	0.20	0.00	0.20	0.11	53.8%
Processed food	4.7	0.36	0.07	0.29	0.21	73.0%
Non-energy industrial goods	-0.2	0.33	0.05	0.29	0.16	55.9%
Energy	16.7	0.31	0.17	0.14	0.13	96.7%
Services	1.9	0.78	0.05	0.73	0.38	51.8%

* The VAT pass-through is measured as the ratio of VAT actual impact to VAT *mechanistic* impact.

centage points under the mechanistic assumption of full pass-through. In other words, out of the total increase in VAT rates during 2011, only an average of about 60% was passed on to final consumer prices, while the remainder was absorbed by the firms themselves. Thus, the actual contribution of total indirect taxes (VAT and SCTs) to inflation for that year was 1.32 (=0.18+1.64) percentage points, against 1.98 percentage points under ELSTAT's mechanistic method.

In 2012, VAT rates remained unchanged at their 2011 levels. However, the impact on inflation continued to be visible, albeit diminishing, as a carry-over effect from the previous year. The pass-through of VAT changes rose to 86.7% in processed food and declined to 28.0% in services (see Table 7). In addition, apart from the carry-over effect of past VAT increases, a significant contribution to inflation for that year also came from the rise in SCT on heating oil in October 2012.

Table 7 Inflation and indirect taxes (VAT and special consumption taxes), 2012

	Inflation (% per annum)	Total impact of indirect taxes (VAT and special consumption taxes) to inflation (in percentage points)	Impact of special consumption taxes on inflation (in percentage points)	VAT (*mechanistic* impact or full pass-through in percentage points)	VAT (actual impact in percentage points)	VAT pass-through*
HICP (overall index)	**1.0**	**0.91**	**0.29**	**0.62**	**0.19**	**30.3%**
Unprocessed food	1.4	0.00	0.00	0.00	0.00	0.0%
Processed food	1.2	0.02	0.00	0.02	0.02	86.7%
Non-energy industrial goods	-0.6	0.00	0.00	0.00	0.00	0.0%
Energy	12.6	0.29	0.29	0.00	0.00	0.0%
Services	-0.2	0.59	0.00	0.59	0.17	28.0%

* The VAT pass-through is measured as the ratio of VAT actual impact to VAT *mechanistic* impact.

Table 8 VAT pass-through to final consumer prices in 2005, 2010, 2011 and 2012

	VAT pass-through to final prices			
	2005	2010	2011	2012
HICP (overall index)	**88.5%**	**70.2%**	**60.0%**	**30.3%**
Unprocessed food	82.7%	75.3%	53.8%	0.0%
Processed food	96.9%	81.2%	73.0%	86.7%
Non-energy industrial goods	91.2%	74.1%	55.9%	0.0%
Energy	97.4%	92.2%	96.7%	0.0%
Services	80.8%	54.1%	51.8%	28.0%

On the basis of the above analysis, aggregating VAT pass-through across years and product groups over the 2010-2012 period (i.e. during the economic crisis) and as opposed to 2005, the year closest to pre-crisis VAT rate increases, we can observe the following (see Table 8):

In 2005, VAT increases were passed on to final prices to a much larger extent than in the 2010-2012 period. In particular, the VAT pass-through rate was 88.5% on average, with small variations across inflation components, implying that almost all products were affected by the bulk of the VAT increase. The pass-through percentage ranged from a maximum of 97.4% (energy products) to a minimum of 80.8% (services).

By contrast, in 2010-2012 the economic conditions, as shaped by the crisis, significantly restricted the ability of enterprises to pass VAT increases on to final consumers, as their primary concern was to maintain demand for their products. Thus, despite the successive VAT increases, the rise in prices was only 70.2% of that in VAT in 2010 and even less (60.0%) in 2011. At the same time, differences across the affected categories of goods widened: in energy, due to price inelasticity and the specific conditions of the energy market, the VAT pass-through remained the highest and very close to its 2005 levels; by contrast, in the other components, deteriorating economic conditions, strong competition, lower

disposable income and falling demand, all contributed to a larger absorption of VAT increases by firms, to the benefit of consumers. Thus, the VAT pass-through was contained to 54.1% (the lowest level) in services in 2010 and 51.8%, in services again, in 2011. In other words, the range of items that were less affected by VAT increases expanded.

For 2012, the VAT pass-through only refers to the impact of VAT increases intoduced in 2011 – mainly in the components of processed food and services – which had not fully worked through into prices. It should be noted that the latest VAT increases date back to September 2011. In particular, the rate of VAT was raised from 13% to 23% for refreshments-juices (included in the processed food component) and various catering services (fast food, meals and refreshments served, desserts, coffee, etc.). Thus, in 2012 the rate of VAT pass-through fell to 30.3% on average, having declined in services (28.0%) and increased in processed food (86.7%).

3 ACTUAL AND THEORETIC/MECHANISTIC IMPACT OF INDIRECT TAXES

The above analysis suggests that in 2010, when the first successive indirect tax increases of the crisis period were introduced, inflation rose to an average 4.7%, from 1.3% in 2009. Assuming that indirect taxes (VAT and SCTs) are fully and directly passed on to final consumer

prices, they added 3.32 percentage points to inflation, of which 1.68 percentage points are attributable solely to VAT and the remaining 1.64 percentage points are attributable to SCTs. Given that the latter represent a quasi cost element of an administrative nature levied on the production of goods and carried over further along the supply chain, their impact (1.64 percentage points) is fully passed on to final consumer prices. With regard to VAT, however, its pass-through to final prices varies depending on the assumption used. Under the full pass-through assumption used in our analysis, it is estimated that only about 70% of the theoretic inflationary impact of VAT (1.68 percentage points) is passed on to final consumer prices. Thus, in 2010 the actual increase in inflation resulting from VAT is estimated to have been 1.18 percentage points (see Table 5). As a result, the total actual increase in inflation arising from indirect taxes in 2010 (VAT and SCTs) was 2.82 percentage points, compared with 3.32 percentage points according to ELSTAT (see Table 9).

In January 2011, the reduced VAT rate was raised to 13% (from 11%) and the super-reduced rate to 6.5% (from 5.5%). In September 2011, certain goods and services (refreshments-juices and restaurant services) were moved from the reduced rate (13%) to the standard rate (23%), while in January 2011 pharmaceuticals and hotel accommodation services were moved to the super-reduced rate (6.5%). Inflation fell to 3.1% in 2011 and the actual contribution of indirect taxes (VAT and SCTs) declined to 1.32 percentage points (VAT: 0.99 percentage point, SCTs: 0.33 percentage point), compared with 1.98 percentage points as recorded by ELSTAT (see Table 9).

Finally, VAT rates remained unchanged in 2012 and no items were moved to different rates. The only indirect tax increase that took place was the one resulting from bringing the special consumption tax on heating oil to 80% of that on diesel in the last quarter of the year. Given that this tax is by definition considered as a quasi cost element determining the price of a product, the increase is passed on to the final consumer in its entirety.

Therefore, the contribution of indirect taxes to inflation for the year 2012 came mainly from the rise in the special consumption tax on heating oil in the last quarter of the year and from the changes in VAT (mostly moves to different rates) carried out in 2011 and fully reflected in prices in 2012. This carry-over effect was 0.19 percentage point from the VAT increase and 0.29 percentage point from SCTs. In total, indirect taxes contributed 0.48 percentage point to inflation, compared with 0.91 percentage point recorded by ELSTAT (see Table 8), while inflation fell to 1.0% on average over the same period.

Table 9 Impact of indirect taxes (VAT and special consumption taxes) on final consumer prices in the years 2010, 2011 and 2012 under alternative approaches

(percentage points)

| | Impact of indirect taxes (VAT and special consumption taxes) | | | | | |
| | 2010 | | 2011 | | 2012 | |
	ELSTAT	Present study	ELSTAT	Present study	ELSTAT	Present study
HICP inflation	**3.32**	**2.82**	**1.98**	**1.32**	**0.91**	**0.48**
Unprocessed food	0.10	0.08	0.20	0.11	0.00	0.00
Processed food	0.49	0.44	0.36	0.28	0.02	0.02
Non-energy industrial goods	0.85	0.69	0.33	0.21	0.00	0.00
Energy	1.27	1.25	0.31	0.30	0.29	0.29
Services	0.66	0.39	0.78	0.42	0.59	0.17

CONCLUSION

Our research has shown that at the time of implementation of the changes in the rates of indirect taxes and mostly in VAT, the use of the HICP-CT, as published by ELSTAT, leads to some degree of (expected) overestimation of the actual impact on final consumer prices, as the pass-through should not necessarily be considered as full and immediate. However, to the extent that this tax increase is passed on to final prices, possibly in full, this suggests that the timing and pace of this impact may differ from the mechanistic effect implied by the HICP-CT. As we demonstrated, the actual impact may be lower than the mechanistic one, depending on the prevailing economic conditions and the pricing strategies of businesses.

In general, although the importance of indirect taxes as a factor influencing inflation is indisputable, the HICP-CT provides a good and transparent tool for measuring this process. Such measurements are necessary if we are to obtain a robust estimate of the inflationary pressures that arise from this factor, in parallel or in contrast with other factors, such as labour costs and profit margins.

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STRUCTURAL REFORM OF THE ROAD HAULAGE SECTOR*

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1 INTRODUCTION

Freight transport is an integral part of the supply chain and plays an important role in shaping a market's competitiveness. According to the European Commission, logistics, such as transport and storage, account for 10-15% of the final cost of the finished product.[1] As regards the Greek economy in particular, road and sea freight transport play a predominant role in the carriage of goods, due to lack of alternative modes of land freight transport (inadequate rail network, no river transport) and the country's distinctive terrain (numerous islands and mountain ranges).

By late 2000, the institutional framework on road haulage in Greece had been characterised by very tight restrictions on competition (see, for instance, IOBE 2006, SEV 2010, KEPE 2011). On top of these restrictions, the costs associated with red tape and, more generally, doing business in Greece (*Doing Business Indicators*, World Bank 2012) had been elevated. Despite harmonisation with European Union regulations and directives on individual matters, e.g. lifting restrictions on cabotage, maximum driving hours, etc., there had been no targeted legislative interventions to liberalise the industry and address distortions caused by outdated market arrangements. The structural reform started with the recently adopted Framework Law 3887/2010, which laid the groundwork for the industry's consolidation and growth and is expected to bring significant benefits to the Greek economy as a whole.

This paper begins with an overview of the road haulage industry's structure and performance until 2010 (Section 2) in order to highlight the competitiveness gap between Greece and other European countries. Section 3 reviews competition restrictions under the previous institutional framework, thus reflecting Greece's institutional divergence from other European countries. Section 4 outlines legislative interventions since 2010, Section 5 sets out their expected economic impact in the light of international experience, while Section 6 provides an overview of recent economic developments in the Greek road haulage sector. Finally, Section 7 presents this paper's main findings and puts forward recommendations for further policy measures.

2 THE SECTOR'S STRUCTURE AND PERFORMANCE UNTIL 2010

Up until 2010, the road haulage sector accounted for roughly 1% of total employment and GDP in Greece, compared with corresponding shares of up to 2% in the EU-27. A common feature of EU countries in relation to other advanced economies is that concentration in this industry is low (see Boylaud and Nicoletti, 2001). Fragmentation is particularly high in the Greek road haulage sector, with 96% of all 23,765 firms active in the sector in 2007[2] posting turnovers of up to €0.5 million.[3] It is indicative that the average number of employees per road haulage firm in Greece is 2, compared with 10 in Germany and 6 in Portugal. Moreover, the rate of self-employment in road haulage was among the highest in the Greek economy (62%, compared with 35% in the Greek economy as a whole).[4]

Before 2010, the sector enjoyed substantial profit margins. According to national accounts

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1 See http://europa.eu/pol/trans/index_el.htm.
2 Latest available ELSTAT census data.
3 This percentage was 97% in 2002, implying a low degree of resource reallocation in the industry towards larger units. The low concentration of the industry is also seen in the KEPE study (2011) on the basis of the Herfindahl index and the market shares of larger undertakings.
4 On the basis of sample survey data by Eurostat (Structural Business Statistics) for 2009 – the latest available year.
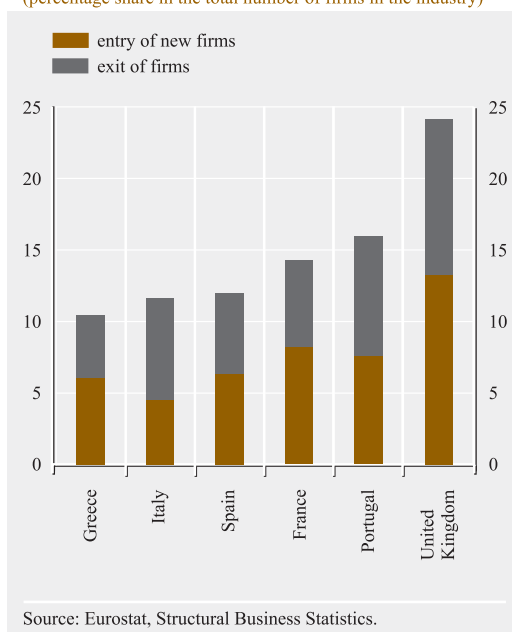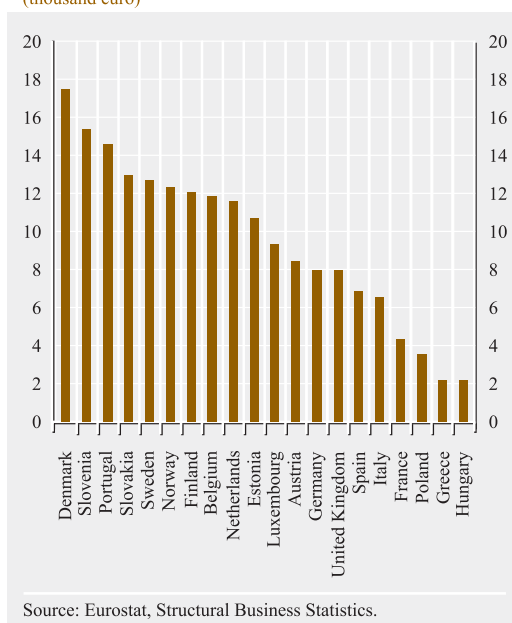
ment) was 14% in Greece, compared with 10% for the corresponding sector in Portugal and 5% for the Greek economy as a whole.[5] Despite such profit margins, the mobility rate of Greek road hauliers was low compared with other countries, mainly as a result of the limited number of exits from the industry (see Chart 1).[6]

The above-mentioned data indicate that road haulage operators were not facing fierce competition on the domestic market. The relative lack of competition is corroborated by the fact that land freight transport is almost entirely (97%) carried out by road in Greece, since the rail network has not been sufficiently developed in terms of coverage and quality (see Alpha Bank 2008). In addition, weak competition on the domestic market is also underpinned by the very low penetration of cabotage (1% in 2010). This may be attributed to the fact that, given the country's geographical location, the country offers lucrative opportunities only to hauliers from Greece's bordering countries.[7] However, restrictions on cabotage by Balkan hauliers, who have motives to penetrate the Greek market, were lifted only recently.

The lack of competitive pressures is in line with the low level of investment per employee (see Chart 2). It is also consistent with the industry's low efficiency, evident in a series of individual indicators:

First of all, the Greek market's excessive truck intensity (4.7 vehicles per €1 million of GDP

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[5] The Centre of Planning and Economic Research (KEPE) (2011) examines net profit margins on the basis of official accounting data of road haulage firms and identifies satisfactory profit margins.

[6] Data are available only for the broader sector of "Land transport and transport via pipelines" (NACE Rev. 2, Division 49), which includes road, rail and waterborne transport of both freight and passengers. The share of the road freight transport industry in the total output value of the whole land freight transport services sector is 48% (Eurostat 2009). Data on the entry/exit of firms do not, by definition, concern rail freight sector, given the state monopoly.

[7] A European Commission report (2011) leads to the conclusion that cabotage in a country is mainly carried out by hauliers from its bordering countries. Cabotage has grown mainly in central European countries, although it remains limited due to its — by definition — temporary nature. In Greece, cabotage penetration rates are comparable with those of other countries on the EU's periphery.

data, in 2008 the sector's ratio of profit to total turnover (adjusted for the rate of self-employ-

Chart 3 Commercial and private goods vehicle fleet

(thousand vehicles)

- ■ commercial goods vehicles
- ■ private goods vehicles
- — private heavy goods vehicles (share in total private goods vehicles, right-hand scale)
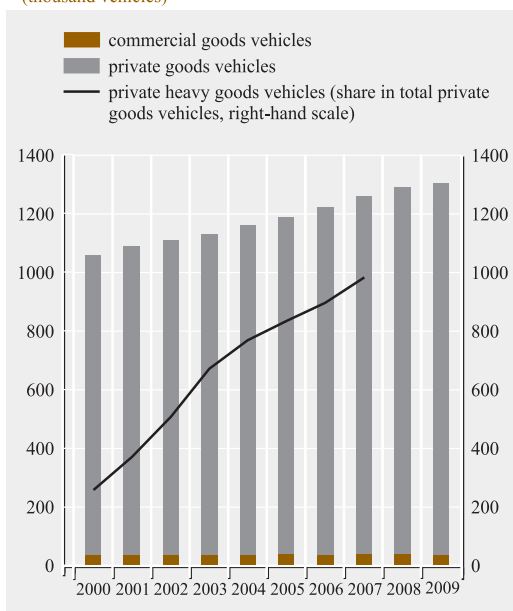
Sources: ELSTAT, and Alpha Bank, *Economic Bulletin*, No. 107, 2008.

Chart 4 New and used goods vehicles as a share of newly registered goods vehicles (per category of use), 2009

new commercial goods vehicles
1%

used commercial goods vehicles
5%

new private goods vehicles
43%

used private goods vehicles
51%
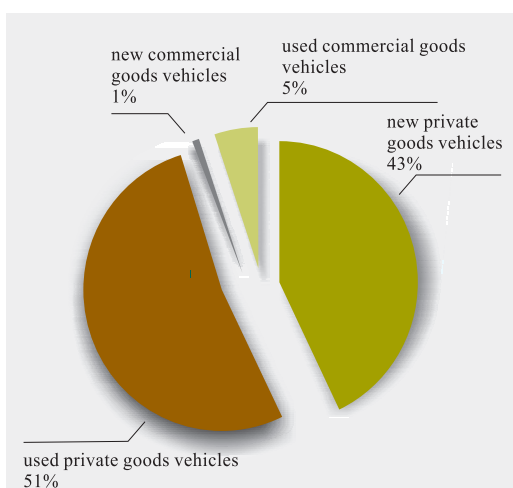
Source: Eurostat.

in Greece, compared with €2.5 in EU-15 countries in 2009[8]), as a result of the boom in the "own-account" fleets of non-transport under-

takings (see Chart 3), in their effort to ensure lower costs and higher quality for the carriage of their goods.

Second, the old age of the vehicle fleet (new trucks of less than 2 years accounted for 11% of the fleet in 2010, compared with 31% in Spain and 48% in Germany; see also Chart 4).

Third, a high share of empty runs in (total) national transport (38% in 2010, compared with 26% in EU-15).

The low efficiency of the industry may also be attributed to the limited extent and low quality of road and warehouse infrastructures, as well as inadequate interconnectedness with other transport modes. As a result, environment and road safety are heavily impacted and the quality of transport services is low (lack of flexibility and timely servicing). Indicatively, McKinsey & Company (2012) report that transportation operating productivity is 13 km/hour worked in Greece, compared with 24 km/hour worked in EU-15.

These shortcomings are reflected in the labour productivity ratio for the Greek road haulage sector and its divergence from the corresponding ratios of other European countries. For instance, in 2009, value added per employee in the Greek road haulage sector represented 25% of the average productivity of the same sector in EU-15.[9] Greece's shortfall is also evident in European Commission reports (see, for instance, European Commission 2011) and in the World Bank Logistics Performance Index.

3 THE INSTITUTIONAL FRAMEWORK UNTIL 2010 AND THE ENSUING DISTORTIONS

Up until 2010, the institutional framework for the domestic road haulage market included

8 See http://www.eea.europa.eu/data-and-maps/figures/truckintensity-in-the-eea.
9 Structural business statistics data, Eurostat. The conclusions on turnover per employee are similar.

barriers to market entry[10] and operation, and discrimination against potential foreign entrants into the domestic market. As a result, the previous regulatory framework helped create (and maintain) low levels of competitiveness and market distortions and thus contributed to the industry's low efficiency.

In greater detail, the previous institutional framework on the road haulage industry mainly consisted of Law 383/1976 relating to "commercial goods vehicles" and Law 1959/1991 relating to "private goods vehicles."[11]

As regards access to the market of commercial goods vehicles, it is indicative that the number of licences, which was administratively set by the State, had remained unchanged (at 36,495 vehicles) since the 1980s, despite the Greek freight transport market's rising needs. Furthermore, the territorial coverage of licences for freight transport within the country was subject to tight restrictions depending on the category.[12] Institutional barriers to licensing caused a series of market distortions: a "premium value" market emerged, with commercial goods vehicle licences being traded for €30,000 to €300,000.[13] These premium values acted as a barrier to the entry of new operators into the market. Moreover, the lack of new commercial goods vehicle licences accentuated the dependence on private goods vehicles to meet freight transport needs (see Chart 3), despite the fact that access to the market for private goods vehicles was also subject to restrictions.

The previous institutional framework enabled the State to periodically determine maximum and minimum freight charges for transport within a single prefecture. The administratively set freight charges acted as an additional barrier to market entry, as they secured profit margins for existing firms, restricted inter-operator competition and reduced incentives for improving the quality of services.

In addition, the previous institutional framework impeded (or blocked) access to certain

services, such as truck hire, combined transport, mixed-load and liquid-fuel transport. A case in point for market distortions was the fact that commercial goods vehicles had the exclusive right to transport empty containers; as a result, the share of empty runs was high. According to McKinsey & Company (2012), the high ratio of empty runs is one of the key reasons behind the low productivity of the Greek road haulage sector.

Greece had complied with EU rules on maximum daily driving hours, rest periods and requirements for admission to the occupation of road haulage operator. It also complied with the lifting of cabotage restrictions, thus allowing the national carriage of goods for hire or reward to be carried out by non-resident EU-27 hauliers on a temporary basis in Greece. However, foreign firms interested in a permanent establishment in Greece were also subject to the same regime that did not provide for the issuance of new commercial goods vehicle licences.

The restrictive regulatory framework governing market entry and operation in the Greek road haulage sector is reflected in the high score of the relevant OECD index (Road Freight Product Market Regulation Index).[14] In fact, the extent of regulatory barriers to competition in road haulage was one of the highest among OECD countries in 2008 (see Chart 5). The divergence of Greece's previous

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10 See Boylaud and Nicoletti (2001) for this categorisation of barriers to competition. The first two columns of Table 1 here show the institutional barriers to competition in road haulage in Greece and the ensuing problems until 2010.

11 According to applicable definitions, commercial goods vehicles are licensed for the transport of freight on account of third parties (persons or firms) (hire or reward), while private goods vehicles are licensed only for own-account transport. The former are also referred to as "public-use vehicles" and the latter as "private-use vehicles".

12 Licenses were either "prefectural" or "national" and only the latter enabled carriage of goods between different prefectures.

13 See, for instance, explanatory reports to Law 3887/2010 of the Ministry of Transport.

14 More specifically, the high score may be attributed to the fact that the previous regulatory framework imposed: (i) licensing authorised by the State, and (ii) administratively set freight charges. Other unwarranted regulatory barriers to market entry reflected in the OECD index concern licensing criteria, the ability of regulatory authorities to influence sector completeness, as well as the degree of involvement of professional trade unions and associations in sectoral regulation.

Chart 5 Road Freight Product Market Regulation (PMR) Index,[1] OECD countries, 2008
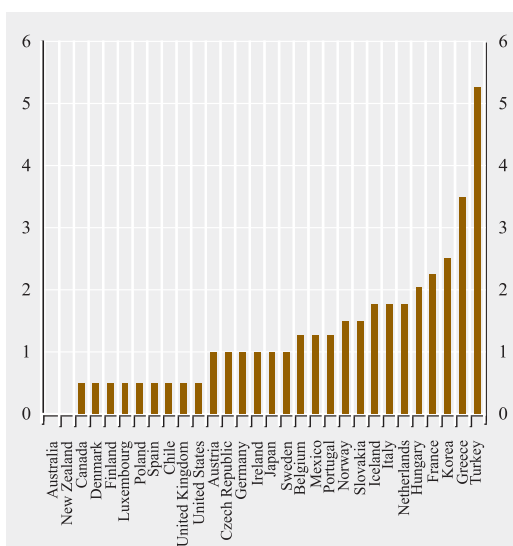
Source: OECD (2011), Product Market Regulation Database.
1 Index scale of 0-6 (from least to most restrictive).

Chart 6 Relative labour productivity and institutional barriers to competition
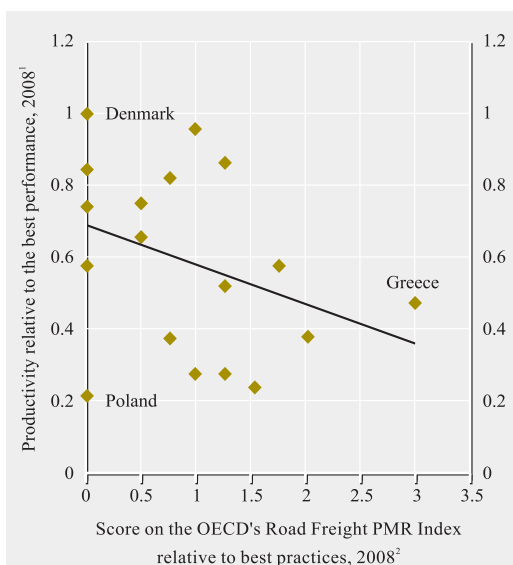
Sources: Eurostat, Structural Business Statistics. OECD (2011). Product Market Regulation Database.
1 The ratio of a country's labour productivity (value added per employee) to that of Denmark (best performing country).
2 Difference from the best performing country in the sample.

institutional framework from best practices is in positive correlation with the divergence in the sector's labour productivity between Greece and Denmark, which is the best performing EU country (see Chart 6).

4 LEGISLATIVE INTERVENTIONS SINCE 2010

The revision of the institutional framework for road freight transport in accordance with international best practices has been completed at the level of primary legislation (see Table 1):

Framework Law 3887/2010 laid the foundations for the liberalisation of the road freight industry by lifting barriers to market entry for commercial goods vehicles. The key reforms introduced in the institutional framework are the full liberalisation of freight charges and the gradual liberalisation of commercial goods vehicle licences.

In more detail, the new institutional framework provides for only two licence categories, national and international; international licences also cover national transport operations. The new licences are issued within three months of the application, on condition of the operator's compliance with objective criteria (harmonised with EU rules) and the vehicle's compliance with technological criteria. The new institutional regime does not leave room for the State to restrict the number of operators and market completeness. Although Framework Law 3887/2010 stipulated that only enterprises (legal entities) would be allowed to obtain new commercial goods vehicle licences, irrespective of the total gross weight (tonnage) of their fleet, subsequent amendments to the Framework Law also provided for licensing of natural persons, who are EU or EEA nationals established in Greece.

The Framework Law stipulated that new commercial goods vehicle licences could be issued until the expiry of a transitional period for the law's implementation on 30 June

Table I Structural reform of road haulage – Summary list of key problems and legislative interventions

Regulatory obstacles to competition until 2010	Ensuing problems	Legislative interventions since 2010	Room for further policy actions
Barriers to market entry			
The number of commercial goods vehicle licences is administratively set (Law 383/1976). The prefectures may decide to issue new licences after evaluating market needs.	The number of commercial goods vehicle licences had remained unchanged at 36,495 since 1976. The number of private goods vehicles was continuously rising in order to cover market needs. Illegal use of foreign trucks and private goods vehicles. At local level, there was room to informally influence decisions on the number of licences through professional associations and industry representatives.	Law 3887/2010 liberalises the number of commercial goods vehicle licences. The issue of new road haulage operator licences is enabled. The criteria for obtaining a licence are objective and fully in line with EU rules (professional competence, financial standing, reliability). The fee for issuing a road haulage operator licence reflects the administrative fee for application processing. Procedures are implemented by administrative services operating in accordance with the "one-stop shop" model. The prescribed maximum time for processing a licence application is three months.	Further reduction of bureaucratic costs (fewer procedures, shortened licensing procedures). Licensing could also be extended to non-EU (e.g. Turkish, other Balkan) nationals, provided that specific criteria are met. Lowered minimum initial capital requirement for natural and legal persons.
Licences are divided into prefectural, national (inter-prefectural) and international, subject to corresponding restrictions on the carriage of goods; the conversion from one licence category to another is subject to restrictions.	Local exclusivities, reduced flexibility. Due to the then current lifting of restrictions on cabotage in accordance with EU legislation, there was an asymmetry between resident and non-resident road hauliers in terms of their ability to transport goods within the Greek territory.	Licences are divided into national and international; a licence for international transport also enables national transport.	
Free from State intervention transfer of licences by purchase, gift or inheritance. State intervention regards imposing a licence transfer tax based on the "objective value" of the licence, as calculated by the Ministry of Finance.	Due to their restricted number, licences were priced with a high premium in the market which constituted a barrier to the entry of new, sufficiently qualified professionals into this industry. Unexploited scope for tax revenue.	Premia in licence value were administratively set at zero as from 27 January 2012 (Law 4038/2012), i.e. at an earlier date than the end of the transitional period initially prescribed by Law 3887/2010. Ministerial Circular (POL) 1065/8 March 2013 – Clarification of transfer modalities and transaction fees for commercial goods vehicle licences that existed before Law 3887/2010 was passed. Road haulage operator licences may not be transferred or inherited.	
No criteria for maintenance of a commercial goods vehicle licence are defined.	Insufficient incentives for investment in infrastructure and new technology goods vehicles.	Road haulage operator licences shall be renewed every 10 years.	Preservation of high standards for the renewal of road haulage operator licences and ongoing review in accordance with developments in EU legislation and technology; ensuring low administrative fees for licence renewal.
Restrictions on obtaining a private goods vehicle licence (Law 1959/1991) and adjusting the capacity of such vehicles.	Inefficient coverage of the needs of non-transport undertakings.	Law 4093/2012 transposes Directive 2006/1/EC on freely hiring private goods vehicles, irrespective of their tonnage, on behalf of non-transport enterprises, as well as leasing such vehicles through leasing companies.	Provision of incentives for upgrading the fleet of private goods vehicles.
Administratively set compulsory minimum and maximum limits for freight charges on national transport. Non-regulated freight charges on prefectural and international transport.	Administrative rules do not reflect the actual supply and demand conditions (infrequent reviews, obscure criteria). Insufficient State control of compliance with legally prescribed limits for freight charges.	Full liberalisation, with the exception of fuel transport to remote mountainous and insular regions. Introduction of compulsory insurance of goods.	Strengthening of market supervision. Combatting illegal trade.

Table 1 Structural reform of road haulage – Summary list of key problems and legislative interventions *(continued)*

Regulatory obstacles to competition until 2010	Ensuing problems	Legislative interventions since 2010	Room for further policy actions
Barriers to market operation			
Only commercial goods vehicles are allowed to perform third-party freight cargo, for hire or reward.			
Freight forwarding companies were not allowed to have their own vehicle fleets, but only to hire commercial goods vehicles.		Liberalisation of truck hire.	
Retail fuel companies were required to use commercial goods vehicles for the transfer of fuels from refineries. They had to own private goods vehicles to hire commercial goods vehicles. Restrictions on the number and tonnage of private road tankers.	Exclusivities for commercial goods vehicles, protection from competition.

Very frequent empty runs with a corresponding negative impact on the environment and road safety. | Law 4093/2012 allows the carriage of fuels to be performed by company-owned or hired road tankers (commercial or private goods vehicles), irrespective of tank capacity.

