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THE DETERMINANTS OF GREEK HOUSEHOLD INDEBTEDNESS AND FINANCIAL STRESS*

Theodoros M. Mitrakos
**Economic Research Department**

George T. Simigiannis
Special Advisor to the Bank of Greece

1 INTRODUCTION

After the entry of Greece into the euro area in 2001 and the complete deregulation of consumer credit in 2003, household borrowing grew at a strong rate, averaging about 28% annually in the period from 2002 to 2007. The fast rise in household credit was mainly driven by increased bank liquidity, especially in the early part of this period.[1] However, it also reflected the fall in interest rates to historically low levels, the intensifying competition among banks in the area of retail banking and low household indebtedness – largely due to barriers until recently preventing households' access to bank lending. Over the past three years, the growth rate of household credit has fallen considerably (2005: 31.4%, 2008: 12.8%), mainly as a result of the slower growth of housing loans (see Chart 1). The total household debt-to-GDP ratio rose from 34.7% at the end of 2005 to 47.5% at the end of 2008, significantly below the euro area average (2008: 59.5%)[2] and the corresponding average for several OECD countries (2005: approximately 80%).[3,4]

While borrowing can boost economic growth and promote the well-being of households, continuous accumulation of debt may undermine a household's ability to regularly service its loan obligations. To examine household borrowing, at the end of 2007 the Bank of Greece repeated the sample survey[5] conducted in 2005 (Wave 2) and before that in 2002 (Wave 1). Although this latest wave (Wave 3) took place in a period when the financial crisis had not yet reached its present proportions, its results are of interest, especially at the current juncture, where the stability of the international and, consequently, the domestic banking system is affected by heightened uncertainty and the overall adverse

Chart 1 MFI credit to domestic households by type of loan

(annual percentage changes)

- total
- housing loans
- consumer credit

Source: Bank of Greece.
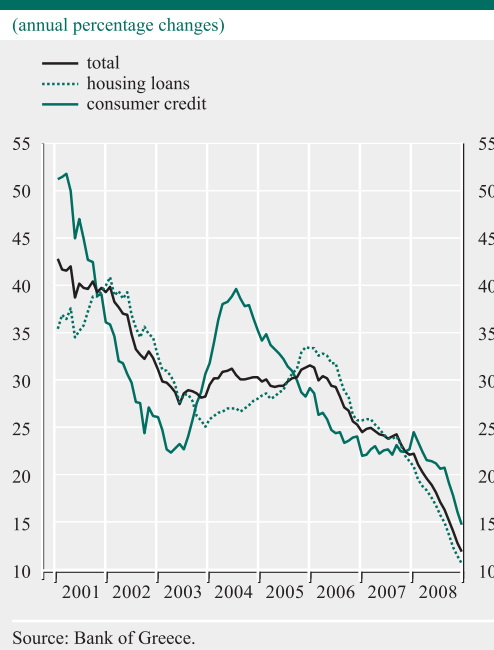
conditions prevailing in the international money and capital markets, which have visible effects on the real economy.

1 It should be recalled that in 2001 the funds held by banks in the form of time deposits with the Bank of Greece had gradually been released after the harmonisation of the Bank's reserve requirements with those of the Eurosystem in 2000. The amount released had totalled €8.1 billion or 5.5% of GDP. See Bank of Greece (2002), *Annual Report 2001*, Chapter VI.

2 Securitised loans included. For the euro area average, see ECB (2007a, 2008).

3 Girouard et al. (2007), using available data for a sample of 15 OECD countries, found that the household debt-to-GDP ratio was, on average, about 80% in 2005, ranging from under 40% in Italy to over 100% in the United Kingdom, the Netherlands and Denmark.

4 Greece's total household and corporate debt-to-GDP ratio (2006: 86%) remains one of the lowest in the EU (EU-25: 132%, EU-12: 129%). See ECB (2007b) and Hellenic Bank Association (2008).

5 The survey was commissioned to TNS-ICAP SA, the market research company that had also undertaken the previous two surveys on behalf of the Bank of Greece.

This paper draws on the results of this wave[6] to investigate the socio-economic determinants of household borrowing and financial stress. Specifically, the following section contains a description of the survey, while Section 3 presents the key characteristics of household borrowing. Section 4 explores the relationship between borrowing and the various demographic and socio-economic characteristics of households using a logistic regression model. Similar econometric techniques are employed in Section 5 to investigate the socio-economic characteristics of households that are most likely to be under intense financial stress or report difficulties in regularly servicing their loan obligations. Finally, the sixth section summarises the main conclusions.

2 STATISTICS FROM THE BANK OF GREECE HOUSEHOLD INDEBTEDNESS SURVEY

Wave 3 was conducted in the last quarter of 2007 and, like the previous two, covered a sample of 6,000 households in urban and semi-urban areas of Greece.[7] A random sampling technique stratified by geographical district was used to ensure that the sample was representative of the surveyed population. Primary data were collected by personal interviews using a specifically designed questionnaire. Compared with the previous ones, the Wave 3 questionnaire enabled a more detailed analysis of the sources of household income and assets. In total, complete responses (i.e. from all adult members of the household) were received from 3,135 households, i.e. the average response rate was 52.3%, roughly the same as in Wave 2 (52%).