The obligation to own private goods vehicles and previous restrictions on the number of available commercial road tankers and their tonnage are lifted. | Direct lifting of asymmetric restrictions on own-account vehicles for the carriage of mixed loads (relevant restrictions are indirectly lifted through the unregulated licensing of road haulage operators and the liberalisation of vehicle hire). |
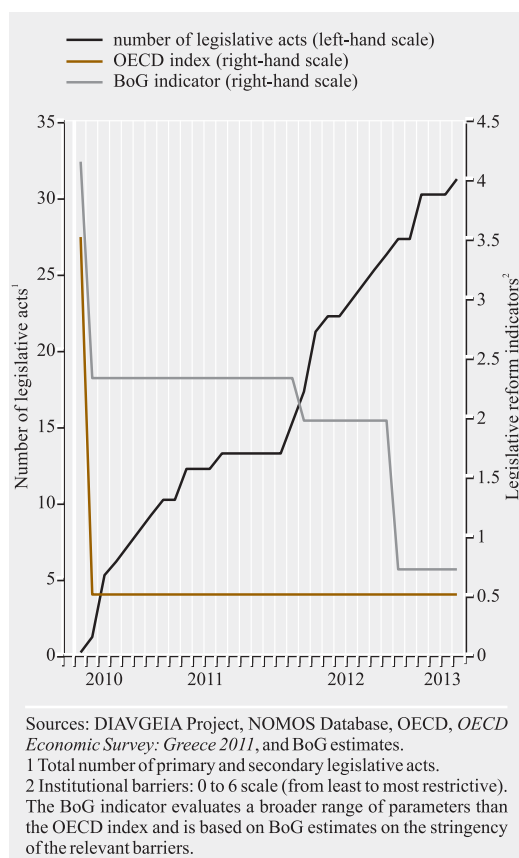| Only commercial goods vehicles were authorised to carry empty containers. | Inefficient use of vehicle fleet and low quality of services. | | |
| Only commercial goods vehicles were authorised to carry refrigerated and non-refrigerated goods (on condition that safety precautions were followed). | | According to Ministerial Circular C5/oik6931/759/8.2.2012, the carriage of owned or non-owned containers to and from company premises may be performed by private goods vehicles. | |
| Combined transport may only be performed by commercial goods vehicles. | | | |

2013. Thereafter, only "road haulage operator licences" may be issued. Within ten years of the entry into force of Law 3887/2010, all firms in this sector must be licensed road haulage operators. Law 4038/2012 introduced amendments which stipulated that the transitional period would end 18 months earlier (on 27 January 2012). The administrative fee for issuing a road haulage operator licence reflects only the fees for processing the relevant application.

The latest legislative interventions introduced by Law 4093/2012 mainly concerned the removal of barriers to market operation. In more detail, the carriage of liquid fuels was liberalised by eliminating barriers to the use of private road tankers and deregulating the con-version of commercial goods vehicle licences to road tanker licences. Restrictions on the acquisition and use of private goods vehicles were also lifted through the full liberalisation of commercial and private goods vehicle hire and the lowering of fees for commercial goods vehicle licences.

The progress of the structural reform of the institutional framework of road haulage is shown in Chart 7. The chart's right-hand scale cumulates the number of primary and secondary legislative acts. The left-hand scale shows two indicators on how the institutional framework's divergence from full liberalisation evolved over time. The OECD index only measures barriers to market access. The "BoG indicator" has been compiled for the purposes

legend:
- number of legislative acts (left-hand scale)
- OECD index (right-hand scale)
- BoG indicator (right-hand scale)

Sources: DIAVGEIA Project, NOMOS Database, OECD, *OECD Economic Survey: Greece 2011*, and BoG estimates.
1 Total number of primary and secondary legislative acts.
2 Institutional barriers: 0 to 6 scale (from least to most restrictive). The BoG indicator evaluates a broader range of parameters than the OECD index and is based on BoG estimates on the stringency of the relevant barriers.

ened transitional period to 2012 sped up the reform, but also contributed to delays in the completion of the necessary legislative work and heightened uncertainty.

The lower fees for new licensing thanks to the recent legislative interventions immediately reduced fixed costs for newly-licensed road haulage operators and, by extension, their total operating costs. A recent study by the Hellenic Institute of Transport (IMET 2013) shows that this reduction could be very substantial.

In addition, the revised institutional framework aims to create a business-friendly environment. Table 2 shows cost parameters for the start-up procedure of road haulage operators, similar to those included in the World Bank's measurement of the cost of doing business. In particular, start-up costs, measured in euro and time spent, are compared with the level of start-up complexity (number of procedures). As a result, the issuance of a road haulage operator licence entails fewer procedures and lower costs than the average business start-up in Greece. By way of example, the administrative licensing fee for a road haulage operator with one commercial vehicle amounts to €1,500. This corresponded to 6% of gross national income per capita in 2012, when the average cost of business start-up accounted for 20.5% of gross national income per capita (World Bank 2012). The most significant charge is the minimum initial capital requirement for starting a business, which is based on relevant EU regulation and, therefore, cannot be subject to reduction.

In conclusion, it would be advisable for any further legislative interventions in the institutional framework to be focused on fully clarifying the new provisions, curtailing red-tape costs for operators, simplifying the procedures for licence issuance and renewal, as well as cutting relevant fees.

of this paper and reflects a broader range of market rigidities, in line with the methodology of Boylaud and Nicoletti (2001).[15] Overall, it is clear from Chart 7 that legislative interventions took place gradually and moved towards convergence with other OECD countries. Thanks to such interventions, Greece is now among the OECD countries with the lowest restrictions on competition in road haulage (see OECD 2011, European Commission 2012).

It is also worth pointing out the difficulty of making and implementing legislation. For the most part, the legislative acts of Chart 7 are explanatory or informative circulars. This is indicative of the delays in the implementation of the new legislation and of the need to clarify the new institutional framework. The short-

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[15] Contrary to the OECD index, the BoG indicator is not comparable among OECD countries and is based on Bank of Greece calculations.

Road haulage operator licensing fee	
Administrative fee	€1,000 for the issue of a road haulage operator licence plus €500 per commercial goods vehicle licence
Minimum initial capital requirement	€9,000 for sociétés anonymes (+€5,000 for each commercial goods vehicle licence)
	€18,000 for natural persons and other company forms (+€9,000 for each commercial goods vehicle licence)
Additional charges	– notarial fees for document validation, power of attorney fees, validation of articles of incorporation (in the case of general partnerships and limited liability companies – LLCs, the articles of incorporation must also be validated by the Court of First Instance), copies of ownership deeds and tenancy agreement
	– fees for the issue of bank letters of guarantee
Processing time[2]	
Issue of road haulage operator licence	Within three months from the date of full submission of the supporting documents (up to 66 working days)
Number of procedures and supporting documents required for starting a business	
1. Issue of road haulier professional licence and proof of financial standing	4 additional supporting documents (+1 for legal persons) besides those attesting professional competence (such as the driving licence)
2. Issue of road haulage operator licence	5 additional supporting documents (+1 for legal persons, +3 for SAs and LLCs, +1 for general and limited partnerships) besides the application form and any certificates of competence
3. Issue of commercial goods vehicle licence	4 additional supporting documents besides the certificate of roadworthiness
State authorisations required for starting a business	
Issue of road haulier professional licence and proof of financial standing	1 service (Citizens' Service Centre – KEP)
Issue of road haulage operator licence	1 service (Regional Transport Department)
Issue of commercial goods vehicle licence	1 service (Regional Transport Department)

1 Referring to new undertakings that hold certificates of professional competence and have roadworthy goods vehicles (equipped with Euro V engines).
2 Based on the administratively set maximum processing times for the granting of a licence and not the average time required for the completion of the procedure. The cost of additional charges is not recorded. It is not possible to evaluate as yet the total opportunity cost of road haulage operator licences (based on the model of World Bank indicators).

5 EXPECTED ECONOMIC IMPACT OF THE LIBERALISATION OF THE ROAD HAULAGE INDUSTRY BASED ON INTERNATIONAL EXPERIENCE

The experience of OECD and EU countries from the liberalisation of the road haulage market has been positively assessed (see Boylaud and Nicoletti 2001), since the full liberalisation of freight charges and the gradual —over a two- to ten-year horizon— liberalisation of licensing have contributed to:

- increasing the rate of entry of new firms in the industry;

- lowering freight charges;

- boosting employment;

- improving the quality of transport services and the overall efficiency of the industry.[16]

16 See Table 3 in Boylaud and Nicoletti (2001) for OECD countries and Table 4.2 in IOBE (2006) for EU countries only.

According to the Foundation for Economic and Industrial Research (IOBE 2006), based on international experience, it is estimated that the full liberalisation of licensing and freight charges in Greece would lower freight charges (up to 2.5% annually), causing, in turn, a decline in the general Consumer Price Index by up to 0.3 percentage point, given the share of transport costs in the final price of goods. Increases are also expected in the number of firms entering the market (up to 2%) and the industry's employment rate (up to 4%) on an annual basis, and also in investment relating to the use of new technologies and upgrading the fleet, thereby improving the quality of services provided. These estimates are based on the premise that licensing will be gradually liberalised; this will contribute, according to the IOBE (2006), to reducing the cost of reform.

As a result, the overall productivity of the road freight transport industry should be boosted (see also Chart 6), with significant positive spillovers to the Greek economy as a whole, given the importance of the sector in enhancing the efficiency of the supply chain and lowering the final cost of goods.

6 RECENT ECONOMIC DEVELOPMENTS IN THE INDUSTRY

The economic impact of road haulage liberalisation cannot yet be singled out and assessed, given that the legislation on structural reform has only recently been completed, and also given the deep recession.

As a first measure of the intensity of competition in the road haulage sector, we look at developments in freight charges since 2010. The main advantage of this index is that freight charges have been fully liberalised since as early as September 2010. Moreover, freight charges are the main tool that the industry's operators may use to compete against each other in the short term. Inter-operator competition in terms of service qual-

Chart 8 Producer price index in road haulage

(2010=100, quarterly data)

Source: Eurostat, Short-term business statistics.
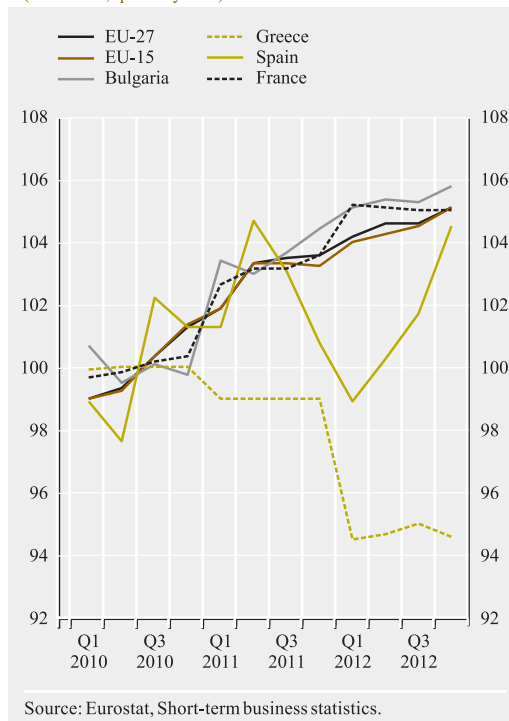
ity will develop only in the medium term, given the time required for investment to be completed.

Chart 8 shows the (quarterly) evolution of the producer price index for road haulage in Greece, the EU as a whole, as well as selected EU countries. It is clear that the Greek index has recorded a sharp decline since the first quarter of 2010. According to annual data, the industry's producer prices dropped in 2010-2012 by 2.8% in Greece, while they rose by 1.8% in EU-15,[17] despite the fact that output costs for transport firms have increased, mainly on account of higher energy costs. One should not lose sight, however, of the fact that the decline in road freight charges is also inextricably linked with the substantial decline in freight transport as a result of the recession

[17] Moreover, producer prices in road haulage declined compared with the overall producer price level in the Greek economy as a whole, given that over the 2010-2012 period Greece's GDP deflator (at basic prices) fell marginally by 0.1%.

Table 3 Characteristics of the goods vehicle fleet[1]

	2009	2010	2011	2012
Goods vehicle fleet	1,302,430	1,318,768	1,321,296	1,318,918
New circulation licences (as a percentage of total circulation licences)	2.9%	2.2%	1.4%	1.0%
New registrations (as a percentage of new circulation licences)	44%	41%	38%	30%

Source: ELSTAT.
1 "New" means a goods vehicle which, in a given reference period (month), is registered for the first time in Greece and has not previously circulated in another country. "Used" means any goods vehicle registered for the first time in Greece and imported from abroad as a second-hand vehicle.

(tonnes of goods transported have recorded a 22% decline since 2009).[18]

Another conjunctural indicator is new registrations of goods vehicles (see Table 3). This indicator shows expectations for the industry's growth and is linked to the future possibilities of firms to improve the quality of their services. The industry's prospects do not appear positive, since new goods vehicle registrations, particularly for new goods vehicles, declined throughout 2010-2012. Moreover, although the new licensing procedure is being implemented smoothly, the number of new licences issued is very limited.

7 CONCLUSIONS

Until 2010, the institutional framework of road haulage was characterised by significant barriers to market entry and operation, which impacted negatively on the industry's efficiency, the economy's competitiveness and the environment.

Distortions caused by the previous regulatory regime called for its revision. Legislation for the reform of the institutional framework, which started with Law 3887/2010, has been completed and the sector is now adjusting thereto. The new institutional environment for road haulage firms is business-friendly and harmonised with international best practices and EU regulations. An in-depth review of the effects of road haulage liberalisation is an area for future research.

It is also worth pointing out that there is scope for additional measures in order to capitalise on the structural reform of road haulage to the maximum extent possible. More specifically, international experience has shown the importance of bolstering market supervision in order to ensure healthy competition in a fully liberalised industry. Furthermore, given the sharp decline in investment, there is an imperative need for the current NSRF to be successfully completed in order for road haulage operators to be streamlined.[19] New NSRF resources could be put to immediate use to motivate firms with private goods vehicles to withdraw their old vehicles and gradually turn to the market to meet their transport needs. European Union programmes may also be tapped, along with new high-technology investment for the implementation of development projects, such as investment in road and rail networks, ports, warehousing and logistics. Finally, measures to liberalise and develop rail freight transport are necessary in order to ensure competitive conditions in land freight transport. Full coordination and timely implementation of policies, such as the ones mentioned above, will boost the efficiency of freight transport and the competitiveness of the Greek economy.

18 Up to 3/4 of the evolution of the total volume of goods transport (in tonnes) over the 2003-2011 period may be explained by Greece's GDP at constant prices and a linear trend.
19 See http://www.espa.gr/el/Pages/Proclamationsfs.aspx?item=1933.

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THE IMPACT OF THE CURRENT CRISIS ON PRIVATE RETURNS TO EDUCATION IN GREECE[*]

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1 INTRODUCTION

Exploring the relationship between the position of individuals in the labour market (as reflected in their employment characteristics and remuneration) and their education level and type is an important aspect of economic research and analysis. Examination of these relationships typically brings to the fore efficiency and equality considerations, while also often leading to interesting education and/or employment policy proposals. These issues are particularly relevant and topical for Greece, a small economy for which EU membership and the adoption of the euro as legal tender in 2002 has limited the economic policy tools available, while at the same time has enhanced the role of education and labour market policies.

Furthermore, from 2008 onwards Greece has been experiencing a prolonged financial crisis, which has led it to adopt policies for public expenditure cuts and higher taxes combined with a variety of structural interventions targeting the labour market. The same period also saw major interventions in the field of education. This crisis had a dramatic impact on the Greek labour market, in terms as much of employment and unemployment as of wages. The effects of the crisis on employment and unemployment in most euro area countries, mainly of the European south, are considerable; however, the strength of this impact differs significantly across individual countries (ECB 2012). In Greece, the number of the employed in 2012 Q2 has dropped by 17.2% compared with 2008 Q2, while at the same time average labour costs for the whole economy have declined by 12.5% (data from ELSTAT's Labour Force Survey, following appropriate adjustments). Another driver of this development has been the structural reform efforts to increase labour market flexibility through specific legislative interventions (see Laws 3845/2010, 3899/2010, 4047/2012 and 4093/2012).[1]

Quite naturally, economic recession and the ensuing wage shrinkage in recent years have had a considerable impact on the labour market position and prospects of the young, who are called to decide whether to continue their studies or not, given also the increased probability of unemployment in the current crisis.[2] As recession has brought changes along the entire wage distribution, returns to education,

[1] For a detailed description of institutional changes in the Greek labour market during the crisis see, among others, Cholezas (2010, 2011, 2012 and 2013), Alpha Bank (2013), and the Bank of Greece Annual Reports of recent years. However, the dramatic drop in employment can also be explained in human capital theory terms (Mincer 1958, 1974, Schultz 1961, Becker 1964), given that lower economic activity and employment as a rule entail higher unemployment, which, in turn, may lead to discouragement and labour force exodus and/or emigration in search of work abroad (brain drain). Both these likelihoods result in a waste of economic resources, during a period in which they are more sought and prized than ever.

[2] Indicative of the importance ascribed to the impact of the current financial crisis on young people's labour market prospects is the strong public debate held at both national and European level regarding youth unemployment and the need to adopt additional measures to promptly tackle it (see COM 2011, 2012, OECD 2013a, Castillo and Paraire 2013).

i.e. an individual's benefits from acquiring more (further) education, would most likely have changed as well. This means that, from a private perspective, investing in more education may no longer be profitable, considering all the adverse results this would entail for the economy's future growth. The aim of the present study is to examine precisely this likelihood and, specifically, how the current financial crisis has affected, so far, private returns to education for narrowly defined education groups.[3]

In this context, the study examines the development of education/wage relationships, before and during the current financial crisis. The next section briefly reviews the literature on returns to education in Greece, while the third section describes the statistical data and the methodology used. The fourth section presents the results of empirical analysis, and the last section summarises the study's main conclusions.

2 LITERATURE REVIEW

The issue of wage differentials between education system levels in Greece has been examined mainly in the context of exploring (usually private) returns to education. However, owing to limited availability of detailed statistical data, until recently at least, relevant studies estimating returns to education in Greece are relatively scarce. This section summarises the findings of the most prominent among them.[4]

2.1 THE STATISTICAL INFORMATION USED IN EARLIER STUDIES

The primary data used in the published studies on returns to education in Greece cover the period from 1957 up until recently, with the first attempt probably being the one by Leibenstein (1967). Most of the available studies rely on detailed data from household surveys conducted by the Hellenic Statistical Authority (ELSTAT) — typically the Household Budget Survey (HBS), the European Community Household Panel (ECHP), the European Union Statistics on Income and Living Condi-

tions (EU-SILC)[5] — and predominantly from the Labour Force Survey (LFS). It should be noted, however, that practically all databases used in the existing studies estimating returns to education in Greece are cross-sectional, as rather recently most of these household surveys have been redesigned, based also on EU practice, and already simultaneously provide both cross-sectional and longitudinal data.

2.2 THE METHODOLOGY APPLIED IN EARLIER STUDIES AND RELATED PROBLEMS

The methodology applied in most of the available studies for Greece in order to estimate and calculate the effect of education on earnings is limited to an econometric estimation of Mincer's (1974) 'classical' semi-logarithmic human capital equation by way of the Ordinary Least Squares (OLS) method. The education variable is usually expressed in years or education levels using dummy variables, while explanatory variables — such as, among others, potential experience and its square, age, father's education level, etc. — are often added with a view to improve the model's explanatory power.

Kanellopoulos (1997), seeking to calculate real returns for individuals employed in the public sector, applies Heckman's two-step method for correcting the sample bias or selection error. Along the same methodological lines, Kanellopoulos and Mavromaras (2002) attempt to explain wage differentials between men and women. Papapetrou (2004, 2007) embarks on a similar effort through a different methodology, using the quantiles regression method that allows estimating the effect of the independent

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3 Changes in the wages of workers of different education groups are usually not uniform and may increase or reduce the benefits from further education for one group compared to another. On the other hand, lower labour income means lower opportunity cost of education, i.e. the pecuniary earnings individuals would receive if they worked. It is impossible to determine a priori which of the two effects will be the strongest.

4 For a similar concise presentation of the relevant literature on private returns to education in Greece, see Mitrakos, Tsakloglou and Cholezas (2010b), while for a more detailed review see Cholezas and Tsakloglou (1999) and Cholezas (2005).

5 For a comparative presentation of the particular characteristics of three household surveys, see Mitrakos and Douros (2006).

variables on the dependent variable along the distribution of the latter.

More recently, Livanos and Pouliakas (2011) correct for selection error and at the same time employ the quantiles regression method, with a view to calculating private returns to education for individual categories of tertiary education graduates. Moreover, Mitrakos, Tsakloglou and Cholezas (2010b) take into account both selection error and unemployment probability at a given time after graduation and calculate private returns to education for narrowly defined specialties of tertiary education. These last two studies' conclusions agree as to the dissimilarity of returns to education among different tertiary education specialties. Finally, earlier works by Leibenstein (1967), Psacharopoulos (1982), Magoula and Psacharopoulos (1999) and Kanellopoulos, Mavromaras and Mitrakos (2003) have calculated social returns to education using cost/benefit techniques.

Almost all findings of the available studies for Greece are consistent with human capital theory, as they confirm a positive effect of education and potential experience on earnings. Moreover, returns to education levels increase with the years of schooling and all additional variables have the expected signs. However, it should be noted that other major assumptions cannot be tested based on the available statistical information, and in fact returns to education are very likely to differ considerably among individuals, depending on, for instance, their abilities or the particular educational institution they attended (in terms of its quality and reputation in the labour market). In addition, the typical use of potential (rather than actual) work experience as an explanatory variable in most studies, may be leading to an overestimated contribution of experience, since it takes no account of periods of unemployment, non-participation in the labour force (e.g. due to pregnancy) or transition between jobs, etc. Furthermore, as several studies use additional independent variables, returns to education are no longer comparable when

these variables affect the estimated effect of education on earnings. On the other hand, these variables often enhance the model's explanatory power and enable an exploration of the numerous factors that affect wages, but may be variably affecting returns to education.

Another major consideration when calculating returns to education relates to possible sample selection errors. Indicatively, in the case of female workers, the sample includes only women who have consciously opted to participate in the labour market. Nevertheless, when working women are not chosen at random, i.e. if they are primarily women with more years of schooling or unmarried, then they are not adequately representative of the entire female population. As a result of such selection errors, estimates need to be corrected using appropriate techniques.

2.3 A COMPARATIVE PRESENTATION OF EARLIER FINDINGS

Obviously, the different statistical information, but above all the methodological dissimilarities and the considerations presented in the previous subsections, disallow a direct comparison of findings. Bearing in mind this limitation, the findings of the available studies reveal the following:

First, returns to education in Greece decrease until the late 1980s and increase in the following decade. This improvement of returns to education after the 1980s is attributed to the steady growth path of the Greek economy and the ensuing higher demand for skilled personnel, in parallel with the abandonment of the income policy for a convergence of wages pursued mainly in the 1980s.[6]

Second, in most studies returns to each individual education level reveal an almost linear

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[6] Indeed, the estimated return to one additional year of schooling stands at 7.8% in 1964 (Kanellopoulos 1985), falls to 5.8% in 1977 (Patrinos 1992) and to 2.5% in 1985 (men-women average, Patrinos and Lambropoulos 1993), only to recover to 7.6% in 1994 (Magoula and Psacharopoulos 1999) and to even higher levels in 1999 (Cholezas 2005, Prodromidis and Prodromidis 2008).

relationship with the years of schooling, with the possible exception of tertiary and, mainly, university education. For instance, in 1994 returns were estimated at 6.7% for higher general secondary education, 6.3% for the respective technical education, 6.9% for Technological Educational Institutes (TEI), and 8.7% for Universities (AEI) (Magoula and Psacharopoulos 1999), whereas in 1999 the corresponding percentages for men (women) were 9.3% (12.5%), 9.6% (7.9%), 11.1% (21.2%) and 14.5% (16.3%) (Cholezas 2005).[7]

Third, in terms of returns to education, Greece seems to rank at one of the top positions among EU Member States, at least according to the analysis by Cholezas (2005) for the second half of the 1990s based on ECHP data. The same study estimates higher returns to education for other South European countries as well, whereas other studies that use different databases for each country arrive at opposite conclusions (Harmon, Walker and Westergaard-Nielsen 2001, OECD 1998, 2010).

Fourth, based on the results of the available studies, the exploration of returns to education by gender seems to reveal a major change over time. Indeed, although women often seem to have enjoyed lower returns in the past, the latest data show a reversal of the situation, as returns to education for women now markedly surpass the respective returns for men.[8] Of course this does not mean that the wages of women are higher than those of men, as they mainly relate to other productive characteristics as well (Cholezas 2005).

Fifth, the coefficient of potential experience (including tenure or not) is always positive and demonstrates the importance of past professional experience in the wage-setting process. However, in the Greek labour market it is not clear whether past professional experience raises wages on account of increased productivity or because of statutory wage increases over the years, such as three-year and seniority increments. The tenure coefficient, albeit included only in a few studies, is positive and

higher than the experience coefficient. This fact probably implies that employers value more the experience gained inside the enterprise at issue, deeming job-specific experience as more important than general experience. Indeed, when tenure is included in the independent variables, the return to one additional year of schooling falls by roughly one percentage point (Kanellopoulos 1985). All the other variables used have the expected signs. Of particular interest is the higher return to one additional year of schooling observed for individuals with higher father's education level (Patrinos 1992, 1995), as evidence of transmission of wage inequalities across generations. As regards returns to education by employment sector, it seems that these are usually higher in the private sector (Hadjidema 1998).

Sixth, gender discrimination in the labour market is yet another point of interest related to returns to education. Available studies show that wage differentials between men and women in Greece are largely due to discrimination in the labour market, since 71.5% (53.8%) of their wage differentials in 1988 (1994) cannot be explained based on differences in terms of male and female human capital (Kanellopoulos and Mavromaras 2002). Between 1988 and 1999 the gender wage gap in the private sector slightly increases but, regardless of the methodology used, most of it still cannot be explained by differences observed in the human capital stocks of men and women (Cholezas 2005).[9] Moreover,

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7 Prodromidis and Prodromidis (2008) report slightly different results for these two years. Returns to higher general secondary education were 6.1% in 1994 and 5.7% in 1999, to higher technical secondary 5.3% and 3.5%, to TEI 5.1% and 9.4%, and to AEI 6.3% and 9%, respectively.

8 Specifically, in 1964 the estimated return to one additional year of schooling stood at 6.6% for male and 6.5% for female employees (Kanellopoulos 1985), while the respective percentages for men (women) were 7.1% (11.4%) in 1974, 5.2% (6.4%) in 1988, 6.7% (7.8%) in 1994, and 7.2% (8.9%) in 1999 (Cholezas 2005). Prodromidis and Prodromidis (2008) also find higher returns to all education levels for women in 1999, while in 1994 women have higher returns only to secondary education.

9 At this point it should be noted that, as a rule, human capital is measured in quantitative (e.g. years of education) and not qualitative (e.g. education specialty) terms, while other factors that may be having an effect on wages, such as inherent abilities, are not taken into account.

although major disparities emerge between the earnings of men and women when also taking into account the workers' education level and position along the wage distribution, in most cases wage differentials cannot be explained by differences in their productive characteristics (Papapetrou 2007, Papapetrou 2008).[10]

Finally, the literature also explores a series of individual questions related one way or another to returns to education. Thus, although according to human capital theory positive returns to education result from higher productivity, according to filter theory they may be stemming from the fact that education signals to employers their (prospective) employees' higher skills. In such cases education may actually represent a waste of resources, since it does not contribute to higher worker productivity.[11]

3 STATISTICAL INFORMATION AND METHODOLOGY

In light of what was discussed in the previous section, so far no study has attempted to estimate private returns to education in the period after the onset of the current financial crisis in late 2008. The present study attempts for the first time to fill this gap, applying the methodology of Mitrakos, Tsakloglou and Cholezas (2010a, 2010b) that takes both sample bias and unemployment probability into account, and focuses on the calculation of private returns to education before and during the current crisis in a way that allows comparisons. Thus, it explores the impact of the crisis on education, and the accompanying change of strategy possibly observed in young people's choices as regards pursuing tertiary education studies or not, as well as the content thereof.

3.1 DATA, DEFINITIONS OF THE VARIABLES AND THE SAMPLE

The data used for the purposes of this study are derived from ELSTAT's Labour Force Survey (LFS) and span from 2004 Q1 to 2012 Q2,

excluding years 2008 and 2009 because during these eight quarters on the one hand the economy seems to have attained historically low unemployment rates (lowest in 2008 Q3: 4.7% for men and 10.8% for women), and on the other hand it is not clear whether the early symptoms of the crisis had already begun to appear by then or not. Thus, with a view to ensuring a clear-cut sample before the crisis and a clear-cut sample during the crisis, the former includes observations between 2004 Q1 and 2007 Q4, and the latter between 2010 Q1 and 2012 Q2 (the last period for which data were available at the inception of the present study). It should be noted that the LFS information collection methodology was radically revised in 2004, while also from 2004 onwards microdata have been made available by ELSTAT in a 'rotating panel' form, as each member in the sample participates in the survey for six consecutive quarters ('waves').

Since 1998 ELSTAT has been conducting the LFS on a quarterly basis (previously only in Q2 of each year). The main purpose of this sample survey is to collect detailed data on the employment and unemployment status of household members aged 15 or over. The LFS quarterly sample includes approximately 30,000 households, with 1/6 of them rotated (replaced) every quarter, which implies at least 120,000 interviews conducted each year.

The final question in the LFS questionnaire —addressed only to household members working as employees— relates to monthly wages. Its exact wording is "What are the total monthly earnings from your main job including extra payments monthly paid? (Data should refer to last month's payments)", and employee's responses can be given on the basis

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[10] Interesting findings are offered by Livanos and Nuñez (2012), who associate race discrimination in the labour market with the function of education as a filter, an assumption apparently relevant in Greece where wage differentials are smaller among tertiary education graduates.

[11] In any case, with respect to this issue the results of the various studies of the Greek labour market (Lambropoulos 1992, Magoula and Psacharopoulos 1999, Cholezas 2005) are evidently not always consistent, and tend to be heavily influenced by the investigation methodology applied.

Education level	Men				Women			
	2004-2007		2010-2012		2004-2007		2010-2012	
	%	N	%	N	%	N	%	N
Primary	45.1	7,228	41.3	3,143	33.1	2,815	32.2	1,438
Lower secondary	56.8	4,890	53.0	2,585	57.0	1,704	56.1	1,141
General lyceum	61.7	8,980	59.6	5,120	71.2	7,113	66.2	4,075
Technical lyceum	67.5	1,993	64.6	1,390	81.2	737	78.0	504
Post-gymnasium technical school	62.8	1,972	57.4	1,021	69.7	297	68.1	143
IEK	70.3	2,615	65.7	1,586	82.8	3,018	80.3	1,657
Other post-lyceum education	71.6	479	73.3	285	73.5	310	70.3	149
TEI								
Structural Engineering	54.9	117	54.6	59	79.4	85	74.6	50
Mechanical & Computer Engineering	73.7	808	69.9	593	85.3	163	87.8	137
Agricultural & Food Technology	72.9	186	71.2	141	82.6	123	77.0	87
Economics & Management	70.0	507	67.7	394	86.6	722	84.4	601
Medical Sciences	59.2	42	75.0	36	90.5	142	91.0	101
Other TEI	66.0	177	70.3	137	91.9	971	88.8	696
AEI								
Structural Engineering	38.6	346	36.0	191	57.1	185	52.5	105
Mechanical Engineering	67.3	497	64.5	321	85.3	104	79.8	79
IT	69.9	51	75.5	40	81.9	104	83.0	88
Physical Sciences	82.8	111	86.2	94	92.8	64	97.6	41
Mathematics & Statistics	68.8	245	69.6	133	91.4	106	82.2	88
Medical School, etc.	51.9	545	46.9	294	47.7	344	48.5	221
Horticulture & Forestry	81.7	433	78.2	248	83.7	221	92.4	171
Law School	78.3	343	80.8	215	85.6	173	87.5	112
Economics & Management	31.7	148	25.3	76	47.2	296	42.8	179
Social Sciences	71.0	1,113	68.7	657	86.2	962	84.8	631
Humanities	71.1	81	84.0	68	85.6	208	81.9	149
Physical Education & Sports	82.2	457	82.7	287	87.1	1,525	86.8	942
Pedagogics	84.0	309	80.0	184	90.3	168	84.4	103
Other AEI	97.1	165	95.8	136	97.4	660	97.7	602
Postgraduate studies								
Postgraduate degree	76.6	396	73.9	387	79.8	297	81.2	324
Doctorate	80.2	210	84.5	131	88.6	117	86.3	82
TOTAL	**58.5**	**35,444**	**56.8**	**19,952**	**65.1**	**23,734**	**64.7**	**14,696**

of income brackets.[12] The present study makes use of these data, although grouped information is admittedly not entirely appropriate for an econometric analysis of wage differentials between sample members.

With respect to net monthly wages for the purposes of the analysis, in the case of the "closed"

[12] For the period before the crisis (2004-2007) the brackets are: up to €250; €251-€500; €501-€750; €751-€1,000; €1,001-€1,250; €1,251-€1,500; €1,501-€1,750; €1,751–€2,000; and €2.001 or more. For the second period, during the crisis, there are two different bracket distributions. Specifically, for the period 2010-2011 the brackets are: up to €400; €500-€699; €700-€799; €800-€899; €900-€999; €1,000-€1,099; €1,100-€1,299; €1,300-€1,599; €1,600-€1,749; and €1,750 or more. For 2012, the wage brackets were revised as follows: up to €499; €500-€699; €700-€799; €800-€899; €900-€999; €1,000-€1,099; €1,100-€1,199; €1,200-€1,299; €1,300-€1,449; and €1,500 or more.

Table 2a Distribution of male employees in income brackets per education level (percentages, all LFSs, at 2009 constant prices)

Education level				Net monthly earnings (EUR)				
	Up to 400	401-600	601-800	801-1,000	1,001-1,200	1,201-1,400	1,401-1,600	1,601-1,800	1,801 or more
2004-2007									
Pre-lyceum education	1.1	2.8	24.6	31.8	17.3	12.4	6.7	1.8	1.6
Lyceum	0.7	1.7	20.8	29.0	16.2	14.9	10.8	3.3	2.7
Post-lyceum non-tertiary education	0.5	1.4	21.0	25.2	15.1	12.8	11.9	4.3	7.8
TEI	0.3	1.3	12.5	26.3	17.7	18.6	15.1	4.0	4.3
AEI	0.3	0.5	6.4	13.7	14.8	20.7	21.8	8.6	13.3
Postgraduate studies	0.4	0.6	3.6	10.3	11.5	11.5	20.6	10.1	31.6
Total	*0.8*	*1.8*	*19.5*	*27.1*	*16.3*	*14.8*	*11.3*	*3.7*	*4.8*
2010-2012									
Pre-lyceum education	4.4	9.2	48.0	25.7	7.4	3.6	0.8	0.4	0.6
Lyceum	2.5	5.2	37.9	25.6	12.5	8.7	5.0	1.3	1.3
Post-lyceum non-tertiary education	2.1	5.2	35.9	25.9	13.2	10.1	5.3	1.0	1.4
TEI	1.8	2.2	21.8	26.2	18.3	16.4	10.0	2.1	1.3
AEI	0.9	1.7	12.1	19.2	17.3	21.5	17.9	4.8	4.7
Postgraduate studies	0.0	0.3	6.8	18.9	11.8	14.2	19.8	7.1	21.0
Total	*2.3*	*4.8*	*32.0*	*24.2*	*13.2*	*11.5*	*7.7*	*2.0*	*2.2*

income brackets we assumed that the respective employee's wage was the mean of the range, whereas for the means of the two "open" brackets (at the top and bottom ends of the distribution) we used the detailed data of the Household Income and Living Conditions Survey conducted annually by ELSTAT, which collects information on net employee wage rates without the use of income brackets. Given that the LFS sample utilised in the analysis of the wages covers the period 2004-2012 on a quarterly basis, the individual value of each income bracket in each quarter of the LFS was suitably adjusted for inflation, based on the Consumer Price Index data published by ELSTAT, in order for all wage data to be expressed at 2009 constant prices.

As regards the definition of education groups, the LFS divides the population into a large number of education categories. Given that this study focuses on tertiary education graduates, we chose to discern and group AEI and TEI degree holders with as much detail as possible.

Yet, in several cases this was unfeasible, due to the limited number of employees in the groups at issue. In the end, the criterion for keeping or merging tertiary education groups was, apart from the similarity of the disciplines, the existence of a minimum number of observations (around 100 men or women) spread over a large number of years after graduation. For the lower education levels we formed relatively fewer groups, and also decided to exclude from the sample a few groups that presented either a rather small number of observations or specific problems (graduates of: special needs schools; Open University and interdisciplinary selection programmes; military and law enforcement academies; the School of Pedagogical and Technological Education (SELETE); and pedagogic academies with a two-year duration of studies).

The sample selected for the study includes all employees from the aforementioned quarters of the survey, the last time they appear in the LFS. Thus, we obtain a higher number of

Table 2b Distribution of female employees in income brackets per education level (percentages, all LFSs, at 2009 constant prices)

Education level	Net monthly earnings (EUR)								
	Up to 400	401-600	601-800	801-1,000	1,001-1,200	1,201-1,400	1,401-1,600	1,601-1,800	1,801 or more
2004-2007									
Pre-lyceum education	2.7	11.2	26.0	32.4	19.2	5.0	1.5	0.1	1.9
Lyceum	1.3	6.7	20.7	31.3	24.8	9.1	2.2	0.3	3.6
Post-lyceum non-tertiary education	1.1	3.6	17.4	28.1	24.8	11.2	3.3	0.3	10.2
TEI	0.6	3.9	15.7	27.0	29.9	13.2	3.5	0.4	5.9
AEI	0.4	1.9	6.5	19.1	30.8	20.2	5.8	0.4	15.1
Postgraduate studies	0.5	0.2	3.2	11.6	24.5	16.3	8.4	0.5	34.9
Total	*1.5*	*6.6*	*19.0*	*28.7*	*24.4*	*10.2*	*2.9*	*0.3*	*6.4*
2010-2012									
Pre-lyceum education	5.2	25.0	35.8	25.8	6.5	1.1	0.3	0.0	0.4
Lyceum	2.8	14.6	33.0	26.6	16.2	4.5	0.7	0.1	1.4
Post-lyceum non-tertiary education	2.0	13.1	28.3	30.2	18.8	5.2	0.9	0.1	1.5
TEI	1.3	6.6	24.0	30.5	25.7	6.9	2.1	0.4	2.4
AEI	1.2	3.6	11.1	22.0	34.2	16.1	4.7	0.4	6.7
Postgraduate studies	0.6	2.7	5.3	20.9	31.0	16.8	5.9	0.3	16.5
Total	*2.5*	*12.4*	*25.9*	*26.1*	*20.6*	*7.4*	*1.9*	*0.2*	*3.0*

observations, which enables a more thorough analysis based on education specialty, without creating in parallel any other technical problems.[13] This means that, ceteris paribus, the sample includes proportionately more employees from the last quarter of the period before the crisis (2007 Q4) and the last quarter of the period during the crisis (2012 Q2). Table 1 shows the total sample used, and the numbers and shares of male and female employees in the total number of employed persons aged 15-64 for the various education levels and individual schools. As it appears, overall women are more often employed as employees, both before and during the crisis. Moreover, the share of tertiary education graduates working as employees is larger than that of lower education level graduates, probably on account of the —according to many— oversized public sector in Greece (high formal qualifications are a prerequisite for recruitment in the public sector). Considerable gender differentials are detected even for graduates of the same field of study. Indicatively, among AEI grad-

uates of structural engineering, men working as employees represent a minority, in contrast with what is recorded among female graduates. Finally, owing to the crisis and the ensuing drop in employment, the share of male employees in the total of the employed fell by 1.7 percentage points, while for women the respective change is marginal. This, however, varies considerably across specialties. For instance, male law school graduates work more often as employees during the crisis compared with what was the case before the crisis. The same is true for female AEI graduates of medical sciences. Therefore, it appears that the crisis has changed, to some extent, the type of employment for certain degree holders.

To convert monthly wages into hourly earnings we used the employees' responses to the ques-

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13 Selecting the first or the last observation from the rotating panel, we effectively construct a sample consisting of successive layers, which nevertheless covers 16 quarters (2004 Q1 - 2007 Q4) before the crisis and 10 quarters (2010 Q1 - 2012 Q2) during the crisis, respectively.

tion "How many days and hours per week do you usually work in the above job?" (referring to their main job). This led to the exclusion from the analysis of some additional responders who stated that they cannot define the number of hours they usually work, because it differs significantly from one week or month to the other. The new distributions of the employees in the sample, resulting on the basis of nine income brackets (at 2009 constant prices), appear in Tables 2a (for men) and 2b (for women) grouped according to education level. It should be noted that around 15% of the employees in the sample (14.2% in the period 2004-2007 and 16.4% in the period during the crisis) have not responded to the question regarding net monthly wages (stated: NA) and, as a consequence, were excluded from the analysis. This share does not seem to be closely related to the employees' education level.

Tables 2a and 2b lead to two main conclusions. First, the recorded clear shift of all distributions to the left shows that net monthly wages during the crisis declined for both genders. Second, the net monthly wages of men are higher than those of women, both before and during the crisis. Indicatively, during the crisis 11.9% of men receive net monthly wages of more than €1,400, while the respective percentage for women is 5.1%.

3.2 METHODOLOGY

The methodology to calculate returns to education aims at estimating the internal rate of return that equates the present value differences in the wages of different education groups. This implies an initial calculation of employees' earnings for each year after graduation, weighted by the unemployment (or employment) probability already estimated at an earlier stage, and then a calculation of returns to education. Thus, the method consists of two stages, while all estimations are carried out separately for men and women, both for the sample before the crisis (2004 Q1-2007 Q4) and for the sample during the crisis (2010 Q1-2012 Q2). More specifically, the

methodology can be broken down into a series of successive steps.

In a first step, we calculate unemployment probability for each individual separately and for each year since graduation from the highest education level completed, depending on his/her characteristics (including education specialty, years since graduation, region of residence, urbanisation, year and quarter of the interview, etc.). To this end, we estimate the probability of the individual being unemployed (probit model), after adjusting for the labour force participation bias (in a variation on Heckman's method for correcting the sample selection error).[14]

In a second step, we estimate earnings equations for the employees in the sample based on human capital theory, after adjusting for the probability of bias in the sample used (i.e. the individuals' probability of earning wages, or, in other words, of having a paid job), in a way similar to that followed for estimating unemployment probability (i.e. applying Heckman's sample selection method). According to human capital theory, labour income differences are due to the different human capital stock of individual workers. This stock governs their productivity, which in a competitive market determines their wage rate. The specific elements human capital consists of are the knowledge, abilities and skills acquired by individuals through formal or informal education and past work experience, as well as their inherent abilities. On the basis of these assumptions, we form the Mincerian earnings equation (Mincer 1974), extensively used in the literature on education economics. Thereafter, we estimate wages for each individual separately and for each year since graduation from the highest education level completed.

In a third and final step, we calculate the expected wage of each education group and

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14 For a detailed description of the method, see Mitrakos, Tsakloglou and Cholezas (2010a).

adjust it for each education group's probability to work (1 minus the estimated unemployment probability).[15] Thus, we construct "wages/years since graduation" profiles for each education group. The discount term that equates the present values of different "education groups" wages, known as the "internal rate of return", ultimately yields private return to education. This method is similar to the one applied by Mitrakos, Tsakloglou and Cholezas (2010b).

4 EMPIRICAL RESULTS

4.1 ESTIMATION OF UNEMPLOYMENT PROBABILITY

As already discussed in the previous section, the first step in our effort to calculate private returns to education involves an estimation of unemployment probability. Needless to note that an individual's unemployment probability is affected by a multitude of factors, not just education qualifications. Moreover, these factors are interdependent, while random factors may also affect this probability. The LFS waves provide enough information on variables considered to affect unemployment probability. Therefore, the best approach to the examination of the phenomenon would be through the use of multivariate econometric probability analysis.

The labour force participation rate seems to be related both to the individual's age (and probably years since graduation) and education level, as well as to gender and perhaps other factors (such as family status). Therefore, without testing and correcting for labour force participation probability, the results of the unemployment probability estimation may very likely be biased. In other words, another econometric technique that takes this bias into account by simultaneously estimating both labour force participation probability and unemployment probability (in a variation on Heckman's method) is most likely in order.

Descriptive data examination reveals that the variable most likely related to unemployment probability is the time since graduation, and not the individual's age. The same results seem to show that time since graduation affects unemployment probability non-linearly, a fact that must be taken into account during the econometric estimation. Moreover, both the unemployment rate and its change after graduation differ considerably between men and women, and therefore necessitate an econometric estimation of separate equations for men and women, not just the introduction of a dummy variable for women in the unemployment probability equation. Finally, given that the evolution of the unemployment rate by years since graduation seems to be substantially different even among groups of graduates of the same education level, instead of using dummy variables to differentiate among various graduates of different specialisations, we need to use flexible non-linear types of equations that allow us to differentiate unemployment probability as a function of time since graduation for different types of education groups.[16]

All the above considerations have been taken into account during specification of the econometric model developed for estimating unemployment probability. The adjustment for selection error (the key issue is labour force participation or not, regardless of unemployment or type of work) revealed the existence of a statistically significant bias in the case of men, but not in the case of women, a finding inconsistent with our expectations, although the correlation between the two equations' residuals is marginally statistically insignificant.[17] However, for reasons of comparability with men, and after controlling for the esti-

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[15] Thus taking into account the period an individual remains unemployed, since unemployment rate varies in each year since graduation for each narrowly defined education group and for each gender, an element that according to Caporale and Gil-Alana (2012) seems to differentiate younger from older workers.

[16] For a detailed descriptive exploration of the factors that possibly affect unemployment probability in the period before the current crisis, see Mitrakos, Tsakloglou and Cholezas (2010a).

[17] See the statistically insignificant *rho* at the last column of Table A in the Appendix (-0.124).

mated wages' deviation from the actual ones, it was decided to use common estimates for both genders. The methodology applied is a variation on Heckman's (1979) two-step method, by which we attempted to correct the sample's selection error.[18] The detailed results of these estimations are presented in Table A of the Appendix.[19]

The dependent variable is unemployment probability, while independent variables include the individuals' education characteristics, years since graduation (and their square), demographic characteristics as to their household composition, their nationality, the region and degree of urbanisation of their place of residence, the local unemployment rate, and dummy variables for the year and quarter of the LFS they took part in. Compared with the labour force participation probability equations, education groups in the estimation of unemployment probability are discerned in much more detail, while demographic groups (household composition) are much fewer. To obtain a differentiation of each education group's unemployment probability broken down by time since the graduation year, we also introduce multiplicative terms between the dummy variable of each education group and the individual's time since graduation and its square.

Tables 3a (for men) and 3b (for women) show the ratio of the estimated unemployment rates for the two periods (before and during the crisis) by education level for selected years since graduation – specifically, for less than 1 year since graduation, and for 5, 10, 20 and 30 years since graduation. The larger than 1 this ratio is, the higher the unemployment during the crisis compared with the period before the crisis. A first glance reveals that the crisis seems to have increased unemployment more for the graduates of lower education levels and for older graduates, since the unemployment rate ratio for almost all education levels increases as we move further away from graduation. The pattern is clearer in the case of men. An exception to this rule are postgraduate degree hold-

ers, among whom younger graduates see their employment prospects worsen more than those of older graduates. This may be due to the fact that postgraduate studies have flourished considerably in recent years, and thus graduates are comparatively younger. The same cannot be argued, however, in the case of female TEI graduates.

The impact of the crisis appears to vary considerably across schools. For instance, in the case of men, TEI graduates of "structural engineering" schools seem to have been hit by the crisis rather disproportionately, a fact not applicable in the case of female graduates of the same school. A particular case among male AEI graduates seems to involve the graduates of "horticulture and forestry", "physical sciences" and "law school", as the crisis has dealt a considerable blow to the former group along the entire age range, and had a major impact on the two latter groups for older graduates compared with other schools. Among women, "horticulture and forestry" graduates seem to face similar problems with male graduates of the same school, while female graduates of "mathematics and statistics" also stand out, as their unemployment rate ratio increases particularly for older graduates.

Finally, running contrary to the overall pattern —i.e. of a greater rise in unemployment for older graduates— are both male and female graduates of "mechanical engineering" and

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[18] Specifically, in the outcome equation, as a dependent variable we use a binomial rather than a continuous one (as in Heckman's classical method), a fact that entails changes in the maximum likelihood function (Greene 2003). On account of heteroskedasticity, the coefficients' estimated standard errors in the estimated equations have been corrected using White's (1980) method. The control group consists of partners in couples without children, who are general lyceum graduates, of Greek nationality, residents of Athens and have participated in the LFS in 2007 Q4 or 2012 Q4.

[19] For a chart illustration and description of the estimated unemployment rate in the period before the crisis for all the individual factors/variables affecting it, as a function of the first 20 years since the individual's graduation from the highest education level completed, having each time isolated the effect of all other variables (family status, region, urbanisation, nationality, local unemployment rate, etc.), see Mitrakos, Tsakloglou and Cholezas (2010a). Corresponding charts based on the estimates of the present study for both periods (before and during the crisis), as well as the results of the econometric estimations of Table A for more detailed education levels and schools, are available upon request.

Table 3a Ratio of pre-crisis to crisis estimated male unemployment rates (by education level; at a given number of years after graduation)

Education level	Years after graduation				
	<1	5	10	20	30
Pre-lyceum education	**1.9**	**2.2**	**2.5**	**3.0**	**3.4**
Primary	1.3	1.8	2.2	3.1	3.6
Lower secondary	2.2	2.4	2.6	2.9	3.1
Lyceum	**1.8**	**2.1**	**2.4**	**3.0**	**3.4**
General lyceum	1.7	2.0	2.3	3.1	3.6
Technical lyceum	1.9	2.1	2.4	2.8	3.0
Post-gymnasium technical school	2.3	2.7	2.9	3.2	3.0
Post-lyceum non-tertiary education	**1.9**	**2.1**	**2.3**	**2.7**	**2.8**
IEK	1.7	2.1	2.4	3.1	3.7
Other post-lyceum education	2.1	2.0	1.9	1.7	1.4
TEI	**1.6**	**2.3**	**3.1**	**3.8**	**2.2**
Structural engineering	2.5	3.6	5.4	11.8	24.4
Mechanical & Computer Engineering	1.7	2.4	3.3	3.8	2.0
Agricultural & Food Technology	1.4	2.2	3.4	4.5	1.8
Economics & Management	1.6	2.0	2.4	2.3	1.5
Medical Sciences	1.0	2.0	4.5	8.8	1.4
Other TEI	1.7	2.4	3.1	3.5	2.1
AEI	**1.4**	**1.7**	**2.0**	**2.4**	**2.3**
Structural Engineering	1.5	1.9	2.4	3.3	2.9
Mechanical Engineering	2.5	2.3	1.9	1.4	1.6
IT	*31.8*	*9.3*	*2.6*	*0.2*	*0.0*
Physical Sciences	1.5	1.6	1.7	2.6	6.6
Mathematics & Statistics	0.9	1.7	3.6	8.7	3.2
Medical School, etc.	1.1	1.5	2.0	3.2	3.1
Horticulture & Forestry	2.4	2.5	2.6	2.7	3.0
Law School	1.5	2.3	3.3	5.3	4.4
Economics & Management	0.9	1.2	1.9	3.5	2.4
Social Sciences	2.8	2.7	2.2	1.3	1.3
Humanities	1.4	1.7	2.0	2.6	2.8
Physical Education & Sports	1.1	1.3	1.6	2.2	2.0
Pedagogics	*-*	*9.2*	*1.2*	*52.6*	*-*
Other AEI	0.8	0.9	1.0	1.3	1.3
Postgraduate studies	**1.5**	**1.7**	**1.7**	**1.4**	**1.0**
Postgraduate degree	1.9	1.7	1.4	1.1	1.1
Doctorate	0.8	1.5	2.8	3.8	0.7

Note: Italics are used to identify education categories that need to be treated with caution due to the scarcity of observations or the uneven distribution of graduates over time.

"social sciences", as well as female graduates of "medical sciences", "law school", "pedagogics" and "other AEI". In the case of female TEI graduates, where the pattern is different anyway —in the sense that the impact is greater for younger graduates— only female graduates of "medical sciences" follow a course in the opposite direction.

Table 3b Ratio of pre-crisis to crisis estimated female unemployment rates (by education level; at a given number of years after graduation)

Education level	Years after graduation				
	<1	5	10	20	30
Pre-lyceum education	**1.7**	**1.6**	**1.5**	**1.4**	**1.4**
Primary	2.0	1.8	1.7	1.4	1.4
Lower secondary	1.6	1.6	1.6	1.5	1.5
Lyceum	**1.4**	**1.5**	**1.5**	**1.6**	**1.6**
General lyceum	1.6	1.6	1.6	1.6	1.6
Technical lyceum	1.2	1.3	1.4	1.7	2.3
Post-gymnasium technical school	1.4	1.3	1.2	1.2	1.7
Post-lyceum non-tertiary education	**1.5**	**1.6**	**1.6**	**1.7**	**2.0**
IEK	1.4	1.4	1.5	1.6	1.9
Other post-lyceum education	1.6	1.5	1.4	1.3	1.3
TEI	**1.5**	**1.5**	**1.4**	**1.2**	**1.3**
Structural engineering	2.2	2.6	2.8	1.8	0.7
Mechanical & Computer Engineering	2.6	2.6	2.3	1.6	1.5
Agricultural & Food Technology	1.3	1.3	1.2	0.9	0.6
Economics & Management	1.3	1.2	1.0	0.8	0.7
Medical Sciences	1.2	1.2	1.2	1.4	2.6
Other TEI	1.5	1.6	1.5	1.3	1.2
AEI	**1.4**	**1.5**	**1.6**	**1.8**	**2.0**
Structural Engineering	0.9	1.3	2.0	3.1	1.9
Mechanical Engineering	0.8	1.0	1.3	1.4	0.8
IT	*0.8*	*4.8*	*40.4*	*-*	*0.6*
Physical Sciences	0.8	0.8	0.9	2.0	8.6
Mathematics & Statistics	1.3	1.6	1.9	3.8	11.7
Medical School, etc.	0.5	0.7	0.9	0.9	0.4
Horticulture & Forestry	1.7	1.3	0.8	0.6	2.3
Law School	0.9	0.7	0.5	0.4	0.9
Economics & Management	1.4	1.4	1.3	1.4	1.8
Social Sciences	1.6	2.0	2.2	1.6	0.8
Humanities	1.5	1.6	1.6	1.8	2.9
Physical Education & Sports	*2.5*	*1.3*	*1.0*	*11.5*	*-*
Pedagogics	1.0	0.9	0.8	0.7	0.9
Other AEI	1.4	1.7	2.0	1.6	0.5
Postgraduate studies	**2.5**	**1.9**	**1.3**	**0.9**	**1.1**
Postgraduate degree	2.0	1.8	1.5	1.1	1.1
Doctorate	1.5	0.7	0.5	0.4	0.9

Note: Italics are used to identify education categories that need to be treated with caution due to the scarcity of observations or the uneven distribution of graduates over time.

4.2 ESTIMATION OF EARNINGS EQUATIONS

In the second phase of our econometric analysis we estimate expanded Mincerian functions of hourly earnings, which we then use in order to calculate wages/years since graduation profiles. Traditionally, in econometric estimations of earnings functions, the dependent variable

is the logarithm of the employees' hourly earnings, while the main explanatory variables that proxy for the human capital accumulated in the worker are his/her education and work experience. As in all steps of the analysis, education here is expressed using dummy variables that reflect the highest education level and specialisation completed by the individual. For work experience we use the worker's years since graduation and their square.[20] Given that theory suggested no reason to expect that the relationship between experience and earnings would be the same for all education levels and specialisations, we include as explanatory variables in the estimated equation multiplicative terms introduced between the dummy variables of education levels and years since graduation and their square.

In addition to the variables that proxy the worker's human capital stock, a few other variables related to the workers' wage rates have been included in the analysis as explanatory variables. These refer to the region and degree of urbanisation of their place of residence, their employment sector (public/private), their nationality and family status, the size of the local unit and the branch of economic activity of the firm for which they work, and the year and quarter of the LFS they took part in. The reference group consists of single men or women (depending on the equation), who are general lyceum graduates, of Greek nationality, residents of Athens, employed in a business unit of 10 or fewer employees, in the private (retail or wholesale) trade sector.

Selection error correction (in the first phase we estimated the individuals' probability of working as employees, having excluded from the sample all pensioners and non-employee workers) proved to be statistically significant, with the exception of the sample of men during the crisis (see Table B in the Appendix). For comparability reasons, our initial choice was to use the estimates of the two-step correction method, but the sign of the —always statistically insignificant— correction term (inverse Mill's ratio) was the opposite than what was

expected. Therefore, only in this case, we used the earnings estimates derived from a simple least squares model (see the OLS column in Table B of the Appendix). On account of heteroskedasticity, the coefficients' estimated standard errors have been corrected using White's (1980) method.

Tables 4a (for men) and 4b (for women) show the calculated percentage change of net monthly wages in the crisis period. Although as a rule earnings fell during the crisis, differentiations between education levels and genders are considerable.[21] For both genders, a marginally larger wage reduction is recorded among postgraduate degree holders (-10.3%). Moreover, among both TEI and AEI graduates, wages dropped more for men. With respect to years since graduation, in the case of men wages fell more for younger graduates, with the exception of post-lyceum school graduates, AEI graduates and postgraduate degree holders. The picture is not the same for women, as there are even some wage increases recorded for younger graduates of low education levels (e.g. technical lyceum) and, in any case, the pattern of a larger wage reduction for younger graduates is not confirmed.[22]

As also in the case with unemployment, changes in wages vary remarkably among

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[20] The variable used for the individual's work experience is not ideal, since it only partly approximates actual work experience and overlooks any periods of unemployment, withdrawal from the labour market, or even work combined with studies. This may be leading to an overestimation of actual experience, and hence of its effect on earnings. Nevertheless, compared with the corresponding variable used in most other studies (i.e. age minus the minimum years of study required for obtaining the degree minus 6), it is undoubtedly a much better proxy for the actual work experience of the sample members. The quadratic term of work experience, expected to take a negative sign in the econometric estimations, implies that experience accumulation has an increasing effect on the individual's earnings, but at a declining rate, and thus may have a negative marginal effect beyond a certain point (due to the depreciation of knowledge and skills).

[21] A closer look reveals that, overall, earnings reduction for men, with the exception of post-lyceum non-tertiary education graduates, lies close to 10%, whereas for women it is considerably lower, except for postgraduate degree holders.

[22] Lower earnings for younger workers may be attributed to downward wage rigidity in the crisis period for those already working, who as a rule are older and less educated. In addition, no pattern seems to emerge as regards market behaviour towards the low-wage earners, as this would require a more detailed analysis of changes in the earnings distributions.

	Number of years after graduation					
Education level	**<1**	**5**	**10**	**20**	**30**	**Total**
Pre-lyceum education	**-11.3**	**-10.6**	**-10.0**	**-9.1**	**-8.8**	**-9.9**
Primary	-9.5	-9.6	-9.6	-9.6	-9.5	-9.6
Lower secondary	-11.5	-10.4	-9.5	-8.4	-8.2	-9.6
Lyceum	**-9.2**	**-8.9**	**-8.6**	**-8.4**	**-8.6**	**-8.7**
General lyceum	-8.1	-8.4	-8.6	-8.9	-9.0	-8.6
Technical lyceum	-10.7	-8.1	-6.0	-3.6	-3.7	-6.4
Post-gymnasium technical school	-13.1	-11.3	-9.9	-7.8	-7.0	-9.8
Post-lyceum non-tertiary education	**-0.1**	**-3.1**	**-5.4**	**-8.1**	**-8.3**	**-5.0**
IEK	-2.0	-4.3	-6.0	-7.5	-6.6	-5.3
Other post-lyceum education	4.6	2.6	0.4	-5.1	-11.6	-1.8
TEI	**-10.3**	**-10.6**	**-10.6**	**-9.3**	**-6.2**	**-9.4**
Structural engineering	-9.0	-12.7	-14.8	-14.8	-8.8	-12.0
Mechanical & Computer Engineering	-6.5	-8.7	-10.0	-9.9	-6.4	-8.3
Agricultural & Food Technology	-22.5	-18.7	-14.1	-1.5	16.8	-8.0
Economics & Management	-10.2	-11.4	-11.7	-9.8	-4.1	-9.4
Medical Sciences	-9.9	-9.5	-9.6	-11.7	-15.8	-11.3
Other TEI	-7.6	-1.6	3.0	6.8	3.1	0.8
AEI	**-6.2**	**-7.7**	**-9.0**	**-10.7**	**-11.5**	**-9.0**
Structural Engineering	1.2	-0.5	-2.1	-4.9	-7.1	-2.7
Mechanical Engineering	5.5	-0.1	-4.2	-8.3	-7.5	-2.9
IT	*-19.3*	*-15.4*	*-12.1*	*-7.4*	*-5.7*	*-12.0*
Physical Sciences	-8.9	-12.4	-14.5	-15.2	-11.1	-12.4
Mathematics & Statistics	-0.6	-3.1	-5.7	-11.4	-17.7	-7.7
Medical School, etc.	-14.3	-12.2	-10.7	-9.5	-10.9	-11.5
Horticulture & Forestry	-9.0	-7.3	-6.3	-7.0	-10.9	-8.1
Law School	-11.6	-11.9	-12.6	-15.5	-20.0	-14.3
Economics & Management	0.6	-3.5	-6.5	-9.5	-8.9	-5.6
Social Sciences	-22.1	-16.9	-12.9	-9.4	-12.6	-14.8
Humanities	4.5	-7.5	-15.4	-22.3	-19.0	-11.9
Physical Education & Sports	-3.8	-4.7	-6.4	-12.0	-19.9	-9.4
Pedagogics	*5.4*	*-0.9*	*-6.9*	*-17.8*	*-27.4*	*-9.5*
Other AEI	-39.5	-23.2	-8.9	4.3	-9.3	-15.3
Postgraduate studies	**-8.3**	**-6.5**	**-6.2**	**-10.3**	**-20.0**	**-10.3**
Postgraduate degree	2.6	-0.7	-4.5	-13.3	-23.1	-7.8
Doctorate	-30.7	-18.9	-9.8	-4.1	-16.7	-16.1

Note: Italics are used to identify education categories that need to be treated with caution due to the scarcity of observations or the uneven distribution of graduates over time.

graduates of different schools. Male TEI graduates record a larger reduction in the wages of younger graduates, with the most indicative example being the "agricultural and food technology" graduates. Moving in the opposite direction — in the sense that older graduates see their wages drop more — are the graduates of "medical sciences". For female TEI graduates the crisis has a greater impact on older graduates, as there are even some increases

Table 4b Growth in female hourly earnings between the pre-crisis and crisis periods (in percentages; by education level; at a given number of years after graduation)

Education level	\<1	5	10	20	30	Total
			Number of years after graduation			
Pre-lyceum education	**5.9**	**5.2**	**4.6**	**3.4**	**2.3**	**4.3**
Primary	7.2	5.3	3.7	1.3	0.0	3.5
Lower secondary	-4.3	-0.8	1.8	3.7	1.3	0.3
Lyceum	**6.6**	**3.2**	**0.3**	**-3.6**	**-5.5**	**0.2**
General lyceum	1.8	-0.1	-1.7	-4.3	-6.0	-2.1
Technical lyceum	7.6	3.8	0.8	-2.5	-2.7	1.4
Post-gymnasium technical school	7.6	6.3	4.2	-2.0	-10.5	1.1
Post-lyceum non-tertiary education	**-1.2**	**-2.5**	**-3.5**	**-5.1**	**-5.8**	**-3.6**
IEK	-2.7	-3.2	-3.7	-5.2	-7.1	-4.4
Other post-lyceum education	-7.9	-8.2	-7.6	-3.9	3.6	-4.8
TEI	**1.4**	**-0.9**	**-2.4**	**-3.0**	**-0.4**	**-1.1**
Structural engineering	-21.1	-12.5	-5.7	0.6	-4.2	-8.6
Mechanical & Computer Engineering	-7.7	-7.7	-7.5	-6.3	-4.2	-6.7
Agricultural & Food Technology	8.8	0.0	-3.8	2.1	30.3	7.5
Economics & Management	-3.3	-3.9	-4.3	-4.6	-4.3	-4.1
Medical Sciences	7.0	1.3	-2.4	-4.7	-0.4	0.2
Other TEI	-6.0	3.1	8.4	5.5	-13.3	-0.5
AEI	**-1.6**	**-3.7**	**-5.3**	**-6.7**	**-5.7**	**-4.6**
Structural Engineering	-16.9	-13.0	-9.0	-0.7	8.2	-6.3
Mechanical Engineering	-25.0	-15.9	-7.5	6.4	13.9	-5.6
IT	*-14.3*	*-6.5*	*0.1*	*9.2*	*11.2*	*0.0*
Physical Sciences	14.4	2.8	-5.4	-13.8	-13.3	-3.1
Mathematics & Statistics	60.6	28.8	7.7	-14.7	-20.0	12.5
Medical School, etc.	12.2	3.7	-2.6	-10.0	-11.4	-1.6
Horticulture & Forestry	-19.8	-14.0	-10.7	-11.9	-23.0	-15.9
Law School	2.8	-4.3	-8.6	-10.1	-2.1	-4.5
Economics & Management	-5.7	-5.3	-5.1	-4.6	-4.4	-5.0
Social Sciences	-4.5	-5.0	-5.2	-4.7	-2.9	-4.5
Humanities	-5.9	-6.3	-6.5	-6.5	-5.9	-6.2
Physical Education & Sports	*-21.7*	*-19.4*	*-16.2*	*-6.2*	*9.8*	*-10.7*
Pedagogics	-5.9	-2.0	-1.6	-11.3	-31.1	-10.4
Other AEI	-18.0	-15.5	-13.7	-13.0	-15.7	-15.2
Postgraduate studies	**-6.2**	**-9.3**	**-11.4**	**-13.2**	**-11.5**	**-10.3**
Postgraduate degree	-7.1	-10.2	-12.4	-14.5	-13.5	-11.5
Doctorate	-8.1	-9.8	-11.1	-12.6	-12.7	-10.9

Note: Italics are used to identify education categories that need to be treated with caution due to the scarcity of observations or the uneven distribution of graduates over time.

recorded among the younger. A possible explanation would be the small number of observations, i.e. of younger graduates of specific schools. Overall, among male TEI graduates, the largest earnings reduction appears for graduates of "structural engineering" schools and "medical sciences", while among female TEI graduates for those of "structural engineering" schools and "mechanical and computer engineering" schools.

In the case of AEI graduates, the earnings development pattern is the same for men and women, with older graduates suffering the larger wage reductions, quite higher in the case of men (6.2% to 11.5%, against 1.6% to 5.7% for women). Exceptions to this rule include male graduates of "medical schools", "social sciences" and "other AEI", and female graduates of "structural engineering", "mechanical engineering", "social sciences" and "other AEI", as in these cases younger graduates face larger wage reductions. Among the schools with the largest reductions of their graduates' wages are "social sciences" and "law" schools for men, and "horticulture and forestry" and "pedagogics" for women.

4.3 ESTIMATION OF PRIVATE RETURNS TO EDUCATION

Having drawn the picture of the graduates' unemployment and wages and the impact of the financial crisis, we approach the main investigation of our study, i.e. the calculation of private returns to education, so as to assess whether education remains a rewarding investment in crisis conditions. Despite the lower earnings and increased unemployment due to the financial crisis, no a priori assumptions can be made regarding the impact of the crisis on returns to education. The main reason for this is the large number of factors involved in the calculation of returns to education, and their conflicting effects. Of course, in view of the fact that some of the respective groups in our sample are relatively small, not adequately represented throughout the entire range of years since graduation, or showing high percentages of self-employment, the corresponding results should be treated with caution.

Tables 5 and 6 present the results of the calculations of returns to education for tertiary education graduates, first unadjusted and then adjusted for unemployment probability. As already discussed in previous sections, we initially calculate the expected wage of each education group and then adjust it for each education group's probability of having a job

(1 minus the unemployment probability).[23] The internal rate of return reflected by the discount term that equates the present values of different education groups' wages ultimately yields the wanted private return to education (for more details, see Mitrakos, Tsakloglou and Cholezas 2010b).

Before embarking on the analysis of the results, it should be noted that, as a consequence of the use of multiplicative terms between education levels and specialties and years since graduation and their square, the returns to education derived from our analysis are not invariable, but change as we move further away from the time of graduation. Calculation of these returns relies on a number of assumptions. As regards TEI graduates, we assumed that they come mainly from technical lyceums, and so their estimated wages were compared with those of technical lyceum graduates. Given that the latter are lower than the wages of general lyceum graduates, if TEI graduates actually come mainly from general lyceums, then their returns have been overestimated in the tables below. Until recently, TEI (or formerly KATEE) studies lasted 3 years. However, since 2001 the required duration of studies for all TEI (for certain ones already since 1999) is 4 years. Thus, owing to the rather limited number of TEI graduates with 4 years of studies in our sample, the estimates presented below rely on the assumption of a 3-year duration of studies for all TEI graduates. Obviously, the estimated internal rates of return would have been lower had we assumed a 4-year duration of studies.

Similarly, we assumed that studies in technical university as well as "horticulture and forestry" schools last 5 years. Returns for "medical school, etc." graduates were also calculated based on the assumption of

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23 As Mitrakos, Tsakloglou and Cholezas (2010a) show, the estimated unemployment rates vary significantly among education levels and specialisations and change considerably as we move further away from the graduation year. Therefore, to calculate the expected wage, the estimates of hourly earnings have to be multiplied by the employment probability of the respective education group at the specific time interval from the year of graduation.

Table 5 Private returns to education, not adjusted for the probability of unemployment

	2004-2007		2010-2012	
	Men	Women	Men	Women
TEI				
Structural engineering	4.7	6.7	2.8	3.5
Mechanical & Computer Engineering	4.3	6.7	3.6	3.5
Agricultural & Food Technology	-0.7	-	3.3	4.5
Economics & Management	2.1	4.6	1.4	2.7
Medical Sciences	3.6	4.0	-2.8	3.9
Other TEI	4.2	2.6	6.0	-
AEI				
Structural Engineering	4.2	4.8	5.9	4.4
Mechanical Engineering	5.2	4.8	6.7	4.3
IT	5.6	6.0	4.9	6.7
Physical Sciences	5.3	5.6	4.3	4.8
Mathematics & Statistics	4.9	5.6	4.5	8.2
Medical School, etc.	6.8	5.5	6.1	5.4
Horticulture & Forestry	3.5	5.2	3.4	-
Law School	6.7	5.1	4.8	4.6
Economics & Management	4.7	4.6	5.5	4.0
Social Sciences	4.0	4.4	2.1	4.1
Humanities	6.0	6.9	4.4	5.9
Physical Education & Sports	4.1	6.3	2.8	4.9
Pedagogics	8.0	8.7	7.4	5.9
Other AEI	7.4	7.9	5.3	3.5
Postgraduate studies				
Postgraduate degree	7.2	7.9	7.4	5.8
Doctorate	6.8	5.3	5.3	3.8

Note: "-" means the inability to compute the present value (such as when an education group systematically earns less than the reference group).

5-year-long studies because, although medical school studies last 6 years, other schools of that group are completed in only 5 or even 4 years. In this case as well, the estimated internal rates of return would have been lower had we assumed a longer duration of studies. For all other AEI graduates, we assumed that studies last 4 years. For postgraduate degree holders, it was assumed that studies after lyceum last 5 years and, therefore, if postgraduate studies last mainly 2 years and most graduates come from schools with 5 or more years of bachelor studies, then the respective returns have been overestimated in the tables below. Finally, we assumed that the acquisi-

tion of a doctorate degree requires 8 years of studies after lyceum.

Needless to say, estimates in both Table 5 and Table 6 focus on pecuniary private returns to education and ignore other, non-pecuniary benefits a student may enjoy by participating in the higher levels of the education system. To calculate the returns listed in these tables we assumed that the individuals' working life is 35 years. This limit is most likely realistic in the case of men, but perhaps excessive in the case of women, at least based on present-day data (although recent developments in retirement age limits seem to rapidly move in this direc-

Table 6 Private returns to education, adjusted for the probability of unemployment

	2004-2007		2010-2012	
	Men	Women	Men	Women
TEI				
Structural engineering	6.2	16.4	3.1	10.4
Mechanical & Computer Engineering	4.7	16.6	5.2	-2.0
Agricultural & Food Technology	-	-	3.2	7.2
Economics & Management	2.1	-1.3	4.0	10.7
Medical Sciences	3.5	9.2	3.5	13.1
Other TEI	1.5	-1.4	2.9	-0.1
AEI				
Structural Engineering	4.4	7.8	7.2	10.1
Mechanical Engineering	5.1	6.0	6.5	10.5
IT	6.7	10.6	6.8	12.9
Physical Sciences	4.5	6.4	4.3	11.2
Mathematics & Statistics	4.3	7.2	4.9	10.4
Medical School, etc.	6.7	8.3	8.0	16.4
Horticulture & Forestry	3.3	5.2	2.5	0.9
Law School	8.3	9.2	9.0	15.1
Economics & Management	4.1	7.1	7.0	9.4
Social Sciences	3.0	5.3	1.1	5.7
Humanities	5.1	8.7	4.1	9.2
Physical Education & Sports	3.0	8.8	2.9	8.6
Pedagogics	9.8	9.7	7.8	15.4
Other AEI	5.8	10.9	7.7	9.1
Postgraduate studies				
Postgraduate degree	7.5	11.9	9.6	12.8
Doctorate	6.6	7.8	7.2	10.0

Note: "-" means the inability to compute the present value (such as when an education group systematically earns less than the reference group).

tion). In the literature, working life is often estimated based on a person's (theoretical) graduation year and (theoretical) retirement year. In the case of Greece, however, this would translate into lyceum graduates with up to as much as 46 years of experience as employees after graduation. Yet, our sample includes very few workers (and practically no employees) with such characteristics.

Taking no account of employment probability (or alternatively unemployment risk) and assuming that upon finishing their studies and throughout their entire working life individuals can immediately find employment, and so their wages are equal to those observed in the market, we construct Table 5. As typically seen in the literature, as a rule returns to education are higher for women (e.g. TEI graduates of "economics and management" or AEI graduates of "physical education") and for AEI graduates and postgraduate degree holders, compared with TEI graduates. This fact should not come as a surprise, despite women's lower wages, given that the key element in the calculation of returns to education is the wage gap between each education category and the reference education group (general or technical lyceum in our case). However, the crisis has resulted in a reduction of the number of schools that yield

higher returns for women. Thus, whereas before the crisis only 6 schools led to higher returns for men, during the crisis these schools became 10. Returns to education are relatively higher for male "mechanical engineering" graduates (6.7%) and postgraduate degree holders (7.4%) and for female graduates of "IT" (6.7%) and "mathematics and statistics" (8.2%). Finally, there are 6 tertiary education schools which record an increased return to education during the crisis for men (graduates of "other TEI", "structural engineering", "mechanical engineering", "economics and management", and postgraduate studies) and only 2 for women ("IT" and "mathematics and statistics"). A closer look reveals that AEI graduation seems to be justified more during the crisis.

Table 6 takes unemployment risk into account and re-calculates the adjusted returns to education. As a result, returns to education increase in some cases (mainly for men) and decrease in others (e.g. AEI "structural engineering" school). The correction seems to produce larger changes in the returns to education during the crisis, a rather anticipated fact considering the much higher unemployment rates involved. A major point that must not be overlooked is that, despite the financial crisis, returns to education increase both for men and women, with very few exceptions (7 education groups in the case of men, and 5 in the case of women).[24] Thus, education remains a rewarding investment even in crisis conditions, at least for AEI graduates. For instance, male graduates of "law school" enjoy returns in the order of 9% during the crisis, and of "medical sciences" 8%, while female graduates of "medical sciences" have a return of 16.4%, followed by graduates of "pedagogics" with a return of 15.4%. Moreover, opportunity cost has declined considerably in the period of the current crisis, making the acquisition of further education more attractive, given also the extremely high unemployment rates observed among the young.

The fact that tertiary education graduates receive higher wages does not necessarily imply that they have become more productive because of their studies. They may simply be more capable of using their tertiary education qualifications as a signalling mechanism vis-à-vis employers, an aspect not explored in the context of the present study. In addition, all returns to education examined in this study are private returns.[25] High private returns do not necessarily imply high social returns, which would be indispensable in order to support the view that investment in tertiary education is profitable for society. Furthermore, one cannot safely predict whether high private returns will persist in the future, as the supply of skilled and specialised labour will increase due to the rapid expansion of "mass" tertiary education attendance observed in our country over the past decade. Finally, high unemployment rates after the period examined in this study, currently galloping at dramatic levels, may have brought about changes in the previous findings.

5 CONCLUSIONS

The aim of the study was to estimate the impact of the crisis on private returns to education, also taking into account the higher unemployment risk. To this end it made use of the primary data of the LFS on the periods both before (2004 Q1-2007 Q4) and during (2010 Q1-2012 Q2) the current crisis. Specifically, by successively estimating unemployment and earnings equations, adjusting for selection error and employment probability as per case and, thereafter, calculating the internal rate of return that equates the present value of different education levels' wages, always on the basis of years since graduation, it estimated private returns to education for individual groups of tertiary education graduates.

24 Fernandes, Ferreira and Winters (2013) show that facilitation of new business start-ups in Portugal has resulted in a 5% increase of the wage return to university education and a 3% increase of the return to high qualifications. Therefore, structural reforms in the labour market during the crisis may have had a positive effect on returns to education in Greece as well.

25 For a comparative analysis of Greece vis-à-vis other OECD countries as regards private and public returns to education, see OECD (2013b).

The main conclusions of the study are the following:

First, the financial crisis has resulted in a higher unemployment probability for all. However, this probability increase varies across education levels, genders, and tertiary education schools. Thus, in terms of unemployment, lower education level graduates, men, and older graduates have suffered a greater impact. An exception to the age pattern are postgraduate degree holders of both genders and female TEI graduates, while there are many differentiations among graduates of different schools.

Second, higher unemployment was accompanied by a drop in the employees' wages, albeit with considerable variations across individual groups. For both genders, a larger earnings reduction is recorded for postgraduate degree holders. Moreover, wages fell more for male AEI and TEI graduates. With respect to the years since graduation, in the case of men as a rule the wages of younger graduates fell more, unlike women for whom the pattern of a larger wage reduction for younger graduates is not confirmed.

Third, as to the main question of the study, i.e. the calculation of private returns to education and the changes brought about by the financial crisis, some further interesting conclusions came to the fore. More specifically, in accordance with the literature, private returns to education increase along with the education level, and are higher for women. The crisis period examined in this study, i.e. up to mid-2012, seems to have had mixed results, in the sense that returns to education are higher in some cases and lower in others. However, even after adjusting for unemployment risk, the analysis shows that education continues to yield high returns even in the period of the current financial crisis experienced by the Greek economy. It is of course true that some graduates fare better than others, depending on their tertiary education type (AEI graduates better than TEI graduates) and graduation school. In any case, from a private perspective, education seems to remain a rewarding investment. In parallel, it should be noted that, in order to be able to generalise this result and safely make suggestions such as "improve education financing", one should estimate social returns to education rather than private ones. This would be the only way to obtain a clear and accurate picture of society's overall benefits from education.

In conclusion, the main finding of the analysis is that, from a private perspective, education continues to be a rewarding investment even in the period of the current financial crisis. Undoubtedly, graduates of some schools fare better than others, but in general terms tertiary education graduates —always compared with lower education level graduates— enjoy better prospects in the labour market.

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APPENDIX

	Before crisis		During crisis	
	2004 Q1-2007 Q4		2010 Q1-2012 Q2	
Variable	Men	Women	Men	Women
a. Dependent variable: unemployed (1=yes, 0=no)				
Pre-lyceum education	-0.290***	-0.254***	-0.363***	-0.039
Lyceum	0.000	0.000	0.000	0.000
Post-lyceum non-tertiary education	0.230***	-0.094	0.327***	-0.127
TEI	0.511***	-0.080	0.560***	-0.101
AEI	0.492***	-0.037	0.417***	-0.156
Postgraduate studies	0.208	-0.815***	0.084	-0.651***
Years after graduation	-0.044***	-0.060***	-0.031***	-0.068***
Years after graduation sqrd.	0.000***	0.001***	0.000**	0.001***
Years after graduation x Pre-lyceum education	0.034***	0.049***	0.045***	0.030***
Years after graduation x Lyceum	0.000	0.000	0.000	0.000
Years after graduation x Post-lyceum non-tertiary education	-0.022**	-0.005	-0.037***	-0.011
Years after graduation x TEI	-0.093***	-0.034***	-0.078***	-0.062***
Years after graduation x AEI	-0.073***	-0.057***	-0.081***	-0.063***
Years after graduation x Postgraduate studies	-0.064**	0.003	-0.084***	-0.064**
Years after graduation sqrd. x Pre-lyceum non-tertiary education	-0.001***	-0.001***	-0.001***	-0.001***
Years after graduation sqrd. x Lyceum	0.000	0.000	0.000	0.000
Years after graduation sqrd. x Post-lyceum non-tertiary education	0.001*	0.000	0.001***	0.001**
Years after graduation sqrd. x TEI	0.002***	0.001***	0.002***	0.002***
Years after graduation sqrd. x AEI	0.002***	0.001***	0.002***	0.001***
Years after graduation sqrd. x Postgraduate studies	0.002*	0.000	0.002**	0.002**
Single with children	0.542***	0.332***	0.485***	0.308***
Single with children and other household members	0.522***	0.291***	0.492***	0.439***
Couple with children, without other household members	0.232***	0.192***	0.204***	0.157***
Couple with children and other household members	0.215***	0.162***	0.367***	0.229***
Single with no children, with other household members	0.159***	-0.039	0.113***	-0.094**
Couple, no children, no other household members	0.000	0.000	0.000	0.000
Single with no children, with other household members	0.296***	-0.042	0.129***	0.060
Couple with no children, with other household members	0.237**	-0.171*	0.078	-0.159
Greek national	0.000	0.000	0.000	0.000
EU-27 national	-0.153	-0.058	0.169**	-0.024
Third-country national	-0.159***	0.030	0.253***	-0.000

*** Statistically significant at the 1% level.
** Statistically significant at the 5% level.
* Statistically significant at the 10% level.

Table A Results of econometric estimations of unemployment equations, with adjustment for selection error by Heckman's two-step method (aggregate education levels) *(continued)*

| | Before crisis | | During crisis | |
| Variable | 2004 Q1-2007 Q4 | | 2010 Q1-2012 Q2 | |
	Men	Women	Men	Women
Eastern Macedonia – Thrace	-0.025	0.084*	-0.008	-0.008
Central Macedonia	-0.039	0.187***	-0.143***	0.030
Western Macedonia	-0.082	0.126*	-0.019	0.072
Epirus	0.040	0.199***	-0.088**	0.106**
Thessaly	0.009	0.215***	-0.125***	0.074*
Ionian islands	0.084	0.189***	-0.045	0.209***
Western Greece	-0.040	0.184***	-0.124***	-0.001
Central Greece and Euboea	-0.017	0.220***	-0.106**	0.118***
Attica	0.000	0.000	0.000	0.000
Peloponnese	0.077*	0.228***	-0.106**	0.104**
North Aegean	-0.117*	0.220***	-0.131**	0.117*
South Aegean	-0.015	0.100*	-0.064	0.126**
Crete	0.022	0.132***	-0.055	0.017
Capital region – Athens	0.000	0.000	0.000	0.000
Thessaloniki city complex	-0.106*	-0.198***	0.161***	0.160***
Other urban areas	-0.098***	-0.054	0.009	0.127***
Semi-urban areas	-0.183***	-0.167***	-0.102***	-0.021
Rural areas	-0.240***	-0.257***	-0.229***	-0.191***
Regional unemployment rate	7.261***	7.030***	3.262***	3.894***
Year 2004	-0.028	-0.012		
Year 2005	-0.055**	0.002		
Year 2006	-0.011	0.012		
Year 2007	0.000	0.000		
Year 2010			-0.211***	-0.038
Year 2011			-0.079**	-0.024
Year 2012			0.000	0.000
1st quarter	-0.040	-0.039*	-0.074***	-0.043*
2nd quarter	-0.041*	-0.010	0.000	0.000
3rd quarter	-0.025	-0.032	-0.029	-0.016
4th quarter	0.000	0.000	-0.002	-0.029
Constant term	-1.861***	-1.114***	-1.319***	-0.596***

***   Statistically significant at the 1% level.
**   Statistically significant at the 5% level.
*   Statistically significant at the 10% level.

Table A Results of econometric estimations of unemployment equations, with adjustment for selection error by Heckman's two-step method (aggregate education levels) *(continued)*

Variable	Before crisis 2004 Q1-2007 Q4		During crisis 2010 Q1-2012 Q2	
	Men	Women	Men	Women
b. Dependent variable: labour force participation (1=yes, 0=no)				
Pre-lyceum education	0.016	-0.231***	-0.083***	-0.168***
Lyceum	0.000	0.000	0.000	0.000
Post-lyceum non-tertiary education	0.428***	0.740***	0.356***	0.579***
TEI	0.513***	0.914***	0.554***	0.846***
AEI	0.456***	0.889***	0.496***	0.837***
Postgraduate studies	0.802***	1.380***	0.715***	1.269***
Age	0.425***	0.260***	0.427***	0.283***
Age sqrd.	-0.005***	-0.003***	-0.005***	-0.003***
Married	0.306***	-0.365***	0.279***	-0.317***
No children under 14	0.000	0.000	0.000	0.000
With children aged 0-4 years	0.568***	-0.194***	0.503***	-0.257***
With children aged 5-14 years	0.031	-0.127***	-0.019	-0.185***
With children aged 0-4 and 5-14 years	0.292***	-0.327***	0.243***	-0.371***
Greek national	0.000	0.000	0.000	0.000
EU-27 national	0.379***	0.098**	0.387***	0.229***
Third-country national	0.634***	0.127***	0.643***	0.133***
Eastern Macedonia – Thrace	-0.049	0.260***	-0.121***	0.060*
Central Macedonia	-0.044	0.099***	-0.063	-0.059*
Western Macedonia	-0.273***	0.040	-0.268***	-0.041
Epirus	-0.131***	0.110***	-0.133***	0.041
Thessaly	0.039	0.166***	0.029	0.072**
Ionian islands	-0.024	0.167***	0.096	0.068
Western Greece	-0.086**	0.003	-0.033	-0.089***
Central Greece and Euboea	0.009	0.095***	-0.169***	0.028
Attica	0.000	0.000	0.000	0.000
Peloponnese	0.039	0.286***	0.043	0.108***
North Aegean	-0.136***	-0.078**	-0.156***	-0.224***
South Aegean	0.112**	-0.059*	0.134**	-0.053
Crete	-0.009	0.298***	-0.013	0.157***
Capital region – Athens	0.000	0.000	0.000	0.000
Thessaloniki city complex	0.009	-0.180***	0.017	-0.042
Other urban areas	0.057**	-0.121***	0.070**	-0.014
Semi-urban areas	0.221***	0.007	0.296***	0.114***
Rural areas	0.339***	0.226***	0.397***	0.300***
Regional unemployment rate	0.542	0.929**	0.910*	-0.517

*** Statistically significant at the 1% level.
** Statistically significant at the 5% level.
* Statistically significant at the 10% level.

Variable	Before crisis 2004 Q1-2007 Q4		During crisis 2010 Q1-2012 Q2	
	Men	Women	Men	Women
Year 2004	0.014	-0.005		
Year 2005	0.010	-0.004		
Year 2006	0.024	0.003		
Year 2007	0.000	0.000		
Year 2010			0.209***	-0.070
Year 2011			0.099***	-0.028
Year 2012			0.000	0.000
1st quarter	0.037**	-0.024*	0.031	-0.013
2nd quarter	0.023	-0.019	0.000	0.000
3rd quarter	-0.019	-0.001	-0.041	-0.027
4th quarter	0.000	0.000	-0.060**	0.022
Number of working household members (apart from oneself)	0.223***	0.104***	0.195***	0.065***
Number of retired household members (apart from oneself)	-0.099***	-0.081***	-0.124***	-0.111***
Number of economically inactive household members (apart from oneself)	0.016	0.115***	-0.039**	0.090***
Constant term	-7.234***	-4.665***	-7.478***	-4.827***
rho	0.53	0.07	0.60	-0.12
LR test (rho=0): x^2 (1)	129.90	0.91	146.03	1.27
Prob>x^2	0.00	0.35	0.00	0.26
Log likelihood	-39,893.99	-66,164.26	-33,227.77	-45,837.06
Number of observations	84,763	88,588	55,515	57,863

*** Statistically significant at the 1% level.
** Statistically significant at the 5% level.
* Statistically significant at the 10% level.

Table B Results of econometric estimations of earnings equations, with adjustment for selection error by Heckman's two-step method (aggregate education levels)

| | Before crisis | | During crisis | | |
| | 2004 Q1-2007 Q4 | | 2010 Q1-2012 Q2 | | |
Variable	Men	Women	Men	Women	Men OLS
a. Dependent variable: logarithm of hourly earnings					
Pre-lyceum education	-0.012	0.159***	-0.042	0.154***	-0.036
Lyceum	0.000	0.000	0.000	0.000	0.000
Post-lyceum non-tertiary education	0.015	0.008	0.117***	-0.069**	0.112***
TEI	0.075***	0.047	0.074**	-0.007	0.065**
AEI	0.164***	0.194***	0.206***	0.110***	0.197***
Postgraduate studies	0.401***	0.304***	0.425***	0.171***	0.412***
Years after graduation	0.013***	0.008***	0.016***	0.003	0.015***
Years after graduation sqrd.	-0.000***	-0.000	-0.000***	0.000	-0.000***
Years after graduation x Pre-lyceum education	-0.003**	-0.017***	-0.002	-0.011***	-0.002
Years after graduation x Lyceum	0.000	0.000	0.000	0.000	0.000
Years after graduation x Post-lyceum non-tertiary education	0.005**	0.005*	-0.003	0.009***	-0.003
Years after graduation x TEI	0.005*	0.007**	0.003	0.009**	0.003
Years after graduation x AEI	0.009***	0.007***	0.004	0.009***	0.005*
Years after graduation x Postgraduate studies	-0.001	0.016**	0.003	0.015**	0.004
Years after graduation sqrd. x Pre-lyceum education	0.000	0.000***	0.000	0.000	0.000
Years after graduation sqrd. x Lyceum	0.000	0.000	0.000	0.000	0.000
Years after graduation sqrd. x Post-lyceum non-tertiary education	-0.000	-0.000	0.000	-0.000*	0.000
Years after graduation sqrd. x TEI	-0.000	-0.000	-0.000	-0.000	-0.000
Years after graduation sqrd. x AEI	-0.000***	-0.000	-0.000	-0.000	-0.000
Years after graduation sqrd. x Postgraduate studies	0.000	-0.000*	-0.000	-0.000	-0.000
Married	0.074***	0.056***	0.105***	0.045***	0.101***
Greek national	0.000	0.000	0.000	0.000	0.000
EU-27 national	-0.125***	-0.111***	-0.173***	-0.198***	-0.174***
Third-country national	-0.151***	-0.106***	-0.148***	-0.158***	-0.151***
Eastern Macedonia – Thrace	-0.082***	-0.039***	-0.031***	-0.002	-0.033***
Central Macedonia	-0.083***	-0.068***	-0.021*	-0.020	-0.024**
Western Macedonia	-0.007	0.047***	0.089***	0.086***	0.088***
Epirus	-0.015*	0.000	0.040***	0.013	0.039***
Thesssaly	-0.061***	-0.016	0.013	0.010	0.011
Ionian islands	-0.057***	-0.003	-0.005	-0.014	-0.008
Western Greece	0.003	0.028**	0.018	-0.003	0.018
Central Greece and Euboia	0.013	0.003	0.061***	0.003	0.058***
Attica	0.000	0.000	0.000	0.000	0.000

*** Statistically significant at the 1% level.
** Statistically significant at the 5% level.
* Statistically significant at the 10% level.

Table B Results of econometric estimations of earnings equations, with adjustment for selection error by Heckman's two-step method (aggregate education levels) *(continued)*

Variable	Before crisis		During crisis		
	2004 Q1-2007 Q4		2010 Q1-2012 Q2		
	Men	Women	Men	Women	Men OLS
Peloponnese	-0.042***	-0.021*	0.026**	0.022	0.024**
North Aegean	0.017	0.048***	-0.024	0.023	-0.024
South Aegean	0.024**	0.055***	0.020	0.024	0.018
Crete	-0.020**	-0.015	0.044***	0.013	0.042***
Capital region – Athens	0.000	0.000	0.000	0.000	0.000
Thessaloniki city complex	0.067***	0.086***	-0.044***	-0.030*	-0.041***
Other urban areas	-0.002	-0.005	-0.059***	-0.020*	-0.057***
Semi-urban areas	-0.022***	-0.012	-0.056***	-0.024*	-0.055***
Rural areas	-0.015*	-0.014	-0.067***	-0.042***	-0.066***
Agriculture, forestry and fishing	-0.097***	-0.038*	-0.089***	-0.001	-0.089***
Mining and quarrying*	-0.089**	0.171**	0.010	0.107	0.010
Manufacturing	0.190***	0.185***	0.210***	0.117	0.210***
Electricity, gas, steam and air conditioning supply*	0.057***	0.076***	0.065***	0.076***	0.065***
Water supply, sewerage, waste management and remediation activities*	0.171***	0.122***	0.053***	0.094***	0.053***
Construction**	0.097***	0.165***	0.070***	0.148***	0.070***
Wholesale and retail trade; repair of motor vehicles and motorcycles	0.000	0.000	0.000	0.000	0.000
Transportation and storage	0.014*	0.036***	0.049***	0.049***	0.049***
Accommodation and food service activities	0.108***	0.116***	0.131***	0.136***	0.131***
Information and communication	0.153***	0.183***	0.151***	0.217***	0.152***
Financial and insurance activities	0.025**	0.065***	0.006	0.068***	0.007
Real estate activities*	0.101***	0.120***	0.021*	0.100***	0.021*
Professional, scientific and technical activities	0.317***	0.337***	0.310***	0.357***	0.310***
Administrative and support service activities	0.080***	0.121***	0.019	0.058***	0.019
Public administration and defence; compulsory social security	0.047***	0.046***	0.053***	0.021	0.053***
Education	-0.108***	-0.104***	-0.097**	-0.044***	-0.097**
Human health and social work activities	0.248***	0.498***	0.116	0.240**	0.116
Large firm (>10 employees)	0.072***	0.067***	0.082***	0.076***	0.082***
Private sector	0.000	0.000	0.000	0.000	0.000
Public sector	0.091***	0.084***	0.110***	0.083***	0.109***
Years after graduation x Public sector	0.003***	0.010***	0.002	0.006***	0.002
Years after graduation sqrd. x Public sector	-0.000	-0.000***	-0.000	-0.000*	-0.000

*** Statistically significant at the 1% level.
** Statistically significant at the 5% level.
* Statistically significant at the 10% level.

Table B Results of econometric estimations of earnings equations, with adjustment for selection error by Heckman's two-step method (aggregate education levels) *(continued)*

Variable	Before crisis 2004 Q1-2007 Q4		During crisis 2010 Q1-2012 Q2		
	Men	Women	Men	Women	Men OLS
Year 2004	0.026***	0.031***			
Year 2005	-0.001	0.006			
Year 2006	-0.004	0.005			
Year 2007	0.000	0.000			
Year 2010			0.170***	0.137***	0.166***
Year 2011			0.117***	0.081***	0.115***
Year 2012			0.000	0.000	0.000
1st quarter	0.002	0.007	0.044***	0.036***	0.043***
2nd quarter	-0.013***	-0.001	0.000	0.000	0.000
3rd quarter	0.004	0.001	0.011	0.014	0.011
4th quarter	0.000	0.000	-0.001	-0.011	-0.000
Full-time employment	0.000	0.000	0.000	0.000	0.000
Part-time employment	0.176***	0.199***	0.198***	0.163***	0.198***
Constant term	1.396***	1.324***	1.174***	1.357***	1.199***
b. Dependent variable: employee (1=yes, 0=otherwise)					
Pre-lyceum education	-0.163***	-0.405***	-0.281***	-0.367***	
Lyceum	0.000	0.000	0.000	0.000	
Post-lyceum non-tertiary education	0.193***	0.510***	0.150***	0.318***	
TEI	0.222***	0.684***	0.234***	0.630***	
AEI	0.055**	0.684***	0.259***	0.661***	
Postgraduate studies	0.203***	0.833***	0.421***	0.766***	
Age	0.272***	0.250***	0.236***	0.241***	
Age sqrd.	-0.003***	-0.003***	-0.003***	-0.003***	
Married	0.400***	-0.337***	0.330***	-0.247***	
No children under 14	0.000	0.000	0.000	0.000	
With children aged 0-4 years	0.104***	-0.054**	0.136***	-0.034	
With children aged 5-14 years	-0.132***	-0.094***	-0.147***	-0.102***	
With children aged 0-4 and 5-14 years	-0.032	-0.223***	-0.110***	-0.187***	
Greek national	0.000	0.000	0.000	0.000	
EU-27 national	0.459***	0.206***	0.169***	0.306***	
Third-country national	0.463***	0.236***	0.271***	0.265***	
Eastern Macedonia – Thrace	0.344***	0.122***	0.164***	0.038	
Central Macedonia	0.256***	0.019	0.302***	0.026	
Western Macedonia	0.301***	-0.024	0.133**	-0.074	
Epirus	0.050	0.000	0.072*	0.012	
Thessaly	0.235***	0.015	0.330***	0.072*	

***   Statistically significant at the 1% level.
**   Statistically significant at the 5% level.
*   Statistically significant at the 10% level.

Table B Results of econometric estimations of earnings equations, with adjustment for selection error by Heckman's two-step method (aggregate education levels) *(continued)*

Variable	Before crisis		During crisis		
	2004 Q1-2007 Q4		2010 Q1-2012 Q2		
	Men	Women	Men	Women	Men OLS
Ionian islands	0.309***	0.229***	0.392***	0.205***	
Western Greece	0.171***	-0.079**	0.079**	-0.025	
Central Greece and Euboia	0.341***	0.093***	0.323***	0.103***	
Attica	0.000	0.000	0.000	0.000	
Peloponnese	0.170***	0.060**	0.196***	0.023	
North Aegean	0.266***	-0.120***	-0.023	-0.252***	
South Aegean	0.156***	-0.007	0.159***	-0.058	
Crete	0.145***	0.164***	0.232***	0.194***	
Capital region – Athens	0.000	0.000	0.000	0.000	
Thessaloniki city complex	0.062	0.078**	-0.302***	-0.138***	
Other urban areas	-0.013	-0.040*	-0.229***	-0.255***	
Other semi-urban areas	-0.039	-0.138***	-0.159***	-0.234***	
Rural areas	-0.006	-0.198***	-0.078**	-0.279***	
Regional unemployment rate	-3.275***	-2.804***	-0.064	-1.550***	
Year 2004	0.101***	0.062***			
Year 2005	0.077***	0.052***			
Year 2006	0.013	0.022			
Year 2007	0.000	0.000			
Year 2010			0.493***	0.097*	
Year 2011			0.267***	0.056	
Year 2012			0.000	0.000	
1st quarter	0.086***	0.002	0.060***	0.030	
2nd quarter	0.065***	-0.001	0.000	0.000	
3rd quarter	-0.010	-0.011	-0.030	0.021	
4th quarter	0.000	0.000	-0.095***	0.026	
Number of working household members (apart from oneself)	0.148***	0.058***	0.084***	0.017*	
Number of retired household members (apart from oneself)	-0.058***	-0.096***	-0.116***	-0.143***	
Number of economically inactive household members (apart from oneself)	0.078***	0.019	-0.026*	-0.077***	
Constant term	-5.076***	-4.685***	-4.976***	-4.626***	
lamda	-0.045***	-0.066***	0.014	-0.105***	
Number of observations	53,364	70,143	35,686	45,570	17,019

***   Statistically significant at the 1% level.
**   Statistically significant at the 5% level.
*   Statistically significant at the 10% level.

THE GREEK LABOUR MARKET DURING THE CRISIS: UNEMPLOYMENT, EMPLOYMENT AND LABOUR FORCE PARTICIPATION*

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1 INTRODUCTION

In the almost three years after the outbreak of the debt crisis and the adoption of adjustment programmes, economic activity registered a cumulative decline of about 20%, weighting heavily on the labour market. The unemployment rate showed a substantial increase, with signs of persistence. In the same period, the number of the long-term unemployed almost quadrupled (reaching some 847 thousand in the fourth quarter of 2012) and the unemployment rate of youths below 25 years hit historical highs. Employment fell substantially (around 795 thousand persons from the fourth quarter of 2009 to the fourth quarter of 2012), mostly as a result of the large decline in the male employment rate. During the same period, the labour force participation rate increased marginally, reflecting higher female participation.

Against this background, scientific discourse concerning the relationship between unemployment, employment and labour force participation rates comes again into focus, as the current recession affects participants in ways not seen in past recessions. During past downturns, workers, particularly older ones, withdrew from the market, motivated by negative prospects to find a job, as well as government policies, which in several cases entailed early-retirement schemes (Duval et al. 2011, OECD 2010). The current crisis shows evidence that women and youths enter the labour market to compensate for the loss of family income caused by persistently falling male employment (Mattingly and Smith 2010, OECD 2012).

The change in the behaviour of labour market participants is of particular interest in modern economies and has been the focus of recent studies (European Central Bank 2012). As regards Greece, a study and analysis of the evolution of unemployment, employment and participation rate after the country was placed under a support mechanism, although significant in economic and scientific terms, has not been conducted yet. After the onset of the crisis, falling demand, in the context of dealing with the problem of the long-term competitiveness and fiscal adjustment of the economy, led to a drop in labour demand, a decrease in employment and an increase in the unemployment rate. In the same period, major changes in labour regulations and a series of reforms in the labour market took place (Bank of Greece 2011, 2012, 2013). Recent legislative reforms increased labour supply, particularly of youths and women. As a result, the unemployment rate rose by 16.6 percentage points, from 7.6% in 2008 to 24.2% in 2012, the employment rate, which had been among the lowest in the European Union, fell substantially by 9.3 percentage points (from 49.4% in 2008 to 40.1% in 2012), and the labour force participation rate declined marginally.

This study examines recent developments in a number of key indicators of the Greek labour market, such as the unemployment rate, the long-term unemployment rate, the labour force participation rate and the employment rate. The examination of these indices is very important, as they are associated with human capital and their evolution affects the productive capacity of the economy, currently and in the

future. The human capital is an important factor of production, and its absence from this process leads to a shrinking of labour and depreciation of human skills, reduces the economy's productive capacity, and inhibits the return of the economy to stable and sustainable growth rates. Moreover, the absence of youths from economic activity has long-term adverse effects on demographics, as it may —among other things— have a negative impact on or delay the decision to start a family, thus decreasing or even inhibiting birth-rates. This study provides evidence of significant differentiation in the relationship between the employment rate, the labour force participation rate and the unemployment rate before and during the crisis. Therefore, hypotheses and proposals which are based on the assumption that there is a linear relationship between these variables, without considering the possibility of it being asymmetric, could lead to wrong conclusions and policy decisions.

The examination of the relationship between the three economic indices is carried out using vector autoregression error-correction model estimation, and aims at examining whether labour force participation and employment rate depend on the size of unemployment. The econometric analysis uses the two-regime threshold cointegration model of Hansen and Seo (2002). The basic assumption tested is whether the relationship between the labour force participation and the employment rate is linear or asymmetric (i.e. depending on the size of unemployment and the country's economic activity). In these models, a long-run equilibrium is achieved in the system, when it either exceeds or falls short of a threshold value or a critical regime. This model determines endogenously two regimes, a "typical" regime, which represents a low unemployment rate, and a second regime, which represents a higher unemployment rate. The estimation is conducted using quarterly data from the Greek labour market for the period between the first quarter of 1990 and the first quarter of 2012. Empirical findings show that the relationship between labour force participation and the

employment rate is not linear and rather depends on the rate of unemployment, and thus on the state of the economy. In particular, the econometric analysis shows that during the first regime, i.e. when the unemployment rate is low, the employment rate increases and the labour force participation rate is a weakly exogenous variable. By contrast, during the second regime of high unemployment rates, such as after the second quarter of 2010 when the Memorandum of Understanding was signed, strong downward pressure is generated on the employment rate, and while the labour force participation rate continues to increase, it is still lower than before the crisis. The results indicate that when unemployment is high, labour market participants have a low probability of employment. Moreover, econometric analysis shows that the unemployment rate in Greece is persistent.

This study is structured as follows. Section 2 briefly reviews the key characteristics of the Greek and the European labour markets through an examination of a number of key labour market indicators. Section 3 describes the methodology used in the empirical analysis and Section 4 presents data and empirical results. The last section summarises the results of this study.

2 THE GREEK AND THE EUROPEAN LABOUR MARKET: KEY CHARACTERISTICS, TRENDS AND RELATIONSHIPS
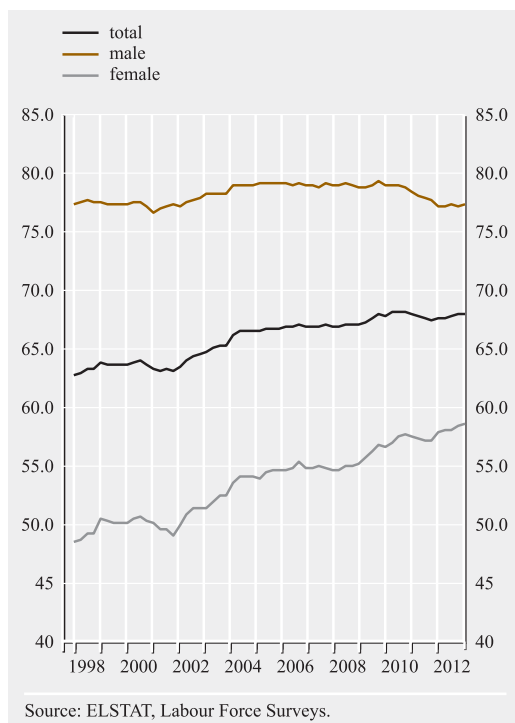
Despite some distinct characteristics before and during the crisis, the Greek labour market is in many respects similar to those of the other EU-27 countries.

2.1 LABOUR FORCE PARTICIPATION RATE

According to the Labour Force Survey (LFS) data, the labour force participation rate[1] increased continuously from the first quarter of

1 The labour force participation rate of people aged 15-64 years is calculated as the ratio of the labour force aged 15-64 to the total population of this age.

Chart 1 Labour force participation rate by gender: Greece, 1998-2012 (ages 15-64)

- total
- male
- female

Source: ELSTAT, Labour Force Surveys.

Chart 2 Employment rate by gender: Greece, 1998-2012 (ages 15-64)

- total
- male
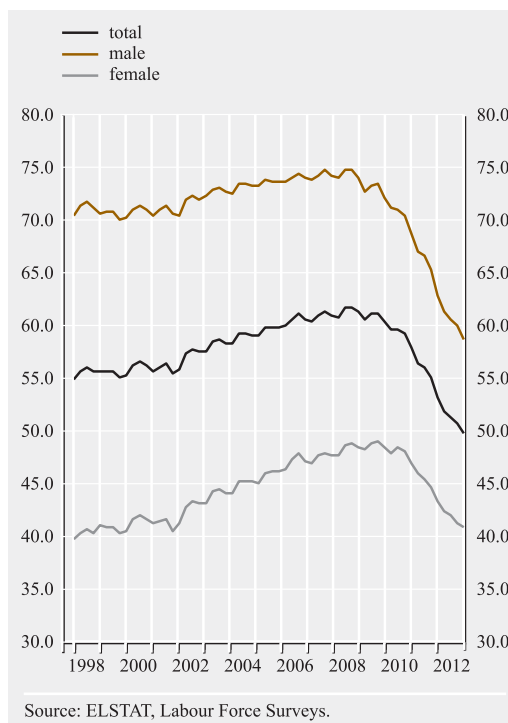- female

Source: ELSTAT, Labour Force Surveys.

1998 to the third quarter of 2010 (from 62.9% to 68.3%). However, despite a marginal decline during the crisis, the labour force participation rate remains high (see Chart 1).

There is a wide difference between male and female participation rates, as the female participation rate, despite increasing over time, is significantly below the participation rate for men. The labour market gender gap fell from 24 percentage points in 2008 to 19 percentage points in 2012. Despite this substantial decline, it was still the second highest in the EU in 2012 (see Table 1).

2.2 EMPLOYMENT RATE

The employment rate in Greece[2] increased over time from 55.3% in the first quarter of 1998 to 62.2% in the third quarter of 2008 (see Chart 2). This trend was reversed during the economic crisis and the employment rate fell substantially by 12 percentage points (50.2% in

the fourth quarter of 2012).[3] The decline in employment mostly reflects the stronger decrease in male employment compared with female employment. In the current recession, male employment is more sensitive to a decrease in economic activity, mostly because men were employed in sectors that were hit the hardest by the crisis, such as construction.[4] The rate of female employment in Greece falls significantly short of the male rate, and is also considerably below the respective EU rate.[5]

2 The employment rate of persons aged 15-64 years is calculated as the ratio of the employed aged 15-64 years to the total population of the same age.

3 Sectors that suffered more job losses during the recent period are construction (due to the decline in private construction activity and the discontinuation of large infrastructure projects), manufacturing and trade (owing to shrinking domestic demand).

4 The male employment rate in Greece, although increasing over time, from 71% in the first quarter of 1998 to 74% in the third quarter of 2009, fell sharply to 59.2% in the fourth quarter of 2012, declining by 14.8 percentage points, thus settling at substantially lower levels than in 1998.

5 The female employment rate in Greece, although rising over time (from 39.9% in the first quarter of 1998 to 49.3% in the third quarter of 2009), fell sharply to 41.2% in the fourth quarter of 2012 (down by 8.1 percentage points).

Table 1 Gender gaps in employment, labour force participation and unemployment, 2008-2012

|	Employment/Population					Labour force participation					Unemployment				
	2008	2009	2010	2011	2012	2008	2009	2010	2011	2012	2008	2009	2010	2011	2012
Austria	12.7	10.5	10.8	11.2	10.6	12.8	11.4	11.6	11.5	11.1	-0.6	0.5	0.4	-0.3	0.0
Belgium	12.4	11.2	10.9	10.4	10.1	12.5	11.9	11.6	11.2	11.1	-1.1	-0.3	-0.4	0.0	0.3
Czech Republic	17.8	17.2	17.3	16.8	16.4	17.1	17.0	17.1	16.5	16.0	-2.2	-1.9	-2.1	-2.1	-2.2
Denmark	7.5	5.3	4.5	5.5	5.2	7.4	6.8	6.6	6.2	5.7	-0.5	1.4	2.0	0.3	0.1
Estonia	7.2	1.1	1.0	5.0	5.3	8.0	6.9	5.7	6.7	7.3	0.5	6.5	5.0	1.1	1.6
Finland	4.4	1.0	2.8	3.4	2.7	4.1	2.3	4.3	4.8	4.0	-0.8	1.5	1.4	1.3	1.2
France	9.3	8.5	8.4	8.4	8.0	9.3	9.0	8.8	8.6	8.7	-1.0	-0.4	-0.7	-0.9	-0.2
Germany	11.6	10.3	10.0	9.7	9.7	12.4	11.9	11.6	10.8	10.7	-0.2	0.8	1.0	0.6	0.5
Greece	26.3	24.6	22.8	20.8	18.8	24.0	22.6	21.3	20.2	19.0	-6.4	-6.3	-6.3	-6.4	-6.7
Hungary	12.4	11.2	9.8	10.6	10.4	13.2	12.8	11.6	12.0	12.2	-0.4	0.6	0.9	0.1	0.6
Ireland	15.1	9.2	7.9	7.1	7.2	17.7	16.4	15.1	14.4	14.5	2.3	7.4	7.3	7.5	7.4
Italy	23.1	22.6	21.9	21.3	19.8	22.8	23.0	22.6	22.0	20.8	-3.0	-2.5	-2.1	-2.0	-1.9
Luxembourg	16.3	16.2	15.9	15.1	13.4	16.0	15.9	15.7	14.2	13.2	-1.7	-1.7	-1.3	-2.4	-1.4
Netherlands	13.1	11.9	10.6	9.9	9.3	13.1	12.3	11.1	10.4	10.0	-0.6	0.0	0.0	0.0	0.1
Norway	5.2	4.0	4.1	3.8	3.9	5.6	4.9	5.2	4.3	4.8	0.3	1.0	1.1	0.4	0.9
Poland	13.9	13.4	12.7	13.3	13.2	14.0	14.0	13.6	13.8	13.6	-1.5	-0.9	-0.7	-1.4	-1.5
Portugal	11.5	9.5	9.0	7.8	6.2	10.6	9.5	8.4	8.7	7.8	-2.4	-1.3	-2.1	-0.3	0.4
Slovakia	15.3	14.8	12.9	13.6	14.0	15.0	15.7	14.7	15.7	15.5	-2.7	-1.5	-0.4	0.0	-1.0
Slovenia	8.5	7.2	7.1	6.8	6.9	8.3	7.7	8.0	7.4	6.8	-0.9	0.1	0.4	0.0	-1.0
Spain	18.9	14.0	12.6	11.3	9.8	18.9	16.5	15.1	13.6	12.4	-3.0	-0.7	-0.8	-1.0	-0.6
Sweden	4.8	3.9	4.9	4.5	3.8	4.7	4.9	5.6	5.1	4.7	-0.6	0.7	0.3	0.2	0.6
Switzerland	11.9	10.8	12.0	12.1	11.5	11.4	10.7	11.9	12.0	11.6	-1.1	-0.7	-0.9	-0.7	-0.5
United Kingdom	11.7	10.1	9.9	10.2	10.4	13.2	13.0	12.4	12.3	12.3	1.0	2.4	1.9	1.4	1.1

Source: OECD, Online Employment Database.

The employment gender gap fell from 26.3 percentage points in 2008 to 18.8 percentage points in 2012, mainly due to the decline in the male employment rate (see Table 1). The male-female employment gap, despite falling, remains particularly high compared with other EU countries (the second highest in the EU-27, following Italy, where the male-female employment gap for 2012 was 19.8%).

2.3 LABOUR FORCE PARTICIPATION, EMPLOYMENT AND UNEMPLOYMENT: BREAKDOWN BY NATIONALITY AND AGE

Before the crisis, foreign nationals had higher employment and participation rates and lower unemployment rates than Greek nationals. This trend was reversed after the onset of the crisis. Specifically (see Table 2):

— Between 2008 and 2012 (fourth quarter), the employment rate of foreign nationals fell much more than that of Greek nationals. In 2012 (fourth quarter), the employment rate of foreign nationals (aged 15-64 years) was lower than the respective rate for Greek nationals. The decline in the employment rate of foreign nationals is attributable to the substantially larger decline in the employment rate of male foreign nationals (larger than the decline in the employment rate of female foreign nationals), as a significant percentage of foreigners worked in construction, which has shrunk substantially during the recent crisis.

— The decline in the employment rate is stronger among foreign nationals than among Greek nationals in all age groups, and the 20-24 age group in particular.

— The unemployment rate of foreign nationals is higher than the respective rate for Greek nationals (36.9% against 25.0% in the fourth quarter of 2012), a trend observed since 2009. The increase in unemployment of foreign nationals is substantial and higher than the increase in unemployment of Greek nationals across all age groups during 2008-2012.

Chart 3 Employment rates in EU countries as a percentage of the labour force, ages 15 and above (June)

Source: Eurostat, Labour Force Surveys (LFS).
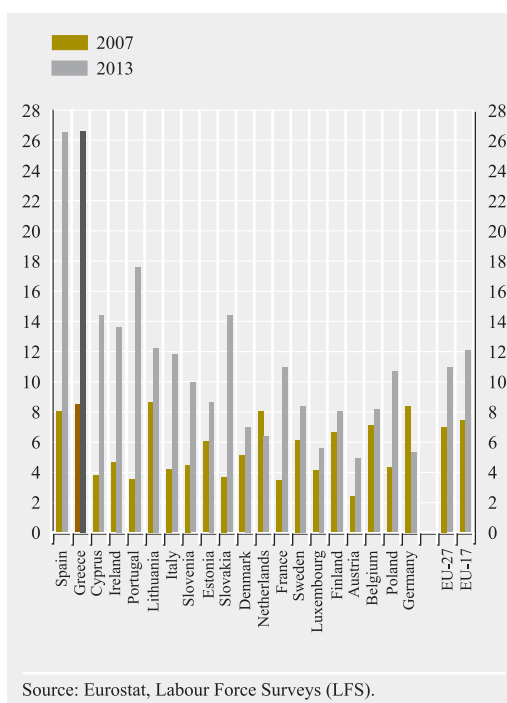
The fall in employment, the increase in unemployment, as well as the strength and the duration of this crisis are factors expected to affect the immigrants' decisions as to whether they should remain in Greece, driving a large share to leave the country (OECD 2013).

2.4 UNEMPLOYMENT RATE

The unemployment rate in the EU is at its highest since the start of the monetary union and the differences observed in unemployment rates among EU countries are substantial. The unemployment rate in Greece (26.8% in March 2013) is the highest in the EU. The gender unemployment gap in 2007-2013 rose substantially in Spain and Greece (by 18.7 and 18.1 percentage points, respectively) and was considerably higher than the corresponding EU-27 average (3.6 percentage points). By contrast, during the same period, the rate of unemployment fell only in Germany (by 3.6 percentage points, from 9% to 5.4% – see Chart 3).

Table 2 Employment, labour force participation and unemployment rates by nationality and age group (2000 Q4 - 2012 Q4)

Age	Employment rate							Labour force participation rate							Unemployment rate						
	2000	2008	2009	2010	2011	2012	2008/12	2000	2008	2009	2010	2011	2012	2008/12	2000	2008	2009	2010	2011	2012	2008/12
Total (all nationalities)																					
Total	46.3	49.3	48.2	46.1	42.0	39.2	-10.0	52.0	53.5	53.8	53.8	53.0	53.0	-0.5	11.0	7.9	10.3	14.2	20.7	26.0	18.1
15-19	10.3	6.2	6.1	3.9	3.4	2.4	-3.8	15.6	8.8	8.9	7.4	8.3	7.8	-1.0	33.8	29.2	31.5	47.9	59.3	69.0	39.8
20-24	45.9	40.0	36.9	33.5	26.5	22.2	-17.8	62.5	51.3	51.2	51.9	51.3	50.6	-0.7	26.6	22.0	27.9	35.4	48.3	56.1	34.1
25-29	68.6	72.6	71.4	65.0	56.0	52.0	-20.7	82.3	83.4	85.2	84.6	84.8	85.8	2.4	16.6	13.0	16.2	23.2	34.0	39.4	26.5
30-44	74.1	79.1	77.8	75.0	70.3	65.6	-13.5	81.3	85.2	85.8	86.4	86.9	87.5	2.2	8.9	7.2	9.3	13.2	19.1	25.0	17.8
45-64	53.0	58.5	58.0	56.9	52.6	50.5	-8.0	55.8	61.2	62.0	62.4	60.9	61.7	0.5	4.9	4.3	6.3	8.7	13.5	18.1	13.9
65+	5.0	4.2	4.2	3.9	3.2	2.5	-1.7	5.1	4.2	4.2	4.0	3.3	2.7	-1.5	1.3	0.7	0.9	1.6	3.4	6.3	5.6
15-64	56.6	61.7	60.8	58.3	53.5	50.2	-11.5	63.7	67.1	67.9	68.1	67.7	68.1	1.0	11.1	8.1	10.5	14.4	20.9	26.3	18.2
Greek nationals																					
Total	45.9	48.0	46.9	44.5	41.2	38.8	-9.3	51.5	52.2	52.2	52.3	51.7	51.7	-0.5	10.9	8.0	10.2	13.9	20.2	25.0	17.0
15-19	9.9	5.6	5.5	2.8	2.9	2.5	-3.2	15.0	8.0	7.9	6.4	7.4	7.4	-0.6	33.9	29.8	30.3	46.7	60.1	66.7	36.9
20-24	45.7	38.0	34.2	30.6	25.4	22.3	-15.7	62.5	49.7	49.2	50.5	50.3	50.1	0.3	26.9	23.6	30.4	37.0	49.6	55.6	31.9
25-29	68.8	73.0	72.1	64.2	56.1	52.4	-20.6	82.7	84.6	86.3	85.6	86.0	86.9	2.3	16.7	13.7	16.5	23.6	34.8	39.6	25.9
30-44	74.2	79.3	78.3	74.6	70.9	66.8	-12.6	81.3	85.6	86.2	86.7	87.3	87.9	2.3	8.8	7.3	9.2	13.0	18.8	24.0	16.8
45-64	52.8	57.9	57.3	55.9	52.2	50.5	-7.4	55.5	60.4	60.9	61.4	59.9	60.8	0.5	4.8	4.1	5.9	8.3	12.8	17.0	12.9
65+	5.0	4.1	4.1	3.8	3.1	2.5	-1.6	5.1	4.2	4.2	3.9	3.2	2.7	-1.5	1.3	0.7	0.9	1.6	2.4	6.0	5.3
15-64	56.4	61.1	60.2	57.2	53.3	50.5	-10.6	63.5	66.5	67.1	67.4	67.0	67.6	1.0	11.1	8.1	10.3	14.1	20.5	25.2	17.1
Foreign nationals																					
Total	61.5	66.9	65.0	68.4	54.4	45.6	-21.3	70.0	72.4	73.6	73.6	72.8	72.3	-0.1	12.2	7.5	11.7	17.0	25.2	36.9	29.4
15-19	22.5	14.0	12.3	15.6	8.5	2.0	-12.0	33.6	18.9	19.5	19.1	19.0	13.0	-5.9	33.0	26.2	37.1	52.2	55.6	84.9	58.7
20-24	49.7	56.4	56.5	57.6	36.3	22.0	-34.4	62.6	63.8	65.7	63.3	60.3	55.4	-8.5	20.6	11.6	13.9	25.1	39.8	60.3	48.7
25-29	64.7	69.7	66.4	70.7	55.3	47.8	-21.9	75.3	75.1	76.5	77.1	76.0	76.7	1.6	14.0	7.2	13.2	20.3	27.2	37.7	30.5
30-44	72.3	77.1	74.4	77.7	65.1	56.3	-20.7	79.8	82.1	82.8	83.7	82.9	84.1	2.0	9.4	6.2	10.2	15.0	21.5	33.1	26.9
45-64	69.5	73.3	72.1	76.6	60.8	50.5	-22.8	75.1	79.2	81.6	80.6	80.6	79.3	0.1	7.5	7.5	11.6	14.5	24.5	36.3	28.8
65+	8.7	11.3	9.9	12.1	6.0	6.4	-5.0	8.7	11.3	9.9	12.1	10.7	7.7	-3.6	0.0	0.0	0.0	0.0	43.6	17.4	17.4
15-64	62.9	68.3	66.5	70.0	55.8	47.0	-21.4	71.7	73.9	75.4	75.4	74.5	74.5	0.6	12.2	7.5	11.8	17.1	25.2	36.9	29.4

Source: ELSTAT, Labour Force Surveys.

Female and youth unemployment

The female unemployment rate[6] (29.9% in the fourth quarter of 2012) is substantially higher than the male unemployment rate (23.5%) and considerably higher than the average female unemployment rate in the EU. Since the onset of the crisis, the gender unemployment gap in Greece has declined, reflecting the fact that men were more severely hit than women. A significant share of women work in the non-tradables sector (healthcare, education, public administration), which until now has not been badly affected by the crisis, while female participation in construction, which has suffered the largest job losses in the past few years, is small. It is a fact that Greek female workers are worse off relative to their Greek male colleagues and their European female counterparts (Papapetrou 2008).

The unemployment rate grew considerably across all age groups between 2007 and 2012 (fourth quarter) (see Chart 4). The strongest increase in unemployment concerns younger ages (by 34.2 and 25.1 percentage points for 20-24 years and 25-29 years, respectively), while older workers (45-64 years) registered the smallest increase (by 14.1 percentage points).

According to Eurostat data, the highest youth unemployment rates for the 15-24 age group are recorded in Greece (56.8%) and Spain (at 54.1%) (fourth quarter of 2012). The youth unemployment gap in 2007-2013 (third quarter) rose substantially in Spain and Greece (by 36.3 and 35.2 percentage points, respectively), which is significantly above the corresponding EU-27 average (8.8 percentage points). At the EU-27 level, the unemployment rate for this age group has grown by almost 50% since the onset of the economic crisis (from 14.9% in the third quarter of 2007 to 23.2% in the fourth quarter of 2012) (see Chart 5).

Unemployment and education level

Unemployment rates grew for all education levels between 2007 and 2012 (fourth quarter)

Chart 4 Unemployment rates by gender, age group and education level in Greece, 2007, 2010, 2012 (Q4)

Source: ELSTAT, Labour Force Surveys.
Note: The data on unemployment refer to the 15-64 age group.
Low skills: ISCED levels 0-2 (pre-primary, primary and lower secondary education).
Medium skills: ISCED levels 3-4 (upper and post-secondary, non-tertiary education).
High skills: ISCED 5-6 (first stage of tertiary education, second stage of tertiary education).
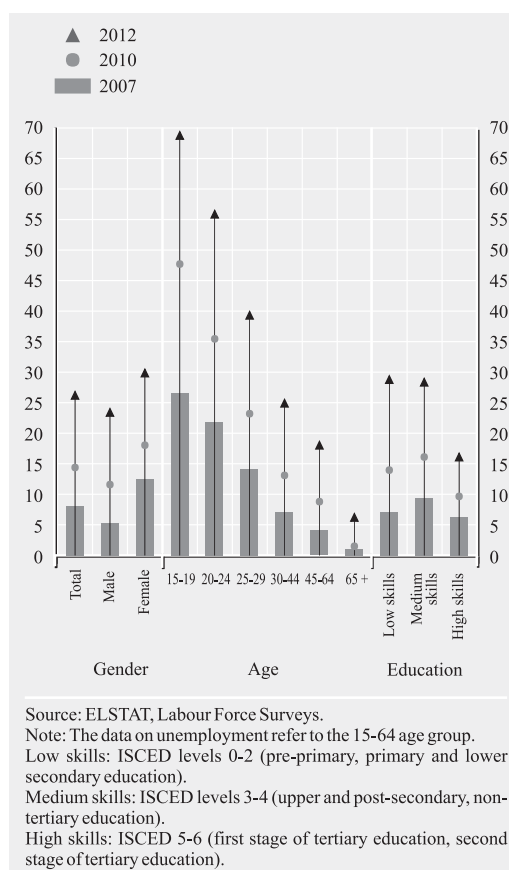
(see Chart 4).[7] Employees with the highest education level seem to have the lowest unemployment rates and those with the lowest education level have the highest. The mildest increase in unemployment is recorded for the education group with the highest level of education (10 percentage points between the fourth quarter of 2007 and the fourth quarter of 2012) and the strongest increase is recorded for the education group with the lowest level of education (21.7 percentage points in the same period). As a result, the unemployment gap between the low- and high-skilled widened substantially.

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6 The unemployment rate refers to the 15-64 age group.
7 The importance of education in employment and the decline in unemployment is well established both worldwide and in the case of Greece (Papapetrou 2007, Mitrakos, Tsakloglou and Cholezas 2010).

Source: Eurostat, Labour Force Surveys (LFS).

Source: Eurostat, Labour Force Surveys (LFS).

Long-term unemployment

Another aspect of unemployment is its duration. The share of the long-term unemployed (those unemployed for 12 months or over as a percentage of the labour force) in Greece is higher than the average share of the long-term unemployed in the EU-27 (see Chart 6). The share of female long-term unemployment is substantially higher than the respective share for men, and also the highest in the EU-27.

As from the second quarter of 2008, long-term unemployment (over a year) in Greece became stronger. The impact of unemployment —particularly long-term unemployment— is reflected in the labour market, and also in production and social cohesion. Human capital is an important factor of production, and its absence from the production process leads to a deterioration of skills, shrinks the economy's productive capacity, and inhibits the return of the economy to stable and sustainable growth

rates (Hotchkiss 2009, Lolos and Papapetrou 2010). As the duration of unemployment increases, people may be discouraged, stop looking for work and withdraw from the labour market. In Greece, a dramatic aspect of unemployment concerns youths, who find it hard to get their first job and enter the labour market; as a result, their skills deteriorate and they have no chance to gain knowledge and experience from participating in the labour market. The economy is deprived of a large share of one of the most productive and dynamic segments of the labour force, youth and women, which could contribute to the diffusion of innovation and new technology, and support the social security system. Recent data on OECD countries show that the increase in the duration of unemployment spells is largest for Greece and Ireland and, according to a non-recovery scenario, the unemployment spells in Greece and Ireland may last around two-and-a-half and one-and-a-half years, respectively, longer than at the start of the crisis (OECD 2012).

Even before the onset of the crisis, Greece had high unemployment and long-term unemployment rates, reflecting the inherent weaknesses of the Greek economy and the failure of the Greek labour market to provide jobs for the long-term unemployed. The recent economic crisis and the tightening of fiscal and credit policy as a result of the Memorandums of Understanding, economic uncertainty and the collapse of investment have significantly affected the depth and magnitude of the recession in Greece and aggravated the problem of unemployment, particularly long-term unemployment, in the Greek economy.

3 RELATIONSHIPS AMONG EMPLOYMENT, UNEMPLOYMENT, AND LABOUR FORCE PARTICIPATION RATES

3.1 INTERNATIONAL EXPERIENCE

The current crisis affects the labour market in ways not seen in previous recessions. During past recessions, workers, particularly older ones, withdrew from the market, motivated by negative prospects to find a job, and by government policies, which in several cases provided for early-retirement schemes (OECD 2010). During the current recession, female labour force participation has different characteristics compared with previous recessions. Women enter the labour market to compensate for the loss of family income, due to the stronger decline in male employment than female employment (Mattingly and Smith 2010).

Despite falling demand, the labour force participation rate increased in many European countries (e.g. Spain, Germany, Austria, Italy, the United Kingdom). By contrast, other countries recorded lower participation rates after the onset of the crisis (e.g. Ireland, Portugal, Finland, Belgium). In Ireland, the labour force participation rate fell significantly (3 percentage points between the first quarter of 2007 and the first quarter of 2012) as a result of negative developments in the labour market. This was associated with the fact that several Irish

Chart 7 Percentage changes in labour force participation, unemployment and employment rates in selected European countries, 2007 Q4-2012 QI

(in percentages)

- labour force participation rate
- unemployment/population
- ◆ employment

Source: OECD, Online Employment Database.
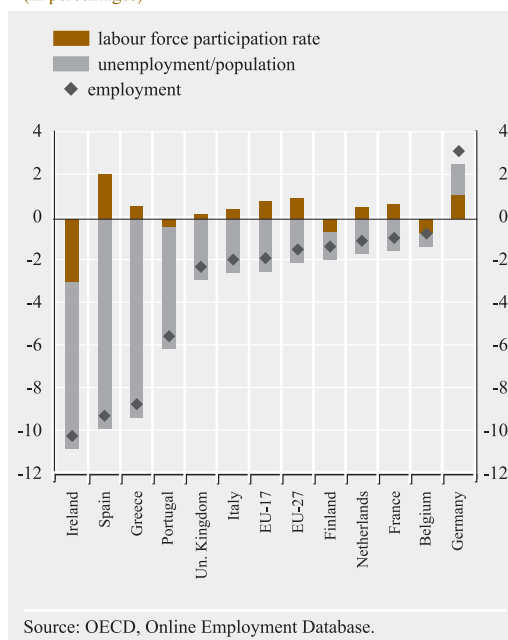
were forced to migrate because they could not find a job (the unemployment rate rose from 5.8% in 2008 to 14.6% in 2011).

The largest decline in employment is recorded in Ireland (10.2 percentage points), Spain (9.3 percentage points), Greece (8.7 percentage points) and Portugal (5.6 percentage points). The decrease in employment in these countries was significantly higher than in the EU (a 1.8% drop between the first quarter of 2007 and the first quarter of 2012 in the EU-17 as a whole). Moreover, the increase in unemployment was much sharper for these countries than for the EU-17 (2.4% between the first quarter of 2007 and the first quarter of 2012). In Ireland unemployment rose by 10.8 percentage points, in Spain by 9.9 p.p., in Greece by 9.3 p.p. and in Portugal by 6.1 p.p. (see Chart 7).

In countries characterised by higher demand, such as Germany and the Netherlands, a higher participation rate is associated with a higher

Table 3 Labour force participation, unemployment and employment rates by gender, 2002-2012 (Q1)[1]

	2002-2012			2002-2008			2008-2012		
	2002	2012	Change	2002	2008	Change	2008	2012	Change
Participation rate									
Total	*63.5*	*67.7*	*4.2*	*63.5*	*66.9*	*3.4*	*66.9*	*67.7*	*0.8*
Male	77.2	77.3	0.1	77.2	79.1	1.9	79.1	77.3	-1.8
Female	50.1	58.1	8.0	50.1	54.7	4.6	54.7	58.1	3.4
Unemployment rate[1]									
Total	*7.3*	*15.5*	*8.2*	*7.3*	*5.6*	*-1.7*	*5.6*	*15.5*	*9.9*
Male	6.1	15.4	9.3	6.1	4.5	-1.6	4.5	15.4	10.9
Female	8.6	15.5	6.9	8.6	6.8	-1.8	6.8	15.5	8.7
Employment rate									
Total	*56.1*	*52.3*	*-3.8*	*56.1*	*61.3*	*5.2*	*61.3*	*52.3*	*-9.0*
Male	70.9	61.9	-9.0	70.9	74.6	3.7	74.6	61.9	-12.7
Female	41.5	42.6	1.1	41.5	47.9	6.4	47.9	42.6	-5.30

Source: ELSTAT, Labour Force Surveys.
1 The unemployment rate refers to the share of the unemployed in total population.

employment rate, according to the assumptions of the "discouraged worker model" (European Commission 2012).

In the current crisis, the increase in the participation rate is associated with the "added worker effect". According to this assumption, when household income declines because the man-primary earner either becomes unemployed or subject to wage cuts, secondary earners in the family, who did not participate in the labour market (e.g. young persons and mothers with children), get affected by the recession. In this case, secondary earners in the family enter the labour market or increase their hours worked in order compensate for the loss of household income.

There is uncertainty about whether the prevalence of high participation rates will continue for much longer or whether this will be accompanied by withdrawal from the labour market in countries where demand remains sluggish or there are no policy interventions aiming to keep the unemployed in the labour market.

3.2 THE GREEK EXPERIENCE

In Table 3 employment, labour force participation and unemployment rate developments in Greece are shown by gender and over time. Given that labour market indices (employment, unemployment, etc.) are affected by fluctuations in economic activity (i.e. whether the economy is in recession or expansion), it was deemed necessary to show developments in two distinct time periods (i.e. before and after the onset of the crisis in 2008). The 4.2-percentage-point rise in the participation rate from 2002 to 2012 (first quarter) reflects the significant increase in the female participation rate by 8 percentage points and the marginal increase in the male participation rate by 0.1 percentage point. Current developments in the labour force participation rate overshadow respective developments during and before the crisis. The total participation rate increased substantially, by 3.4 percentage points, between the first quarter of 2002 and the first quarter of 2008, and by 0.8 percentage points between 2008 and 2012. Male and female participation rates

evolved differently during these two periods. The female participation rate rose significantly both before and during the crisis (4.6 percentage points and 3.4 percentage points, respectively). By contrast, the male participation rate, while rising in the period before the crisis (1.9 percentage points), fell by 1.8 percentage points in 2008-2012.[8]

The unemployment ratio increased considerably (by 8.2 percentage points) from the first quarter of 2002 to the first quarter of 2012.[9] The unemployment rate fell between the first quarter of 2002 and the first quarter of 2008 (1.7 percentage points), but rose significantly by 9.9 percentage points during the crisis.

The employment rate increased in the 2002-2008 period (5.2 percentage points), but decreased substantially after 2008 (9 percentage points). The male employment rate fell substantially compared with the female employment rate during the crisis, while the female employment rate increased further against the respective rate for men in 2002-2008.

The above findings provide substantial evidence that the relationship among employment and labour force participation rates and the unemployment ratio may not be linear. The asymmetric behaviour of these indicators before and during the crisis indicates that using models which assume a linear relationship among these variables could lead to wrong conclusions and policy implications. Further econometric analysis is necessary in this direction, which is the focus of the following section.

4 METHODOLOGY

This section summarises the methodology used to examine the relationship among the key labour market variables: the labour force participation rate, the employment rate and the unemployment rate.

According to the analysis of Congregado, Golpe and van Stel (2011), the relationship

between labour market variables is illustrated in the following identity:

$$e_t + u_t = p_t \tag{1}$$

where p_t is the labour force participation rate, e_t is the employment rate and u_t is the unemployment rate. A restructuring of (1) gives the following relation:

$$u_t = p_t - e_t \tag{2}$$

Thus, equation (2) can be estimated through a bivariate model between the labour force participation rate series (p_t) and the employment rate series (e_t). In this case, the error correction term is the difference between the labour force participation rate and the employment rate ($p_{t-1} - \beta e_{t-1}$). If β equals 1, then the error correction term equals the unemployment rate (u_t).[10]

The empirical examination of the relationship between key labour market variables uses the vector error correction model (VECM). In particular, this methodology examines whether the labour force participation and the employment rate are dependant on unemployment levels and therefore on the business cycle. The basic assumption tested is whether the relationship between the two variables (labour force participation rate and employment rate) is linear or asymmetric (i.e. depending on the size of unemployment). To test whether there is a non-linear relationship between the participation rate and the employment rate when the level of unemployment changes, the two-regime threshold cointegration model of Hansen and Seo (2002) is used.

To proceed to the non-linear analysis, first a benchmark linear model is presented, which is

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8 Nicolitsas (2012) examines the factors that influence the participation rate of women in the labour market in Greece.
9 The unemployment ratio between 15 and 64 years of age is calculated as the number of unemployed persons aged 15 to 64 divided by the total population of the same age.
10 Variables are defined as percentages of the population, therefore the unemployment rate variable is defined as the unemployment ratio or the ratio of the unemployed to total population.

a finite-order vector autoregressive model (VAR) of the following form:

$$y_t = \mu + \sum_{i=1}^{k} A_i Y_{t-i} + \varepsilon_t \tag{3}$$

where $y_t = [p_t, e_t]'$ is a two-dimensional vector containing $I(1)$ variables, where p_t is the labour force participation rate and e_t is the employment rate, A_i is a 2×2 matrix of parameters and ε_t is a 2×1 vector of residuals. This unrestricted VAR model can be written in its vector error-correction representation (VECM) as follows:

$$\Delta y_t = \mu + \Pi Y_{t-1} + \sum_{i=1}^{k-1} \Gamma_i \Delta Y_{t-i} + \varepsilon_t \tag{4}$$

where $\Gamma_i = -\sum_{j=i+1}^{K} A_j$ and $\Pi = \sum_{j=1}^{K} A_j - I$. In the case of cointegration between p_t and e_t, the coefficient matrix Π has rank equal to one and can be decomposed as $\Pi = \alpha\beta'$, where α and β are 2×1 vectors containing the adjustment coefficients and the cointegrating vector, respectively.

The VECM model with one lag order, used as a benchmark, may be analysed as follows:

$$\begin{bmatrix} \Delta p_t \\ \Delta e_t \end{bmatrix} = \begin{bmatrix} \mu_1 \\ \mu_2 \end{bmatrix} + \begin{bmatrix} a_1 \\ a_2 \end{bmatrix} w_{t-1}(\beta) + \Gamma(L) \begin{bmatrix} \Delta p_{t-1} \\ \Delta e_{t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix} \tag{5}$$

where $w_{t-1}(\beta) = p_{t-1} - \beta e_{t-1}$ denotes the error correction term (ECT). The elements a_1 and a_2 are the adjustment coefficients in the error correction model and β contains the cointegrating vector.

The typical linear cointegration model assumes a symmetric long-run dynamic adjustment process and, according to Congregado, Golpe and van Stel (2011), it is an incomplete method of testing the relationship between the two variables. To examine whether there is a non-linear relationship between the p_t and e_t variables, the Hansen and Seo (2002) two-regime *threshold cointegration method* is used. The key assumption in estimating these models is that the long-run equilibrium in the system is ensured when it either exceeds or falls short of a critical threshold or a critical regime.

The two-regime threshold cointegration model (TVECM) of Hansen and Seo (2002) is presented as an extension of the linear benchmark model (5) with one lag and can be written as follows:

$$\begin{bmatrix} \Delta p_t \\ \Delta e_t \end{bmatrix} = \begin{bmatrix} \mu_1 \\ \mu_2 \end{bmatrix} + \begin{bmatrix} a_1 \\ a_2 \end{bmatrix} w_{t-1}(\beta) + \Gamma(L) \begin{bmatrix} \Delta p_{t-1} \\ \Delta e_{t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix}$$

if $w_{t-1}(\beta) \leq \gamma$

$$\tag{6}$$

$$\begin{bmatrix} \Delta p_t \\ \Delta e_t \end{bmatrix} = \begin{bmatrix} \mu_1' \\ \mu_2' \end{bmatrix} + \begin{bmatrix} a_1' \\ a_2' \end{bmatrix} w_{t-1}(\beta) + \Gamma'(L) \begin{bmatrix} \Delta p_{t-1} \\ \Delta e_{t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t}' \\ \varepsilon_{2t}' \end{bmatrix}$$

if $w_{t-1}(\beta) > \gamma$

where there are two regimes, determined by the value of the error correction term ($w_{t-1}(\beta)$), and γ stands for the value of the critical regime or the *threshold* parameter. Based on model (6), the non-linear mechanism is determined by divergences from the long-run equilibrium of the system, when it stands over or under the critical regime value, and where $\Gamma(L)$ and $\Gamma'(L)$ illustrate the system dynamics for each regime. Similarly, α coefficients show, for each equation and in each regime, the speed of adjustment of this variable back to its long-run value. A statistically significant error correction term (i.e. a significant α parameter) implies long-run causality from the explanatory variables to the dependent variable under consideration for the specific regime (see Congregado, Golpe and van Stel, 2011).

To test for a non-linear cointegration relationship, Hansen and Seo (2002) suggest the implementation of the *Lagrange Multiplier* test (*sup*LM), where the null hypothesis of linear cointegration (i.e. non-presence of different regimes) is tested against the alternative two-regime threshold cointegration hypothesis.[11]

Before estimating the long-run relationship, the order of integration of the series is tested.

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[11] For the analysis, a test statistic is used where $\sup \mathrm{LM}^0 = \sup_{\gamma_L \leq \gamma \leq \gamma_U} \mathrm{LM}(\beta_0, \gamma)$, subject to the assumption that the β value is known (β_0) and equals one, i.e. $\beta = 1$.

To this end, the Dickey and Fuller (1979) (ADF), Elliott, Rothenberg and Stock (1996) DickeyFuller GLS (DF-GLS), and Lee and Strazicich (2004) (LM) tests are carried out, to test for the presence of a unit root. ADF and DF-GLS unit root tests are based on the following equation:

$$\Delta y_i = \varphi y_{t-1} + x_t' \delta + \sum_{j=1}^{k} c_j \Delta y_{t-j} + \varepsilon_t \qquad (7)$$

where y_t stands for the labour force participation rate (p_t), the employment rate (e_t), and the unemployment rate (u_t), respectively, and the x_t matrix may contain a constant or a constant and trend, and ε_t stands for the residual.

Similarly, the Lee and Strazicich (2004) test, which takes into consideration *structural breaks* in the model, can be obtained from the following regression:

$$\Delta y_t = \delta' \Delta Z_t + \varphi \tilde{y}_{t-1} + \sum_{j=1}^{k} c_j \Delta \tilde{y}_{t-1} + u_t \qquad (8)$$

where Z_t is the vector accounting for structural breaks.

Lastly, the findings from the unit root test for all variables are used to estimate a measure of persistence. In particular, the *half-life* measure is calculated as $HL = ln(0.5)/ln(1+\varphi)$, where φ is the estimated autoregressive coefficient from equations (7) and (8), respectively, determining the length of time until a unit shock to a series returns to half of its original value.

5 DATA AND EMPIRICAL RESULTS

5.1 DATA

The empirical analysis uses quarterly data for the labour force participation rate (p_t), the employment rate (e_t) and the unemployment rate (u_t) in Greece for the period between the first quarter of 1990 and the first quarter of 2012. The variable for labour force participation (p_t) is defined as the ratio of the labour force to total population, the employment rate (e_t) is defined as the number of the employed

to total population, and the unemployment rate (u_t) is defined as the *unemployment ratio* or the ratio of the unemployed to total population. Data are drawn from ELSTAT national accounts and based on Bank of Greece calculations.

5.2 EMPIRICAL RESULTS

At the first stage of the analysis, before estimating the long-run relationship, the order of integration of the p_t, e_t and u_t series is tested. In order to test the order of integration of the variables, the aforementioned ADF and DF-GLS unit root tests are used, as well as the Lee and Strazicich (2004) LM test, which takes into consideration structural breaks in the series; their findings are presented in Table 4. All tests were conducted using the test specifications (7) and (8), respectively, with and without trend.[12]

Results in Table 4 show that according to the ADF and DF-GLS tests, the series are non-stationary at the 5% level of significance.[13] The Lee and Strazicich (2004) LM test, which takes into account the presence of *structural breaks* in the series and assumes an endogenous determination of structural breaks, supports the findings of the ADF and DF-GLS tests.[14]

Interesting conclusions are drawn from testing for the presence of a unit root in variables according to the ADF, DF-GLS and Lee and Strazicich (2004) LM tests. In series where the null hypothesis of a unit root cannot be rejected at the 5% level of significance, the half-life measure is calculated. The *half-life* measure is a measure of a series persistence to a unit shock. In particular, it determines the length of time until a shock to a variable dissipates by half (Andrews 1993). Estimates of

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12 The size of lags for the specialised test was selected by using the recursive *t*-statistic, specifying a maximum length of $k_{max}=4$.

13 With the exception of the ADF-GLS test on the employment rate variable (e_t), where the unit-root assumption for the specification without a trend is rejected.

14 The LM test on the unemployment rate with trend rejects the unit root assumption, but in this case the trend coefficient is not significant, and therefore we employ the specification of the equation without trend.

Table 4 Unit root tests

	ADF test					ADF-GLS test		
	φ	ADF	Prob	Optimal lag	Half-life	φ	ADF-GLS	Half-life
Without trend								
p_t	-0.004	-0.266	0.925	0		0.007	0.527	
e_t	-0.042	-2.206	0.206	4	16.03	-0.043	-2.347*	15.75
u_t	0.027	0.882	0.995	4		0.029	1.013	
With trend								
p_t	-0.115	-2.559	0.300	0	5.65	-0.067	-1.775	9.93
e_t	0.004	0.125	0.997	4		-0.046	-1.964	
u_t	-0.015	-0.404	0.986	4	46.51	-0.051	-2.380	13.12

	Lee and Strazicich LM test					
	φ	LM	Break date	Optimal lag	λ	Half-life
Level						
p_t	-0.067	-1.871	1996Q4	4		
e_t	-0.034	-2.805	1997Q4	4		20.10
u_t	-0.038	-2.961	2009Q4	4		18.09
Level and trend						
p_t	-0.391	-4.500	2003Q3	4	0.6	1.40
e_t	-0.107	-2.838	2006Q1	4	0.7	
u_t	-0.119	-4.995*	2004Q1	4	0.7	

Notes: The ADF 5% critical value is -2.89 without trend and -3.46 with trend. The DF-GLS 5% critical value is -1.94 without trend and -3.07 with trend. The LM 5% critical value is -3.57 without trend. The LM 5% critical values with trend depend on the location of the break, $\lambda=(T_B/T)$, where T is the sample size and T_B is the estimated break point, and are symmetric around λ and (1-λ). The critical values for λ=0.7, 0.6 are -4.45, -4.50, respectively. * indicates rejection of the null hypothesis at the 5% significance level.

half-life show that the employment rate and the unemployment rate are more "persistent" compared with the labour force participation rate. The estimated persistence coefficients for the employment rate range between 15.8 and 20.1 quarters, for the unemployment rate between 13.1 and 46.5 quarters, and for the participation rate between 1.4 and 9.9 quarters. It should be noted that the estimated half-lives of the employment and unemployment rates are more persistent in the model which takes into consideration the presence of structural breaks. Specifically in this model, the half-life of the unemployment rate is around 18 quarters, i.e. it takes around 4.5 years for the unemployment rate to fall to half its level in the model reference period. In conclusion, the half-life of the unemployment rate is particularly high, suggesting a particularly strong persistence of unemployment in Greece and confirming the recent study by Bakas and Papapetrou (2012), who demonstrated that the unemployment rate in Greece is characterised by the *hysteresis hypothesis.*

The second stage of the analysis estimates the vector error correction model (VECM) with one lag, as presented in equation (5), using the methodology of Johansen (1991).[15] The results of the linear model estimation lead to the con-

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[15] The lag length for the specified model was selected on the basis of the SBC (Schwarz Bayesian) criterion, setting a maximum length of $k_{max}=4$.

clusion that there is no cointegration at a 5% significance level.[16,17]

The long-run relationship between the participation rate and the employment rate can be asymmetric, and therefore the estimation of this relationship on the basis of the linear model may be inappropriate. Thus, the rejection of cointegration between the series may arise from the presence of non-linearity in the relationships between the two variables.

In view of the above, to test for non-linearity, the Hansen and Seo (2002) *sup*LM test is applied and *p*-values are calculated by two bootstrap methods, i.e. the constant coefficient bootstrap and the residual bootstrap, both calculated on the basis of 5,000 simulation replications. The test results are presented in Table 5 and show that the linear cointegration relationship is rejected in favour of non-linear cointegration.

At the next stage, the two-regime cointegration model (TVECM) of Hansen and Seo (2002) is calculated to analyse the long-run relationship between the labour force participation rate and the employment rate during the recent economic crisis, taking into account the presence of asymmetry, i.e. the dependence on the size of unemployment. Table 6 presents the results of the threshold vector error correction model (TVECM) in the presence of two different regimes. The *threshold* value of the unemployment rate was determined endogenously by the model at $\gamma=0.0786$ and defines the error correction coefficient (w_{t-1}). Therefore, two regimes were estimated: the "typical" regime (accounting for 93.1% of observations), which represents an unemployment ratio below 7.86% and the "extreme" regime, which represents an unemployment ratio of over 7.86% and accounts for 6.9% of observations. This regime covers the period after the second quarter of 2010 (see Chart 8).[18]

The results of the estimation, presented in Table 6, suggest that for unemployment levels below 7.86% (i.e. within the "typical" unem-

Table 5 Testing for threshold cointegration

	*sup*LM[0]	*sup*LM
Cointegration vector	1	0.78
Threshold parameter γ	0.079	0.197
Test statistics	19.629*	22.699*
Fixed regressor 5% critical value	17.946	18.005
Fixed regressor *p*-value	0.018	0.003
Bootstrap 5% critical value	10.338	12.041
Bootstrap *p*-value	0.001	0.000

Note: * indicates rejection of the null hypothesis at the 5% significance level.

Table 6 Threshold VECM estimates (TVECM)

	Regime 1		Regime 2	
	Δp_{t-1}	Δe_{t-1}	Δp_{t-1}	Δe_{t-1}
w_{t-1}	0.0714 (0.0553)	0.1377** (0.0717)	0.0663* (0.0296)	-0.1736* (0.0548)
c	-0.0031 (0.0033)	-0.0078** (0.0043)	-0.0061* (0.0020)	-0.0003 (0.0046)
Δp_{t-1}	0.0958 (0.0716)	0.2896** (0.1496)	-0.2156** (0.1259)	-3.1072* (0.3577)
Δe_{t-1}	-0.1551** (0.0898)	-0.1106 (0.1126)	0.3201* (0.0878)	0.0943 (0.1446)
Capital observations	93.10%		6.90%	

Notes: Eicker-White standard errors in parenthesis. *,** coefficients are statistically significant at significance levels of 5% and 10%, respectively. Regime 1: $w_{t-1} \leq 0.0786$. Regime 2: $w_{t-1} > 0.0786$.

ployment regime) the error correction effect is positive, but it appears to be significant only for the employment equation (at a 10% significance level). However, the non-significance of the error correction term in the labour force participation rate function shows that in the

16 The number of lags for the VECM is $k=1$ according to the SBC criterion. The non-linear analysis (TVECM) is based on the same lag length as the linear model. The results of the linear model are not included, but are available from the authors.

17 The non-presence of cointegration between the participation rate and the employment rate is also supported by the presence of a unit root in the unemployment variable, which was defined in equation (2) as the difference between the other two variables.

18 According to the LFS data, the unemployment rate in the second quarter of 2010 was 11.8%.

first regime, i.e. when the unemployment rate is low, the participation rate is a weakly exogenous variable.

By contrast, during the second, "extreme" regime, i.e. when unemployment is high, the results of the estimation suggest that the error correction term is statistically significant (at a 5% level of significance) and negative for the employment equation, and statistically significant (at a 5% level of significance) and positive for the labour force participation equation. The findings of the analysis show that when the unemployment rate is high, such as after the second quarter of 2010, strong downward pressure is generated on the employment rate, and while the participation rate increases, the size of the effect is smaller than before the crisis.

On the basis of the test on the equality of the error correction terms across the two regimes, i.e. the asymmetry test between the error correction coefficients, the null hypothesis of coefficient equality is rejected (the Wald test equals 13.512 at the 1% level) and, accordingly, on the basis of the dynamic coefficient equality in the model, the null hypothesis of coefficient equality is rejected (the Wald test equals 102.566 at the 0% level). These results show that there is asymmetry in the (error correction and dynamic) coefficients between the two regimes.

It is also interesting to examine the effects of the labour force participation rate on the employment rate in both regimes. In particular, the participation rate seems to have a positive effect on the employment rate when the unemployment rate is low (first regime), while the participation rate has a negative effect on the employment rate when the unemployment rate is high. This finding shows that labour force participation during a period of low unemployment rates is accompanied by an increase in the employment rate. By contrast, during a period of high unemployment rates, participation in the labour market does not translate into employment, i.e. entering the labour force by no means automatically

implies finding a job. Rather, the results show the opposite: when unemployment is high, those entering the labour market have limited employment possibilities.

Finally, Chart 8 presents the evolution of the error correction term, i.e. the estimated response of (changes in) the participation rate (Δp_{t-1}) and (changes in) the employment rate (Δe_{t-1}) to the discrepancy between them (i.e. the unemployment ratio of the previous period). Chart 8 shows that for low employment rates in the "typical" regime, the response of both series is slightly positive. However, in the high unemployment regime, the estimated response of the labour participation rate is positive and the estimated response of employment is strongly negative. The results show that during periods of adverse macroeconomic conditions, as reflected in the high unemployment rate, employment falls substantially and the participation rate increases as income declines and secondary earners enter the labour market to compensate for the loss of household income.

In sum, according to empirical findings, the linear cointegration hypothesis is rejected in favour of a two-regime threshold cointegration model as per Hansen and Seo (2002). Consequently, the two-regime system seems to characterise the asymmetric adjustment of the labour force participation rate to a long-run equilibrium with the employment rate, with the threshold value (i.e. the unemployment ratio) estimated at 7.86%. The "extreme" high-unemployment regime coincides with the recent crisis, as can be seen in Chart 8, while the threshold value coincides with the signing of the Memorandum of Understanding between Greece and its European partners and the International Monetary Fund (second quarter of 2010).

The results of the econometric analysis suggest the need to adopt measures to stop the increase and reduce unemployment in order to correct imbalances in the labour market. In this direction, unemployment could be con-

tained, inter alia through active employment policies, which would increase the employment probability of the unemployed, help employees keep their jobs when they are at risk of losing them, and improve their skills. Moreover, the creation of economic growth is a necessary condition to reduce unemployment. Boosting demand, focusing on productivity and innovation, improving education, combatting tax and contribution evasion, promoting investment, enhancing the effectiveness of public administration, reducing bureaucracy and removing the obstacles and disincentives for starting a business would lead to higher production and employment and ease the unemployment problem.
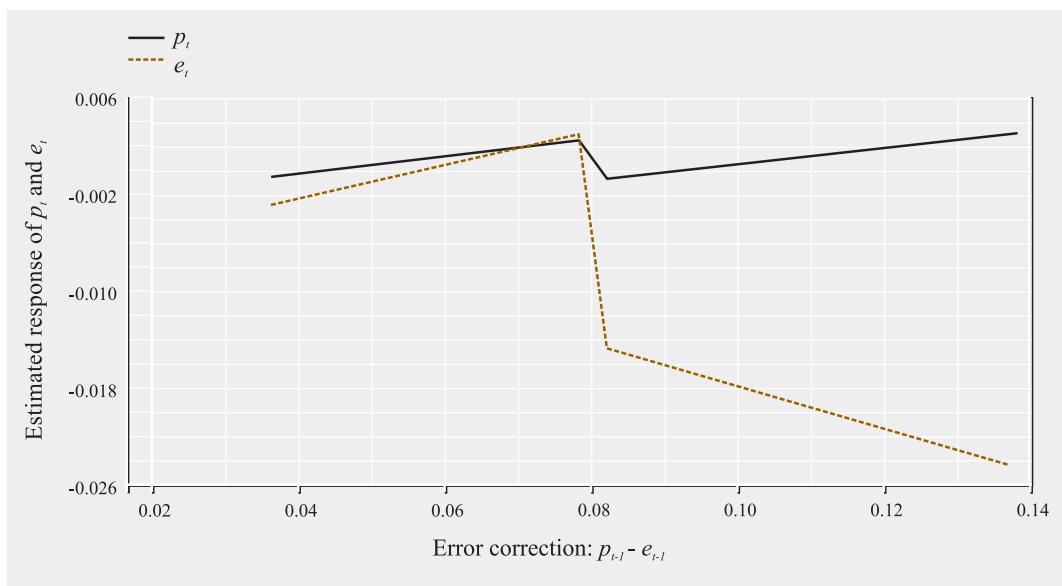
6 SUMMARY OF CONCLUSIONS

The aim of this study has been to explore developments in key labour market aggregates, such as the unemployment rate, the labour force participation rate and the employment rate, and to highlight the fact that, in the current environment of deep and protracted economic recession, they are very different from

what they were before the crisis. The examination of the labour market indicators in the Greek economy is very important, as they are associated with human capital and affect the productive capacity of the economy, currently and in the future.

The study goes on to explore the econometric relationship between employment (e_t), participation (p_t) and unemployment (u_t) rates. The analysis uses quarterly data for Greece spanning the period between the first quarter of 1990 and the first quarter of 2012. The examination is carried out on the basis of the vector autoregression error correction model, which calculates the degree to which labour force participation and employment rate depend on the size of unemployment. In other words, the basic assumption examined is whether the relationship between the labour market participation rate and the employment rate is linear or asymmetric (i.e. depending on the size of unemployment and the stage of the country's economic activity). To examine whether there is a non-linear relationship between the two variables when the level of unemployment changes, the Hansen and Seo

(2002) two-regime threshold cointegration model is used.

The empirical analysis initially examines the degree of integration of the p_t, e_t and u_t series using various tests for the presence of a unit root. Estimates show that the employment rate and the unemployment rate are more "persistent" than the participation rate, suggesting the persistence of unemployment in Greece.

As a next step, the two-regime threshold cointegration model (TVECM) of Hansen and Seo (2002) is estimated to study the long-run relationship between the labour force participation rate and the employment rate, taking into account the presence of asymmetry, i.e. the dependence of the variables on the size of unemployment. The two-regime system seems to characterise the asymmetric adjustment of the labour force participation rate to a long-run equilibrium with the employment rate, and the threshold value of the employment rate was determined endogenously by the model. The high-unemployment regime covers the period after the second quarter of 2010.

Empirical findings show that the relationship between the labour force participation rate and the employment rate is not linear; rather it shows significant differentiation and depends on the unemployment rate, and thus on the state of the economy. The results of the analysis suggest that during periods of low unemployment rates, positive pressures are exerted on both the employment rate and the labour participation rate. By contrast, during the second regime, when the unemployment rate is high, such as after the second quarter of 2010, strong downward pressure is generated on the employment rate, and while the participation rate continues to increase, it is still lower than before the crisis.

The results of the empirical analysis show that in the period before the second quarter of 2010, when the unemployment rate is low, in line with the findings of the employment equation, the labour force participation rate is a weakly exogenous variable, while the employment rate is an endogenous variable. By contrast, during the second "extreme" regime, i.e. when unemployment is high, strong downward pressure is generated on the employment rate, and while the labour force participation rate increases, it is still lower than before the crisis. The high-unemployment regime coincides with the recent crisis and, more specifically, the period of Greece's entry into the Memorandum of Understanding (second quarter of 2010). The results show that during periods of adverse macroeconomic conditions, as reflected in the high unemployment rate, the employment rate falls substantially and the participation rate increases as income declines and secondary earners enter the labour market to compensate for the loss of household income.

It is also interesting to examine the effects of the labour force participation rate on the employment rate under both regimes. In periods of low unemployment, coinciding with upturns in the Greek economy, labour participation is accompanied by an increase in the employment rate. By contrast, during the current high unemployment period, participation in the labour market does not automatically imply finding a job. Rather, the results point in the opposite direction. In other words, when unemployment is high, persons entering the labour market have a low probability of employment.

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THE HOUSEHOLD FINANCE SURVEY: DESCRIPTION OF THE 2009 SURVEY AND MAIN RESULTS ON HOUSEHOLDS' INCOME, WEALTH AND DEBT IN GREECE[1]

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1 INTRODUCTION

The paper presents the methodology and main results of the Household Finance Survey conducted by the Bank of Greece in 2009 in the framework of the Eurosystem's Household Finance and Consumption Survey (HFCS), which used a harmonised methodology to collect data from about 62,000 households in 15 euro area countries.[2]

The HFCS is a new and unique source of data at household level (microdata), which combine information on households' wealth, income, liabilities and consumption together with demographic data.[3] The survey also records data on intergenerational transfers, as well as data relating to households' attitudes towards savings and investment.

Data at household level allow us to analyse the distribution of key economic aggregates, such as household wealth or indebtedness and their correlation, as well as correlations with households' demographic characteristics, which cannot be achieved on the basis of data relating to the economy as whole. For example, they are useful to identify the characteristics of highly indebted households that are more vulnerable to adverse changes in their financial situation or the economic environment. They also enable the study of the effects of monetary policy or of changes in the macroeconomic environment.

The paper is structured as follows: the first section introduces the methodology of the survey, as conducted in Greece in 2009. The second section presents summary data on household income. The third section describes household debt and its distribution according to households' demographic characteristics. The composition and distribution of households' assets in 2009 are presented in the fourth section followed by the key conclusions of the paper.

2 SURVEY METHODOLOGY

To ensure data comparability among HFCS participating countries, common definitions were set forth for all key survey variables. Also, for quality assurance purposes, a common methodology was developed for the main survey and data processing stages. The common definitions of the variables and the recommendations on survey methodology were overall observed in Greece.

Structure and content of the questionnaire

As mentioned, data comparability was mainly ensured by setting out common definitions. A blueprint questionnaire was also prepared and adapted for each country in order to measure the commonly defined variables more accurately.

The questionnaire comprised nine sections with questions on (1) demographic characteristics of household members, (2) household's real assets and mortgage loans, (3) other types of loans, (4) household's financial assets, (5) occupation status of household members, (6) pension and social security schemes, (7) income, (8) intergenerational transfers, and (9) household's consumption and savings.

In Greece, as in most participating countries, data were collected through computer-assisted personal interviews (CAPI).

Sampling

The survey covered all private households throughout the country, except villages with less than 400 residents. Households living in institutions were not included in the survey.

Sampling was based on a two-step stratified household sampling, with two stratification levels. The first level concerned geographical stratification on the basis of the country's division in regions corresponding to the European division level NUTS II, while the two major cities —Athens and Thessaloniki— made up separate geographical strata. The second stratification level concerned the classification of settlements within each region into three categories of urbanisation, according to the size of their population. Having applied these two criteria, the number of final strata came to 41.

Clusters were subsequently defined in each stratum, towns in urban and semi-urban strata and villages in rural strata. For Athens and Thessaloniki, clusters were made up of the municipalities of these cities.

The household sample was selected in two stages: the first stage involved the selection of a sample of clusters (primary units) within each stratum and the second stage concerned the selection of a household sample among the household population of each selected cluster.

A special characteristic of sampling, in Greece as well as in other HFCS-participating countries, is the use of a larger sampling fraction, i.e. a higher probability of selection, for the sampling of wealthy households.[4] It has been observed that wealthier households respond less frequently to sampling surveys and, for this reason, the higher sampling bias aims to restore, to a certain extent, the participation of these households in the sample.

The initial sample size was 6,354 households, of which 2,971 responded to the survey. The final response rate amounted to 47.2%.[5]

Weights

To evaluate the survey characteristics, each household's data were multiplied by a projecting coefficient, which is the product of the following three factors (weights):

a. the inverse of the household's probability of selection on the basis of the sampling design;

b. the inverse of the household response rate within each group; and

c. a calibrating coefficient, calculated in such a way that certain estimates on key sample characteristics coincide with census data or data considered to reflect the total survey population. In this survey, weights were determined in such a way that the home-ownership rate and distributions by age groups, education levels and household size categories correspond to the relevant rates of the 2009 EU-SILC survey.[6]

Imputation of missing values

In questionnaire surveys, it is common that not all questions are answered, e.g. participants may not know the answer or do not want to disclose certain information. For all key variables relating to household assets and loans, missing values were imputed using the method of multiple imputation with chained equations. This method successively estimates the missing values of each variable using stochastic equations and an iterative procedure. The whole process was repeated five times and five data sets, i.e. five new implicates, were created in the end. The final estimates are the averages of these five new implicates. These multiple

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4 Different sampling fractions for the purposes of this survey were applied to Athens and Thessaloniki and, in the absence of household asset register, they were determined on the basis of house purchase prices in these areas.

5 To calculate the rate of response, households/residences considered ineligible for inclusion in the sample, e.g. summer houses, were disregarded.

6 It is noted that, despite the exclusion of villages with less than 400 residents from the survey, weights are constructed so that the estimates of the survey correspond to the total population of the country. This may cause a bias in these estimates which cannot however be evaluated from the survey data.

implicates enable the calculation of the estimates' error to include the estimates' uncertainty arising from the missing values' imputation process, as described below.[7]

Variance estimation

Since the survey is a sampling one and does not survey the total population, estimates are subject to sampling errors. Replicate weights have been calculated to estimate sampling errors, selected using the bootstrap method and according to the original sampling design. The use of these weights enables the correct calculation of sampling errors, since they reflect the structure of the sampling plan.

Moreover, as mentioned above, the use of multiple implicates enables us to estimate the error arising from the imputation of missing values. The total variance T of an estimator θ is given by the following formula:

$$T = W + \left(1 + \frac{1}{M}\right) Q$$

where W is the variance of the estimator in each implicate, Q is the variance of the estimator among implicates and M is the number of implicates (five in this survey).[8]

Data reliability – Comparison with other sources

The results of each similar sampling survey are subject to "errors". In particular, there are the aforementioned sampling errors, which are due to the fact that results are based on a sample and not on total population, and non-sampling errors, such as a potential bias caused by the fact that not all initially selected households respond, or measurement errors, e.g. wrong recording of answers or wrong answers given by the participants (by mistake, ignorance and/or intention). Weights restore sample representativeness to the extent that participating and non-participating households have the same characteristics as regards the surveyed aggregates. This however cannot be statistically verified. Moreover, it is not possible to verify the accuracy of answers,

apart from consistency checks among households' answers.[9]

One way to verify data reliability is to project the sample aggregates to the population and compare them with the corresponding national and financial account aggregates, although the definitions of aggregates are not exactly the same. Overall, it has been observed that sampling household finance surveys underestimate the relevant macroeconomic aggregates, all the more so for financial data.[10] This may be due, on the one hand, to the fact that households are overall reluctant to disclose their assets or loans and, on the other, to the fact that wealthier households in particular tend not to participate in such surveys; as a result, asset aggregates are underestimated. By way of example, in this survey, the comparison of outstanding housing loans, deposits and wages shows that the estimate of total outstanding housing loans on the basis of survey data corresponds to 48% of total outstanding housing loans as recorded by banks in 2009, while total deposits on the basis of survey data correspond to 18.7% of total deposits as recorded by banks for the same year. Employee income seems to have been satisfactorily recorded by the survey, since the estimate of total wages in the survey population comes to 84.8% of the corresponding figure in the National Accounts.[11] A detailed comparison of certain survey data with the corresponding macroeconomic aggregates for all participating euro area countries and an analysis of the definitions of the contrasted aggregates are given in HFCN (2013b). For all countries, it is suggested that survey data

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7 The methodology for imputing missing values in this survey is detailed in HFCN (2013b).
8 The methodology for variance estimation using replicate weights and multiple implicates is detailed in HFCN (2013b).
9 Data were thoroughly examined for extreme values and consistency among responses to different questions per household, and relevant corrections were made when necessary. The data were also checked by the European Central Bank – the relevant methodology is presented in the paper by Honkkila, Sánchez-Muñoz and Zeleny (2012).
10 Including papers by Davies et al. (2008), Moore et al. (2000), Bonci, Marchese and Neri (2005) for Italy, Brandolini, Magri and Smeeding (2010) for various countries of the Luxembourg Income Study, and ONS (2013) for Great Britain.
11 The comparison between the data of this survey with other sources is described in a previous paper (Tzamourani 2012).

Table 1 Demographic characteristics of the sample members

Age (years)	% of persons in the sample
Up to 18	17.0
18-24	7.9
25-49	37.4
50-64	21.4
65+	16.3

Education	% of persons in the sample
Primary	31.1
Secondary	43.7
Tertiary	25.2

Employment status	% of persons in the sample over 15 years
Employee	32.6
Self-employed	14.7
Unemployed	5.0
Student	7.5
Retired	24.2
Domestic tasks	15.2
Other	0.8

Household size	% of households in the sample
1	20.1
2	28.3
3	24.2
4	23.3
5+	4.1

Source: Calculations based on data from Bank of Greece's 2009 Household Finance Survey.

mainly relating to financial assets and loans overall underestimate the corresponding macroeconomic aggregates. The degree of underestimation or underreporting varied among countries and, for Greece, the degree of deposits' underreporting was fairly high. However, despite the weaknesses of these data, multiple checks and data processing so far have shown that the data are rich in information content and consistent with data from other sampling surveys, and the resulting distributions and correlations of aggregates are in line with those of previous surveys. Moreover, comparisons with other euro area countries are overall consistent with other data.

When evaluating the results of this survey, it is also important to bear in mind that the survey relates to the financial situation of households in 2009,[12] before the intensification of the fiscal crisis and the economic recession of the past few years.

Finally, to better evaluate the results, Table 1 presents the key demographic characteristics of the sampled households.

3 SOURCES OF INCOME

This paragraph summarises household income and its sources, according to the 2009 Household Finance Survey. The survey comprised questions on incomes per household member and at household level. In more detail, for every household member aged over 15, there was a question on employee income, self-employment income, pension income and unemployment benefits income. At household level, the survey recorded income from social transfers, private transfers, participation in non-listed firms, rents and investment (deposits, dividends, etc.). Income from all sources was recorded as gross, before taxes and social security contributions, except for employee income, for which recipients were asked to report their net monthly salary and the number of months during which this salary was received. Gross salary was then approximated, taking into account the social security fund and the years during which the participant was insured thereto. The household's total gross income was then calculated as the sum of all members' personal income and the income at household level. Questions about household income concerned the last twelve months before the interview, i.e. the second half of 2008 and the first half of 2009 for most participating households.

Table 2 presents the percentage of households that reported income from some source, as

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12 Questions on employment, assets and loans concerned the period of the interview, while questions on income and consumption concerned the last 12 months before the interview date.

Table 2 Income distribution: Percentages of households reporting income by source of income, mean and median annual gross income per household and source of income

Sources of income	Households (%)	Household income	
		Mean (euro)	Median (euro)
Total income	98.0 (0.5)[1]	27,661 (638)	22,044 (408)
Employment	54.0	26,068	21,780
Self-employment	27.8	23,156	16,263
Pensions from the State/Funds	43.8	13,202	11,000
Private pensions	0.9	10,277	8,400
Unemployment benefits	5.0	3,076	2,728
State benefits	4.0	1,695	1,016
Private transfers	4.6	3,567	2,000
Rents	8.4	6,833	4,000
Investments	8.1	3,178	485

Source: Calculations based on data from Bank of Greece's 2009 Household Finance Survey.
1 Standard errors of main aggregates are given in parentheses.

well as the means and medians of the corresponding income source at household level in the reference period.

The mean and median of total household income for this period amounted to €27,661 and €22,044, respectively,[13] lower than the corresponding figures for the euro area as a whole (cf. the table in the Appendix). The three most important sources of household income, as regards the level of income and the percentage of recipient households per source, were employee income, self-employment income and pensions from state funds, with 54.0%, 27.8% and 43.8% of households reporting income from each source respectively.

The mean and median of gross employee income (per household) amounted to €26,068 and €21,780, respectively. Self-employment income was lower, with the income average and median (per household) at €23,156 and €16,263, respectively, implying larger asymmetry as regards these incomes. Pension incomes were clearly lower, since the average and median from state pensions amounted to €13,202 and €11,000, respectively. Smaller percentages of households (around 8%)

reported income from rents and investment. Income from unemployment benefits, other state benefits and private transfers was reported by 5%, 4% and 4.6% of households, respectively, for each source. Finally, a very small percentage of households (just 0.9%) reported income from private pensions, though with a relatively high mean income.[14]

4 HOUSEHOLD DEBT AND DEBT BURDEN

This section presents results as regards borrowing percentages per loan category, the level of borrowing and the cost of repayment. It also calculates certain indicators for indebtedness and financial pressure. Finally, it describes the distribution of debt according to households' key demographic characteristics.

13 Median is the observation that divides an ordered series of observations in two equal parts. The difference between median and mean is due to the positive distribution asymmetry and the presence of very high income values in the right end of the distribution.
14 It is noted that Tzamourani (2012) shows that incomes from the three main sources, i.e. employee income, self-employment income and pensions, are fairly close to the corresponding figures of the EU-SILC survey, whereas big differences are observed in the percentages of households reporting income from rents and state benefits, which is partly due to the different structure of the questionnaires of the two surveys.

Table 3 Distribution of debt: Percentages of households with debt and outstanding debt per loan type

	Households with debt (%)	Outstanding debt (euro)		Share of type of debt in total debt (%)
		Mean	Median	
Total debt	36.6 (1.6)[1]	32,628 (1,800)	14,570 (1,580)	100.0
Mortgage loans	17.5	53,722	40,958	78.7
– Mortgages on main residence	13.9	52,110	39,864	60.8
– Mortgages on other property	3.9	54,894	42,115	18.0
Other loans	26.1	9,736	4,325	21.3
– Credit lines	5.7	10,910	8,000	5.2
– Credit cards	13.7	2,854	2,000	3.3
– Other	12.6	12,118	6,000	16.3

Source: Calculations based on data from Bank of Greece's 2009 Household Finance Survey.
1 Standard errors of main aggregates are given in parentheses.

The questionnaire comprised detailed questions on household loans. Questions were grouped into three categories: loans for which the main residence was used as collateral, loans for which other properties were used as collateral and "other" loans.[15] Concerning the latter, the questionnaire requested information on open loans, credit card loans and, as a separate category, other types of loans, including loans for vehicle purchase, personal/consumer loans or loans from other households or other entities. In this paper, "mortgage loans" shall mean loans for which a property was used as collateral and "non-mortgage loans" shall include all other loans.

Distribution of indebted households and composition of debt

Table 3 shows the percentages of households reporting some kind of outstanding debt by type of loan, the mean and median of outstanding balances by loan type, as well as the mean and median of monthly repayment instalments by loan type.

The percentage of households reporting outstanding loans on the date of the survey amounted to 36.6%, as shown in Table 3. Loans include mortgage loans, open loans,

credit card loans and other loans from banks or other entities, such as consumer, personal or car purchase loans, loans from employers or other households. The survey shows that the most prevalent loans in 2009 were mortgage loans with 17.5% of households reporting to have such a loan. The second most prevalent category was credit card loans: 13.7% of households reported to have such a loan.[16] Other non-mortgage loans were reported by 12.6% of households. Taking into account all non-mortgage loans, the survey data showed that 26.1% of households had a loan of this type.

It should be noted that the percentage of households with some type of debt is lower than what was estimated in previous Bank of Greece surveys.[17] However, percentages are not directly comparable, since previous surveys

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15 The questionnaire for each type of loan (mortgage on the main residence, mortgage on other property, non-mortgage loans except open and credit card loans) comprised detailed questions about the first three loans of that type and then one question about the total outstanding balance and one about total monthly instalments for any additional loans of that type. Outstanding balances in this paper concern the total outstanding balance of all loans per loan type.

16 The question was: "Following the latest payment of credit card bill(s), is there any outstanding balance on which you pay interest?".

17 The Bank of Greece conducted sampling surveys on household debt in 2002, 2005 and 2007; their results were presented in papers by Mitrakos, Simigiannis and Tzamourani (2005), Simigiannis and Tzamourani (2007), and Mitrakos and Simigiannis (2009), respectively.

only included households in urban and semi-urban areas. There were also differences in the questionnaire and the method of data collection; in particular, the structure of loans was different and the questionnaire was printed and filled out by each member separately. The comparison of loan percentages for single-member households in our previous study[18] also showed a decline in the percentage of households with loans, but not as marked as for the total of households. It seems that the percentages of non-mortgage loans were underestimated, perhaps because it was only one member that reported the loans of other members and who might not be fully aware of the smaller loans of other members.

For households with some type of loan, the mean and median debt per household came to €32,628 and €14,570, respectively. For households with mortgage loans, average indebtedness from these loans was expectedly higher, with the mean and median of mortgage outstanding debt coming to €53,722 and €40,958, respectively. On the contrary, the mean and median non-mortgage loans (including open and credit card loans) amounted to €9,736 and €4,325, respectively (see Table 3).

Although outstanding debt and the level of instalments provide an indication of the households' indebtedness, it is useful for the better evaluation of the latter to calculate indicators such as the ratio of outstanding debt to household income or the ratio of outstanding debt to total household wealth. These indicators determine the level of indebtedness in relation to household income or wealth. As shown in Table 4, the median ratio of outstanding debt to household income amounted to 47.2% in 2009, i.e. for the median, the "typical" household with some loan, the balance of all its loans amounted to about half of its annual gross income. Similarly, the median of the ratio of outstanding debt to its total wealth amounted to 14.8%, i.e. for the median household with some loan, total outstanding loans corresponded to 14.8% of its total wealth, which could potentially be used to repay its loans. For

Table 4 Indicators of debt burden

	Median
For households with debt	
Debt to income ratio (%)	47.2 (5.2)[1]
Debt to assets ratio (%)	14.8 (1.8)
Loan to value ratio of household's main residence (%)	31.6 (3.6)
Debt service to income ratio (%)	14.7 (0.8)
Mortgage debt service to income ratio (%)	16.4 (0.9)

Source: Calculations based on data from Bank of Greece's 2009 Household Finance Survey.
1 Standard errors of main aggregates are given in parentheses.

persons with mortgage loans, the median ratio of outstanding mortgage debt for the main residence to its value amounted to 31.6%. These data show that, for the median household, outstanding debt was well within the limits of its income and wealth. Moreover, comparing these indicators with those of the euro area, both the percentage of households with some loan and the total debt to income ratio were lower than the euro area average (cf. the table in the Appendix). These data are consistent with the fact that the ratio of total loans to households/GDP was lower than the euro area average in 2009.[19]

However, more indicative of the direct financial pressure faced by households is the debt service to income ratio, defined as the ratio of all monthly repayment instalments to monthly household income. The median of this ratio amounted to 14.7% for households with some loan, while the median ratio of the total mortgage loan instalments to the income of households with mortgage loans amounted to 16.4%. Both indicators were slightly higher than those for the euro area (13.9% and 15.9%, respectively), which could be attributed to the dif-

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18 Tzamourani 2012.
19 The household financing balance to GDP ratio (excluding securitised loans) stood at 41.2%, compared with 55.1% for the euro area as a whole (Bank of Greece, *Monetary Policy 2009-2010*, p. 73).

ferent composition of loans among countries (different term, different choice between fixed or variable rates), the overall higher borrowing rates in Greece compared with the euro area average,[20] as well as income differences. It is considered that this ratio should not be higher than 30% or 40% when calculated with respect to gross income, as in this case, since higher values of this ratio are considered indicative of the potential inability of households to service their debts due to adverse changes in the economic conjuncture.[21] According to the survey data, for 8.4% of households in Greece the debt service to income ratio was over 40%.[22] The next section sets out the distribution of loans and this ratio in relation to certain demographic and economic characteristics of households, showing which household groups sustained high financial pressure and were perhaps facing problems in servicing their loans.

Distribution of debt by households' socioeconomic characteristics

This section presents the distribution of debt and indebtedness indicators according to the household's socioeconomic characteristics, i.e. household size, income and wealth, as well as the age, educational level and employment status of the household's reference person.[23]

Table 5 shows that the distribution of debt in relation to the age of the reference person is hump-shaped, with the 41-50 age group having the highest participation percentages and the highest outstanding balances compared with younger and older age groups. The same age group also has the highest contribution to total debt and the highest indebtedness compared to income, as expressed by the median of the outstanding debt to income ratio. However, the next youngest age group experienced the highest direct financial pressure, since its debt service to income ratio was the highest. Housing loans also present a similar picture, i.e. a hump-shaped distribution with respect to the age of the reference person, though the highest outstanding balances of housing loans were

recorded in younger age groups, with the highest being recorded for the 31-40 age group. Increased borrowing in younger age groups is consistent with the lifecycle theory, according to which households may borrow to even out current and future consumption, since they expect higher income in the future.

As regards the educational level, participation rates and outstanding loan balances are higher in households with upper secondary and tertiary educational levels, compared with households with up to low secondary educational level. These two household groups also had a rather higher contribution to the total sample debt in relation to their participation in the sample, perhaps because of easier access to borrowing. The highest indebtedness is observed in households with upper secondary educational level, compared with those with a tertiary educational level, which is due, to the extent that the educational level is associated with income, to the relatively lower income of the former households. The same is true for housing loans as regards participation rates and outstanding loan balances. Regarding other loans, the situation is different: while the households with the lowest educational level have lower participation rates, outstanding loan balances are rather high.

Recourse to borrowing and indebtedness are directly linked to the ownership status of the main residence, because of the importance of housing loans in household borrowing. Owners with main residence mortgage loans account for 67.2% of total debt. However, for

20 A relevant comparison can be found in Bank of Greece, *Monetary Policy 2009-2010*, p. 77.
21 The importance of the debt service to income ratio has been studied inter alia by DeVaney (1994), Debelle (2004) and Faruqui (2008).
22 For contrasting purposes, it should be noted that in September 2009 the share of non-performing loans (NPLs) in total loans was 7.2% (Bank of Greece, *Monetary Policy 2009-2010*, p. 87), while this ratio came to 24.5% at end-December 2012 (Bank of Greece, *Monetary Policy 2012-2013*, p. 81).
23 The reference person in this paper is defined according to Canberra Group (United Nations 2011). In more detail, among members of the household (which may also consist of two or more nuclear families), the following criteria are successively employed: one of the spouses/partners with financially dependent children, one of the spouses/partners with financially independent children, a lone parent with children, the member with the highest income, the eldest member.

Table 5 Distribution of debt according to household demographic and financial characteristics

		Households in the sample %	Households with debt %	Total loans					Mortgage loans			Other loans		
				Share in total debt %	Outstanding debt, mean (euro)	Outstanding debt, median (euro)	Outstanding debt to income ratio, median %	Loans to income ratio, median %	Households with loans %	Outstanding debt, mean (euro)	Outstanding debt, median (euro)	Households with loans %	Outstanding debt, mean (euro)	Outstanding debt, median (euro)
Total sample		100.00	36.6	100.0	32,628	14,570	47.2	14.7	17.5	53,722	40,958	26.1	9,736	4,325
Age of reference person	16-30	7.45	26.5	3.5	20,898	5,107	29.8	16.9	6.7	64,693	60,000	20.8	5,842	3,000
	31-40	18.68	49.8	27.5	35,321	12,000	46.4	17.2	20.5	71,333	66,899	37.7	7,793	4,000
	41-50	18.27	51.8	30.7	38,710	20,000	57.1	15.6	28.1	57,642	43,700	36.8	10,428	4,900
	51-60	18.95	45.8	24.4	33,628	18,070	50.3	12.3	25.2	47,145	29,400	31.6	11,053	5,460
	61-70	16.19	28.6	10.1	26,194	9,788	45.6	14.8	14.2	39,897	24,000	18.3	9,981	3,477
	71+	20.48	12.6	3.8	17,783	6,214	30.3	12.4	4.7	22,370	10,000	9.1	13,215	3,920
Education of reference person	Up to three-grade lower secondary	45.75	26.4	25.3	25,008	12,920	51.3	14.9	12.7	36,920	27,231	17.9	10,645	5,227
	Upper secondary, post-secondary	33.43	45.1	44.7	35,405	14,000	49.6	16.0	20.9	62,911	49,000	32.5	8,730	4,436
	Tertiary	20.83	45.5	30.1	37,932	15,560	36.2	12.1	22.6	60,873	50,442	33.9	10,229	3,860
Employment status of reference person	Employee	39.74	49.2	56.6	34,578	15,460	43.9	13.4	23.6	59,813	50,843	36.0	8,023	3,900
	Self-employed	18.95	44.5	27.8	39,431	14,477	46.8	16.7	20.0	66,206	43,982	33.9	12,690	6,000
	Retired	34.67	20.9	13.2	21,871	10,000	48.7	16.1	10.9	28,061	20,800	12.7	11,808	4,600
	Unemployed, economically inactive	6.65	21.2	2.4	20,047	10,560	106.1	27.6	8.2	40,338	35,000	15.1	6,245	3,200
Main residence	Owned outright	58.48	23.9	21.8	18,640	6,780	21.7	10.9	4.5	50,695	39,137	21.2	10,383	4,600
	Owned with a mortgage	13.93	100.0	67.2	57,635	45,300	157.0	18.3	100.0	53,416	40,650	40.2	10,493	5,400
	Renters	27.60	31.5	11.0	15,080	4,977	19.0	12.4	3.5	66,292	61,314	29.5	8,234	3,577
Income	0-11,000	20.11	15.5	6.6	25,252	8,721	125.6	35.4	6.4	48,882	32,000	11.5	6,711	4,225
	11,001-18,000	20.43	29.0	12.5	25,097	10,517	70.8	23.9	13.0	45,109	35,680	19.4	7,362	3,601
	18,001-27,000	20.30	39.1	17.6	26,521	12,360	52.6	16.3	17.4	43,664	33,813	26.5	10,429	4,980
	27,001-40,000	19.95	46.1	27.4	35,602	14,848	43.9	14.1	22.1	59,379	50,000	32.7	10,003	4,662
	40,001+	19.21	54.4	35.9	41,113	19,200	32.9	9.0	29.2	60,803	45,600	41.5	11,094	4,296
Net wealth	1-15,000	20.27	31.9	11.6	21,402	6,812	29.4	16.3	6.0	74,709	62,529	28.7	8,063	4,740
	15,001-74,000	19.83	35.3	21.7	37,029	17,840	84.7	16.4	20.2	54,055	42,700	21.7	10,038	5,646
	74,001-130,000	20.11	33.9	19.4	34,029	15,820	56.7	13.8	18.5	54,399	42,772	20.9	6,979	3,200
	130,001 - 220,000	19.81	38.2	20.4	32,219	20,420	49.1	13.1	22.1	43,496	29,000	25.7	10,412	5,000
	220,001+	19.98	43.9	26.9	36,629	14,400	38.3	13.8	20.9	57,331	43,780	33.5	12,208	4,000
Household size	1	20.14	20.8	5.1	14,598	3,740	25.3	17.4	4.7	44,677	29,000	17.0	5,606	2,700
	2	28.25	25.5	15.5	25,730	11,267	51.9	16.2	11.9	43,327	34,486	16.5	8,498	5,000
	3	24.17	44.5	32.4	35,983	16,607	48.4	14.6	21.3	58,494	47,980	32.3	10,920	4,418
	4+	27.44	52.7	47.0	38,787	19,440	52.2	13.3	29.3	56,073	40,671	37.3	10,777	5,000

the average household of this group, the debt service to income ratio stood at levels considered tolerable for the smooth servicing of such loans (18.3%).

Both owners without main residence mortgages and tenants had similar percentages of mortgage loans, by definition with a mortgage on other properties, while tenants had higher percentages of non-mortgage loans, however without higher outstanding balances for such loans.

As regards the employment status of the reference person, the highest participation rates in total outstanding debt and in each of the two loan categories were recorded by employees and the self-employed. These two groups also had the highest outstanding balances as regards total outstanding debt, and the highest outstanding balances on housing loans. However, households whose reference person was a pensioner or economically inactive had rather high indebtedness indicators, which is due to the lower average income for this group compared with the other ones. For households whose reference person was unemployed or economically inactive, the median of the debt service to income ratio amounted to 27.6%, which shows that, for a relatively large share of these households, the debt service to income ratio stood at levels considered high, indicating that these households might face difficulties in repaying their loans in the future. This group however had a very small share in total debt (2.4%), therefore precluding any issue of credit risk.

The level of household borrowing is positively related to income, since the average debt per income bracket increases with the rise to a higher income bracket.[24] Moreover, the share of households in the two highest income brackets in total debt was significantly higher than their participation rate in the sample, implying that the relatively increased borrowing was concentrated in these brackets. However, households in the smaller income bracket had rather high indebtedness and a rather high debt service to income ratio, since for 50% of

the households in this group the debt service to income ratio was over 35.4%. The total contribution of this group to debt was however relatively limited, at 6.6% of total debt.

The correlation of the level of household borrowing with net household wealth is also overall positive. Participation rates in borrowing increase with the level of net household wealth. As regards median outstanding balances, we note that the three middle net wealth groups record the highest ones, with the outstanding balance of the highest group also being relatively high. It is however expected that households with the highest net wealth have repaid part of their loans.

Finally, correlation is also positive as regards the size of the household, since participation rates and outstanding loans increase as the household grows in size, with significant increases in participation rates when the household size grows by one member. Moreover, the contribution of households with three or more members to total sample debt is substantially higher than their participation in the sample.

This analysis is descriptive and, for the contribution of each factor to the participation of households or the level of debt, econometric models must be compiled to assess the contribution of the other factors.[25]

5 HOUSEHOLD WEALTH

Composition of wealth

The survey comprised detailed questions on households' real and financial assets. In particular, as regards real assets, the questionnaire

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24 Similar conclusions were also drawn in the previous Bank of Greece surveys on household borrowing, e.g. Simigiannis and Tzamourani (2007), Mitrakos and Simigiannis (2009); similar results are also observed in all countries participating in the survey (HFCN, 2013a).
25 Bover et al. (2013) assess the contribution of the demographic and financial characteristics of households for all euro area countries, including Greece; they also analyse institutional factors that affect these distributions in each country. In any case, the main conclusions drawn by the descriptive analysis as regards participation in borrowing and debt allocation are also confirmed by the econometric model of Bover et al. (2013).

Table 6 Distribution of wealth

| Assets | Households (%) | Value of assets held by households | | Share in total wealth (%) |
		Mean (euro)	Median (euro)	
Total net wealth	94.3 *(1.0)[1]*	147,757 *(5,030)*	101,934 *(2,540)*	
Total wealth	96.7 *(1.0)*	159,704 *(5,070)*	110,200 *(2,570)*	100
Total real assets	92.2	161,199	114,260	93.1
Total real estate	78.7	169,845	120,000	83.7
Main residence	72.4	123,381	100,000	55.9
Other real estate properties	37.9	117,085	61,932	27.8
Vehicles	73.0	9,380	6,000	4.3
Valuables	3.4	14,662	4,000	0.3
Self-employment businesses	9.8	77,460	36,183	4.8
Total financial assets	74.5	14,904	4,372	6.9
Deposits	73.4	12,201	3,637	5.6
Mutual fund shares/units-equity shares-bonds	4.0	24,250	7,341	0.6
Claims/loans to other households	3.9	7,055	2,500	0.2
Private pension plans	3.8	22,625	10,518	0.5

Source: Calculations based on data from Bank of Greece's 2009 Household Finance Survey.
1 Standard errors of main aggregates are given in parentheses.

included questions on the value of the household's main residence, the value of other properties, the value of vehicles, the value of valuable objects and the value of businesses in which household members worked as self-employed. As regards financial assets, the questions concerned the value of shares in non-listed firms, deposits, mutual funds, bonds, shares, household's claims from other households (loans), as well as the value of private pension plans and other financial assets. It should be noted that the given values were based on the participants' personal estimates.

Table 6 shows the percentages of households that reported to own an asset at the time of the interview, as well as the means and medians per household and per type of asset. As recorded in the survey, in 2009 96.7% of households owned an asset and 94.3% had a net wealth position, i.e. the value of the assets reported in the questionnaire was higher than their outstanding debt. Real estate ownership

was very common, since 78.7% reported to own a property. This was largely due to the high home-ownership rate, which amounted to 72.4%.[26] Moreover, 37.9% of households reported to own other real estate properties.

The comparison of these data with the corresponding data of other euro area countries (see the table in the Appendix) shows that the home-ownership rate in Greece was higher than the euro area average and closer to the rates of southern European countries, while high rates were also recorded by Slovenia and Slovakia. In addition, the rate of ownership of other properties in Greece was fairly high in comparison with other countries. Despite these high rates, the percentage of households with a mortgage loan was lower than the euro area average. By contrast, the high home-ownership rate is largely due to gifts and inheritances;

26 This rate is identical to that of the 2009 EU-SILC survey for Greece since, as mentioned above, the current survey's data were weighted so that both rates coincide.

39.6% of owners (or 28.4% of the total sample) reported that they acquired their main residence by gift or inheritance. This percentage is the highest among euro area countries and clearly higher than the euro area average (20.1% of owners and 12.6% of all households, respectively).[27]

Next to properties, the most common asset was deposits, with 73.4% of households reporting to have deposits with a mean and median value of €12,201 and €2,637, respectively. Vehicles were the next most common category, with 73% of households reporting to own a vehicle. By contrast, the survey shows that financial products, except deposits, such as mutual funds, bonds, shares, private pension plans, were not very common. Only 4% reported to own mutual funds share/units, bonds or equity shares, while 3.8% reported to own a private pension plan; this percentage is the lowest among euro area countries. A significant asset for 9.8% of households was self-employment businesses, with a mean and median value of €77,470 and €36,183, respectively.

Overall, households' assets in Greece mostly consisted of real assets, especially properties, since the share of total real assets in the total wealth of the sample came to 93.1% and the share of total real estate in total wealth amounted to 83.7%, while the share of financial assets in the total wealth of the sample came to a mere 6.9%. Comparing these shares with those of other euro area countries (cf. the table in the Appendix), Greece and Slovenia had the highest shares of real assets in total wealth, followed by Italy, Cyprus and Slovakia, with shares close to 90%.[28]

The allocation between real and financial assets varies according to household total wealth – Chart 1 shows the composition per decile of total household wealth. For the first decile, i.e. for the 10% of households owning the lowest wealth (up to €3,800), assets consisted of vehicles (or valuable objects) and financial assets, since most of these households did not own a house. In the second decile, a

Chart 1 Composition of assets per total wealth percentile
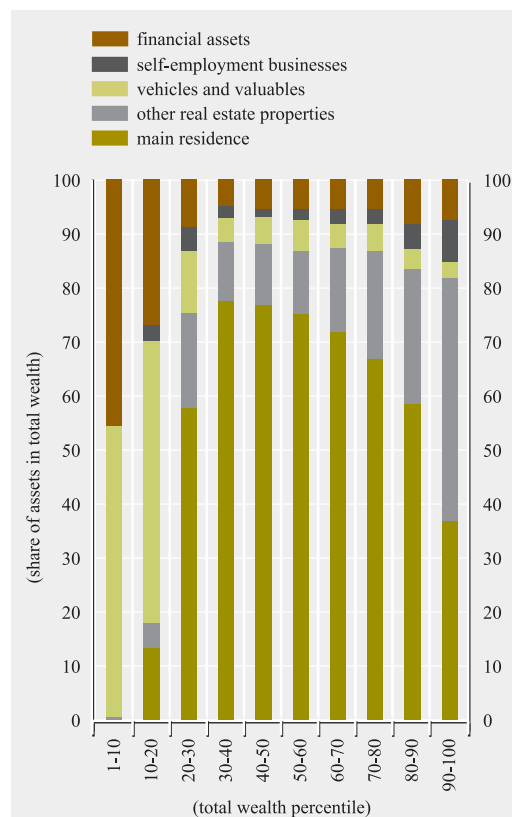
Source: Eurostat, Structural business statistics.

small share of households' wealth concerned the main residence and self-employment businesses, while vehicles continued to make up the bulk of assets of these households. For the third to ninth deciles, the main residence made up the bulk of assets of these households, while the share of other properties also increased gradually. For the 10% of households with the highest wealth, other properties had the highest share in total wealth, while the shares of self-employment businesses and other financial assets were also higher.

27 Similar conclusions on the ownership of other properties and the high rate of donations/inheritances are drawn by the SHARE survey (Nektarios and Georgiadis 2009).
28 As mentioned above, the comparison of the survey data with the corresponding macroeconomic data shows that the phenomenon of underestimation of deposits, observed in all countries, seems to have been stronger in Greece (HFCN, 2013b), affecting the ratio of real/financial assets.

The comparison of the level of net wealth in Greece in 2009 with other euro area countries shows that, although the mean value was fairly lower than the euro area mean, the typical household's net wealth in 2009 was close to that of the typical household of the euro area. It should be noted here that the median is more suitable to compare the "typical" household in each country, while the mean is indicative, by construction, of the total assets that would correspond to the household if the total assets of the reviewed country were equally distributed.[29] As detailed in the Household Finance and Consumption Network (2013a), to explain the differences in net wealth among countries, account must be taken, inter alia, of changes in asset prices, the distribution of wealth within the countries, the demographic characteristics of households, the rate of home-ownership, wellfare state provision and the ensuing need of households to meet any deficiencies in the latter.[30] Very important among these factors are asset prices, especially property prices. Indeed, Christelis et al. (2011) conclude for the United States that changes in household wealth are mainly due to changes in asset prices, rather than to saving. In Greece, property prices have displayed continuous and substantial rates of increase since 1994[31] and peaked in 2008, while they declined only marginally in 2009. Therefore, the value of assets, which was the self-reported personal estimate of their holders, is largely due to high property prices in the survey year. Since 2009 property prices have declined by about 20%,[32] exerting a corresponding effect on the value and structure of household wealth.

Distribution of asset holdings per households' socioeconomic characteristics

This section will concisely present the distribution of total wealth and its main components, specifically the household's main residence, other properties, self-employment businesses and financial assets, in relation to the household's demographic and economic characteristics (see Table 7).

We observe that the distribution of total wealth and its components in relation to the age of the reference person increases for younger age groups, reaches its maximum for total assets and other real estates and financial assets in the 51-60 age group, and decreases in older age groups. The maximum value of the main residence and self-employment businesses is recorded in the next youngest age group.

As regards the educational level, there is a positive relationship with total and individual asset types, i.e. the households' rate of ownership and value of assets increase with the educational level of the reference person. An exception to this pattern is the home-ownership rate, where households with the lowest educational level exhibit the highest ownership rate, a finding which probably relates to the high home-ownership rate in rural areas.

As regards the employment status of the reference person, the highest median value of total and net wealth was observed in the self-employed (€166,603 and €150,310, respectively). As regards total wealth, the second highest position is taken by employees, followed by pensioners, while as regards net wealth, pensioners had a slightly higher net wealth than employees, which is driven by the fact that the former have fewer loans.

There is a positive relationship between wealth and income and, in higher income brackets, higher rates of ownership and higher values for total wealth and individual asset types were observed.

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29 Moreover, the mean per capita value is a more comparable measure, since it takes into consideration the different household sizes across countries. The mean per capita value of net assets for the euro area countries is given in HFCN (2013b).

30 For instance, Cowell et al. (2012) note that, in countries with generous provision welfare state, households have comparably lower assets on average.

31 Since when data have been available: http://www.bankofgreece.gr/Pages/el/Statistics/ realestate/indices.aspx.

32 According to the index compiled by the Real Estate Masrket Analysis Section of the Bank of Greece: http://www.bankofgreece.gr/BogDocumentEn/NEW_INDEX_OF_APARTMENT_PRICES_BY_AGE.PDF.

Table 7 Distribution of wealth according to household demographic and financial characteristics

		Total assets		Net wealth		Main residence		Other real estate properties		Self-employment businesses		Financial assets	
		% of households	Median (euro)	% of households	Median (euro)	% of households	Median (euro)	% of households	Median (euro)	% of households	Median (euro)	% of households	Median (euro)
Total		96.7	110,200	94.3	101,934	72.4	100,000	37.9	61,932	9.8	36,183	74.5	4,372
Age of reference person	16-30	88.5	5,013	85.1	3,464	21.5	131,589	12.9	58,000	5.5	30,002	71.4	1,000
	31-40	95.5	106,383	91.4	81,733	55.6	120,000	31.0	60,000	13.2	42,000	76.3	3,539
	41-50	98.8	144,000	94.7	125,593	73.1	130,000	40.7	69,400	13.6	45,099	75.1	5,000
	51-60	99.0	151,058	97.1	133,380	82.4	100,000	46.2	80,000	13.2	37,236	77.0	5,262
	61-70	98.8	118,611	97.1	112,961	84.9	100,000	48.8	70,000	9.8	20,000	75.2	5,000
	71+	95.3	87,125	95.3	85,192	86.5	80,000	34.3	50,000	1.8	50,000	70.5	4,059
Education of reference person	Up to three-grade lower secondary	96.5	92,900	94.6	86,856	80.4	80,000	38.6	50,000	9.3	20,000	67.4	3,000
	Upper secondary, post-secondary	96.1	121,400	92.7	104,918	64.6	120,500	33.9	74,213	11.6	44,762	78.0	4,000
	Tertiary	98.4	169,652	96.3	147,588	67.3	150,000	42.7	85,435	8.1	57,000	84.3	8,648
Employment status of reference person	Employee	97.1	112,172	93.2	95,964	62.4	120,000	33.6	71,003	2.8	21,923	75.3	4,000
	Self-employed	99.2	166,603	97.0	150,310	76.2	114,344	49.6	61,800	39.3	47,000	78.3	6,124
	Retired	97.3	102,088	96.4	100,520	86.8	82,975	40.7	59,678	3.1	20,000	73.9	4,729
	Other	84.9	15,409	82.7	14,535	46.4	87,505	15.3	69,396	2.9	20,000	61.4	967
Main residence	Owned outright	100.0	145,578	100.0	142,328	100.0	100,000	45.2	62,125	10.1	36,272	77.3	5,506
	Owned with a mortgage	100.0	173,966	98.3	119,804	100.0	125,000	37.1	66,600	13.1	31,600	71.2	2,946
	Renters	88.2	7,040	80.4	5,416	-	-	22.8	60,000	7.6	40,292	70.2	2,000
Income	0-11,000	89.5	55,113	87.7	51,330	64.5	73,627	23.3	31,200	3.5	15,425	59.6	1,417
	11,001-18,000	96.1	81,100	93.1	73,722	69.0	95,095	28.6	50,000	4.8	36,599	69.4	2,379
	18,001-27,000	99.3	113,357	96.5	105,780	71.9	100,000	41.3	64,135	9.0	23,719	77.9	3,298
	27,001-40,000	99.3	137,186	96.3	122,800	74.6	120,000	42.0	66,000	11.8	27,615	82.6	5,090
	40,001+	99.7	225,860	98.2	202,733	82.5	150,000	54.9	100,000	20.6	56,973	83.3	11,314
Net wealth	1-15,000	83.9	3,999	72.0	2,000	6.6	45,000	5.1	10,000	2.5	8,630	61.9	1,000
	15,001-74,000	100.0	53,246	100.0	49,539	74.2	50,000	26.3	20,162	7.4	15,630	65.1	2,470
	74,001-130,000	100.0	105,712	100.0	102,180	92.9	92,106	31.6	30,000	7.8	16,644	75.1	3,947
	130,001 - 220,000	100.0	179,187	100.0	166,930	95.0	134,519	48.3	60,000	11.0	33,452	83.4	5,812
	220,001+	100.0	353,372	100.0	332,144	94.4	180,000	78.4	150,000	20.5	100,000	87.0	15,000
Household size	1	90.5	49,708	87.5	44,027	53.3	80,000	20.7	60,000	1.9	20,000	69.7	2,000
	2	97.8	102,141	96.2	97,317	77.4	100,000	36.8	50,000	5.7	46,517	74.7	5,000
	3	98.8	141,382	95.9	125,309	76.9	113,323	46.1	78,670	14.0	43,596	75.7	5,000
	4+	98.5	160,480	96.1	138,953	77.4	121,768	44.3	70,000	16.2	30,000	76.7	5,000

Household size also has a positive relationship with wealth, since larger households have higher gross and net asset values.

As also noted regarding the distribution of loans, this analysis is descriptive and, to draw conclusions on the contribution of each factor in the ownership or the level of assets, an econometric model is required to simultaneously review all determinants of the variable in question.[33]

CONCLUSIONS

The Household Finance Survey and the Household Finance and Consumption Survey (HFCS) for Greece and the euro area, respectively, constitute a new, rich source of information on the financial situation of households, recording data on household loans, income, assets, intergenerational transfers, consumption and saving.

This paper described the key methodology of the first wave of the survey conducted in Greece during 2009. It also presented summary information on household income, debt and asset composition and allocation in Greece in 2009.

The survey data show that households' recourse to borrowing and indebtedness in 2009 stood at slightly lower levels than the total euro area countries. Borrowing was more concentrated in higher asset and income brackets, while indebtedness indicators were at tolerable levels for the vast majority of households. Moreover, household debt was rather limited compared with household wealth.

Household wealth in Greece, as recorded by the survey in 2009, mainly consisted of real assets, the most important of which were properties. Greece had a high rate of home-ownership and a high rate of ownership of other properties compared with euro area countries. Key determinants of the high rate of home-ownership are inheritances and donations. As regards the level of net wealth, although the mean was fairly lower than the euro area mean wealth, the median, i.e. the "typical" household's net wealth, in 2009 was close to that of the typical euro area household, a finding that is partly due to the high homeownership rate in Greece and the relatively high property prices during the survey period.

It is well known that since 2009, when the survey was conducted, Greece has been facing a deep financial crisis, which has gravely affected the financial situation of households. High unemployment rates, decreased wages and increased taxes have shrunk household incomes. For households with loans, financial pressure has increased substantially, as shown by the increased rate of non-performing loans. Moreover, household wealth has declined substantially, due both to the large fall in the prices of properties, the latter being the most important household asset, and to the fact that households have been using their assets in order to meet living expenses and pay off their loans and taxes. Therefore, the findings of this survey must be assessed in this context.

[33] The paper by Arrondel et al. (2013) develops probit and tobit models for all euro area countries and examines the correlation of household demographic and financial characteristics with the probability of ownership of each type of asset and with the level of assets in each type.

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Selected indicators of euro area countries

Country and year of survey	Income			Debt and indicators of debt burden						Wealth						
	Average household size	Median (euro)	Mean (euro)	House-holds with debt %	House-holds with mortgage loans %	House-holds with other loans %	Debt to income ratio, median %	Debt service to income ratio, median %	Share of mortgage loans in sample's total debt %	Net wealth, median (thousand euro)	Net wealth, mean (thousand euro)	House-holds owning their main residence %	House-holds with other real estate properties %	House-holds with deposits %	House-holds with private pensions %	Real assets to total wealth ratio %
Euro area	2.32	28,600	37,800	43.7	23.1	29.3	62	13.9	82.8	109.2	230.8	60.1	23.1	96.4	33.0	83.2
Belgium (2010)	2.31	33,700	49,500	44.8	30.5	24.2	79.8	15.1	89.6	206.2	338.6	69.6	16.4	97.7	43.3	70.9
Germany (2010)	2.04	32,500	43,500	47.4	21.5	34.6	37.3	10.9	87.7	51.4	195.2	44.2	17.8	99.0	46.5	78.8
Greece (2009)	2.64	22,000	27,700	36.6	17.5	26.1	47.2	14.7	78.7	101.9	147.8	72.4	37.9	73.4	3.8	93.0
Spain (2008)	2.68	24,800	31,300	50.0	32.5	30.7	113.5	19.9	86.3	182.7	291.4	82.7	36.2	98.1	23.6	89.7
France (2010)	2.24	29,200	36,900	46.9	24.4	32.8	50.4	14.7	75.6	115.8	233.4	55.3	24.7	99.6	37.5	80.7
Italy (2010)	2.53	26,300	34,300	25.2	10.8	17.8	50.3	13.2	73.5	173.5	275.2	68.7	24.9	91.8	18.0	90.0
Cyprus (2010)	2.76	32,300	43,300	65.4	44.8	47.9	157.0	25.0	85.8	266.9	670.9	76.7	51.6	81.2	45.7	91.9
Luxembourg (2010)	2.48	64,800	83,700	58.3	38.8	36.9	86.9	16.6	90.2	397.8	710.1	67.1	28.2	98.0	34.3	88.8
Malta (2010)	2.85	21,600	26,400	34.1	15.6	25.2	52.0	11.5	76.0	215.9	366.0	77.7	31.4	96.9	24.2	86.6
Netherlands (2009)	2.22	40,600	45,800	65.7	44.7	37.3	194.1	14.5	82.9	103.6	170.2	57.1	6.1	94.2	49.8	73.4
Austria (2010)	2.13	32,300	43,900	35.6	18.4	21.4	35.6	5.6	83.2	76.4	265.0	47.7	13.4	99.4	17.7	83.1
Portugal (2010)	2.71	14,600	20,300	37.7	26.7	18.3	134.0	17.3	92.1	75.2	152.9	71.5	27.1	94.3	14.1	87.5
Slovenia (2010)	2.57	18,000	22,300	44.5	14.1	38.9	26.6	15.8	41.7	100.7	148.7	81.8	23.2	93.6	18.3	94.4
Slovakia (2010)	2.83	11,200	13,500	26.8	9.6	19.9	22.7	12.5	81.2	61.2	79.7	89.9	15.3	91.2	15.0	91.7
Finland (2009)	2.08	36,300	45,100	59.8	_1	_1	64.3	_1	_1	85.8	161.5	67.8	29.8	100.0	23.7	85.0

Source: HFCN (2013a), *The Eurosystem Household Finance and Consumption Survey - Results from the First Wave.*
1 Missing values.

WORKING PAPERS (DECEMBER 2012 – OCTOBER 2013)

This section contains the abstracts of Working Papers authored by Bank of Greece staff and/or external authors and published by the Bank of Greece. The unabridged version of these publications is available in print or electronic format on the Bank of Greece's website (www.bankofgreece.gr).

CONTENTS

On the optimal mix of fiscal and monetary policy actions

Working paper No. 150
Apostolis Philippopoulos, Petros Varthalitis and Vanghelis Vassilatos

We study optimized monetary and fiscal feedback policy rules for reducing public debt in economic downturns. The setup is a conventional New Keynesian DSGE model of a closed economy calibrated to match data from the euro area. Our aim is to welfare rank alternative tax-spending policy instruments used for shock stabilization and/or debt consolidation when, at the same time, the monetary authorities follow a Taylor rule. The results enable us to assess if and when debt consolidation is welfare improving and corroborate the view that it is better to use public spending, rather than taxes, for debt consolidation.

Inflation persistence and the rationality of inflation expectations

Working paper No. 151
Sophocles N. Brissimis and Petros M. Migiakis

The rational expectations hypothesis for survey and model-based inflation forecasts —from the Survey of Professional Forecasters and the Green Book, respectively— is examined by taking into account persistence in the data. The finding of near-unit-root effects in inflation and inflation expectations motivates the use of a local-to-unity model to test for local unit root against stationarity.

By testing, rather than assuming, stationarity of near-unit-root processes, we enable in-sample-versus-population stationarity to be combined with a cointegration analysis that allows us to distinguish between short- and long-run effects. In this context, we test the rational expectations hypothesis by allowing the co-existence of a long-run relationship with short-run "learning" effects. Our empirical results indicate that the rational expectations hypothesis holds in the long run, while forecasters adjust their expectations slowly in the short run. This finding also lends support to the hypothesis that the persistence of inflation comes from the dynamics of expectations.

Audits and tax offenders: recent evidence from Greece

Working paper No. 152
Athanasios Tagkalakis

Using a novel dataset on tax inspections in the summer of 2012 by the Hellenic Ministry of Finance in tourist and high economic activity areas in 13 regions in Greece, and after controlling for common time and region-specific effects, we find that the intensification of tax audits can induce tax compliance. Moreover, the sensitivity of the ratio of tax offenders to increases in tax inspections is greater in areas of high unemployment and low educational level, and in tourist destinations such as the Greek islands. An increase in the economic sentiment indicator, viewed as heralding a better economic outlook, also encourages tax compliance.

These findings highlight the importance of audits as a key enforcement mechanism for tax legislation as they can deter tax evasion, increase tax collection efficiency and boost

tax revenues. Of course, the final outcome depends on the ability of the State to enforce the penalties and collect the fines imposed, since the intensification of audits alone is not enough to materially deter tax evasion.

The distortive effects of antitrust fines based on revenue

Working paper No. 153
Vasiliki Bageri, Yannis Katsoulacos and Giancarlo Spagnolo

In most jurisdictions, antitrust fines are based on affected commerce rather than collusive profits, and in others, caps on fines are introduced based on total firm sales rather than on affected commerce.

We examine a number of distortions that these policies generate, propose simple models to characterize their comparative static properties, and quantify them with simulations based on market data. We conclude by stressing the obvious need to depart from these distortive rules-of-thumb, which, as shown in the paper, have the potential to substantially reduce social welfare.

Measuring return and volatility spillovers in euro area financial markets

Working paper No. 154
Dimitrios P. Louzis

The examination of the interconnectedness of financial markets is of crucial importance for the understanding of financial crises and their propagation mechanisms, while it is also critical in terms of systemic risk identification and financial stability preservation. This paper studies the price and volatility spillovers among the money, stock, foreign exchange and bond markets of the euro area, utilizing the forecast-error variance decomposition framework of a generalized VAR model proposed by Diebold and Yilmaz (2012). The main advantage of this approach is that it is not sensitive to changes in the ordering of variables in a VAR model, facilitating practical applications. Our empirical results, based on a data set covering a twelve-year period (2000-2012), suggest a high level of spillover effects between the euro area markets throughout the entire sample period. Moreover, the stock market is identified as the main transmitter of both price and volatility (uncertainty) spillovers even during the current sovereign debt crisis. Bonds of periphery countries under financial support mechanisms transmit price spillovers to other market segments only during the 2011-2012 period, but seem to transmit volatility spillovers to other markets diachronically. Finally, we identify the key role of the money market in volatility transmission in the euro area during the global financial crisis.

A financial systemic stress index for Greece

Working paper No. 155
Dimitrios P. Louzis and Angelos T. Vouldis

This paper proposes a systemic stress indicator for the Greek financial system – the Financial Systemic Stress Index (FSSI). It builds upon the proposition of Hollo et al. (2012) to

consider the systemic nature of stress by taking into account the time-varying cross-correlations between variables. A portfolio-based approach is then applied to the construction of an index summing up these variables.

The idea behind this approach is that systemic stress tends to be higher when the financial system is in a state of widespread instability, in which several elements of the financial system are simultaneously under stress and tending to move together, i.e. their correlation increases. A multivariate GARCH approach is used to capture the changing correlations between the system's variables. Moreover, in keeping with portfolio theory, the set of variables used in the construction of the FSSI includes both market and balance sheet data. Empirical results show that the FSSI index is a good indicator of financial crises (as indentified through a survey questionnaire) and systemic stress in the Greek financial system.

Price setting practices in Greece: evidence from a small-scale firm-level survey

Working paper No. 156
Daphne Nicolitsas

The paper documents the price setting practices followed by some 400 or so firms operating in Greece, as reported by them in a relevant survey. Survey replies reveal: a low percentage of firms changing prices with frequency higher than annual; staggering of price changes; asymmetries in price adjustment across positive and negative cost shocks and a speedier adjustment to increases in costs than to reductions in demand.

The data confirm cross-sectional variations in price setting practices also found for other countries. On the basis of the results reached, the conjecture that the prevalence of small firms, of firms providing services to businesses and of firms active in tourism-related activities might lie behind the inflation persistence exhibited until recently in Greece appears plausible.

Investment strategy and Greek shipping earnings: exploring the pre- and post-"ordering-frenzy" period

Working paper No. 157
Zacharias G. Bragoudakis, Stelios T. Panagiotou and Helen A. Thanopoulou

The influx of shipping receipts from the world's leading fleet has been critical for the development of the Greek economy. Following the fateful September of 2008, the range and speed of the shift in direction of the freight rates, combined with the general economic and credit climate, have had a significant impact on Greek receipts from shipping. The paper investigates both the long- and short-term responses of shipping flows (receipts/expenses) in the Greek balance of payments. It also evaluates the role of the change in Greek ship-owners' investment strategies from 2006 onwards. The paper presents estimations of the impact on shipping flows of freight market determinants such as the Greek shipping freight rate index, the outstanding amount of shipping loans and the second-hand vessel's price index. In this respect, a DOLS method is used for the estimation of the cointegrating relationship resulting in orthogonal errors in the entire history of the stochastic process. The findings provide evidence in favour of a change in the investment behaviour of the Greek shipping companies after 2006. Inflows (receipts) and outflows (expenses) tend to be dictated partly by the cash-flow position of the companies involved in the Sale & Purchase (S&P) market, as indicated by the positive relationship with freight rates.

Financial soundness indicators and financial crisis episodes

Working paper No. 158
Maria Th. Kasselaki and Athanasios O. Tagkalakis

Building on earlier IMF studies like Babihuga (2007) and Čihák and Schaeck (2007, 2010), this paper investigates the relationship between financial soundness indicators (compiled by the IMF) and financial crisis episodes controlling for several macroeconomic and fiscal variables in a number of OECD counties.

Our key findings suggest that in times of severe financial crisis the ratio of regulatory capital to risk-weighted assets increases by about 0.5-0.6 percentage point (to abide by regulatory and supervisory demands, as also pointed out by Čihák and Schaeck 2010), non-performing loans (NPLs) to total loans increase by about 0.5-0.6 percentage point in the short run and

3.0-4.6 p.p. in the long run, loan loss provisions fall by about 12.3-18.8 p.p., and profitability deteriorates dramatically.

These results reveal the risks that may arise for financial stability from the fragility of the banking system during episodes of financial crisis. They should be looked at in close association with the findings of Adrian and Shin (2009, 2010), who suggest that banking system total balance sheet aggregates need to be incorporated into macroeconomic analysis to improve the conduct of monetary policy. Alternatively, close cooperation between monetary, fiscal and regulatory authorities is warranted to mitigate risks emanating from the financial sector.

The asymmetric effect of income on import demand in Greece

Working paper No. 159
Ioanna C. Bardakas

This paper presents empirical evidence supporting the argument that a significant asymmetry exists in the income elasticity of Greek imports. Using multivariate cointegration techniques for the estimation of a long-run import function, we derive short-run error correction equations that identify separate income elasticities for periods when income is rising and periods when it is falling. The empirical results show that the response of imports to rising income is stronger than the response of imports to falling income.

More specifically, including the impact of capacity utilisation as an independent variable leads to an income elasticity during expansionary periods of 1.32, while the income elasticity during contractions is 0.47.

If capacity utilisation is not included in the analysis, then the corresponding expansion and contraction income elasticities are 1.46 and 0.69, respectively. This theoretical argument, which is supported by empirical evidence, explains the slow adjustment of Greece's current account balance over the five years of recession.

The important policy implication of this asymmetry is that continuous income growth leads imports to continuously increase, causing the current account deficit to persistently widen. Preventing this crucially hinges on the implementation of structural reforms that enhance FDI and import substitution, thereby helping to maintain balance in the current account.

The impact of immigration on the employment and wages of native workers

Working paper No. 160
Andri Chassamboulli and Theodore Palivos

We analyze the impact on labour market outcomes of the influx of unskilled workers that took place in Greece during the years 2000-2007. We employ a search and matching model of unemployment generated by search frictions that allows for skill heterogeneity and differential unemployment income (search cost) between immigrants and natives. The advantage of this framework is that it takes into account the impact of immigration on the incentives for job creation and hence on wages and job availability.

We find that skilled native workers, who complement immigrants in production, gain in terms of both wages and employment. The effects on unskilled native workers, who compete with immigrants, on the other hand, are ambiguous and depend on the presence of a statutory minimum wage and on the way in which this minimum wage is determined. If the unskilled wage is bargained over, then the unskilled native workers lose in terms of wages but gain in terms of employment. On the contrary, if unskilled native workers receive a statutory minimum wage that is linked to the wage of skilled labour, then they gain in terms of wages but lose in terms of employment. Finally, in the case where the minimum wage is automatically set as percentage of the economy-wide average, there is a negative effect on the unskilled wage and an ambiguous effect on unskilled employment.

Oil price shocks and stock market volatility: evidence from European data

Working paper No. 161
Stavros Degiannakis, George Filis and Renatas Kizys

While much of the energy economics literature deals with the effect of oil price shocks on stock market returns, how these shocks affect stock market volatility is still unclear. We address that issue focusing on the European stock market. Oil price shocks may be either supply-side shocks, aggregate demand shocks or idiosyncratic shocks. Using three measures of volatility (the conditional, the realised and the implied volatility), we examine, for each type of oil price shock, if the resulting oil price changes affect the volatility of the aggregate stock market index EURO STOXX 50 and 10 industrial sector indices. The findings suggest that supply-side shocks and oil specific demand shocks do not affect the volatility of the EURO STOXX 50 index, whereas oil price shocks resulting from aggregate demand shocks lead to a reduction in stock market volatility (regardless of the volatility measure used). Similar results are found for European industrial sectors' volatilities.

How labour market regulation shapes bank performance in EU-15 countries?

Working paper No. 162
Anastasia Koutsomanoli-Filippaki and Emmanuel Mamatzakis

The European banking industry is undergoing significant structural changes as a result of the financial crisis. Against a background of macroeconomic uncertainty, which has signif- icantly affected the prospects for the prof- itability of European banks, the need to adopt measures to reduce operating costs has emerged as an imperative for banking institu-

tions. Yet, the institutional features that affect banks' ability to adjust personnel expenses, which comprise a significant part of banks' non-interest cost, have not been adequately studied.

This paper investigates the effect of labour market institutions and regulations on the cost efficiency of European banks and especially on their ability to adjust staff remuneration. It comes as a complement to the existing literature demonstrating that the regulatory framework can influence the efficiency of the banking system, although the specific effect of labour market regulation is still unstudied.

Results indicate the existence of a negative relationship between bank efficiency and the liberalization of EU labour markets. However, when looking at the effect of the disaggregated components of the labour market regulation index on banks' efficiency, we find considerable heterogeneity. More specifically, our findings demonstrate that the liberalization of the minimum wage, hiring and firing regulations and the cost of dismissals could assert a positive effect on efficiency.

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