As in the previous waves,[8] this rate exhibited significant geographical variation but overall decreased with the degree of urbanisation,[9] with the highest rates recorded in Epirus (61.3%), Eastern Macedonia and Thrace (61.2%) and Peloponnese (57.4%) and much lower rates recorded in Sterea Ellada and Evia (43.9%) and Crete (44.6%).

In order to balance out the impact of geographical variation on the representativeness of the sample, the survey data were weighted to reflect the structure of Greece's population by area and degree of urbanisation of residence location. Moreover, the distribution of household size in the sample was adjusted to reflect the distribution of household size in the population according to the 2001 census. This weighting restores the representativeness of the sample to the extent that the borrowing attitudes of the originally selected households that did not participate in the survey are the same as those of participating households. However, this is not something directly (statistically) controllable and therefore the results of the survey should be judged with due caution.

3 INDEBTED HOUSEHOLDS BY LOAN CATEGORY

According to the survey results (Wave 3), nearly half (48.6%) of households reported no debt at all[10] (see Table 1). However, the proportion of households that reported an outstanding loan debt rose to 51.4%, having increased significantly from the level observed in Wave 2 (46.9%). This development is in principal consistent with the fast expansion of bank credit to households in the period between the two

6 The results of Wave 3 are analysed and compared with the results from the previous waves on http://www.bankofgreece.gr/announcements/files/19.5.200820%20Daneismos%20noikokyrio%202008%20-%20Ereuna.doc.
7 Insular areas (e.g. the Northern and Southern Aegean and the Ionian Islands) were excluded from the sample.
8 For a detailed presentation of the results of these waves, see Bank of Greece (2003), Annex to Chapter VI and Bank of Greece (2006), Annex to Chapter VI. See also Mitrakos, Simigiannis and Tzamourani (2005) and Simigiannis and Tzamourani (2007).
9 The household response rate was slightly below average in Athens (52.0%) and especially in the other urban areas (49.2%) and above average in Thessaloniki (53.9%) and especially in the semi-urban areas (56.8%). Evidence that the non-response of households may not be accidental but related to specific characteristics of the surveyed population, including age, educational level, degree of urbanisation and social status, can be found in most published papers based on sample surveys. See, for instance, D'Alessio and Faiella (2002).
10 As in Wave 2, individuals eligible to participate in Wave 3 were all household members aged 18 and over (18+). By contrast, the 2002 survey had only covered household members aged 25 and over (25+). As indicated by the analysis above, there are no significant differences in the results of the two most recent waves, whether they refer to all household members aged 18+ or are limited to those aged 25+.

Table 1 Indebted households by loan category

Loan category	Household percentages					Average debt (in euro)				
	2007, 18+	2007, 25+	2005, 18+	2005, 25+	2002, 25+	2007, 18+	2007, 25+	2005, 18+	2005, 25+	2002, 25+
Without debt obligations	48.6	47.6	53.1	52.3	51.6					
With debt obligations	51.4	52.4	46.9	47.7	48.4	29,979	30,006	19,665	19,637	15,532
House-related loans – "housing loans"	40.1	40.5	37.3	38	37.2	51,354	51,014	42,366	41,701	29,557
- For house purchase	32.3	32.8	28.4	28.7	27.5	55,069	54,677	48,789	48,156	33,187
- For house repair	10.0	10.1	9.9	10.3	10.7	26,154	25,755	18,539	18,403	16,877
- For land purchase	0.6	0.4	0.9	1.0	1.0	27,508	29,525	28,224	27,401	7,430
Other loans	85.4	84.9	81.7	81.2	85.3	9,193	9,125	6,552	6,275	4,246
Other non-housing bank loans	82.5	82.2	77.8	77.2	75.5	9,442	9,343	6,552	6,447	4,048
- Credit cards	60.8	60.1	54.4	54.1	53.1	3,284	3,296	3,047	3,039	1,701
- Car purchase	19.1	18.5	20.8	20.1	20.9	8,643	8,706	7,495	7,159	5,815
- Other bank loans (personal, consumer, etc.)	31.7	31.5	28.9	28.9	29.4	10,462	10,358	6,552	6,570	2,979
From retail stores	9.0	8.8	9.0	8.9	16.3	1,350	1,386	1,256	1,254	1,294
From other households	0.9	0.8	1.2	1.3	2.8	4,241	4,577	5,612	5,496	12,447

waves. Moreover, comparison of the data from these two waves with that submitted by banks to the Bank of Greece reveals that both the average outstanding amount of housing loans per household and the average outstanding amount of credit card loans as per the survey rose at average annual growth rates almost identical to those computed on the basis of data submitted by banks to the Bank of Greece.[11] This provides a strong indication that responding and non-responding households may have broadly similar borrowing attitudes, thereby strengthening the credibility of the survey results.

As can be seen in Table 1, there are some significant differences between the second and the third wave in terms of the composition of household debt by type of loan. Credit card loans continued to be the most common type of borrowing in 2007, with 60.8% of all indebted households reporting a debt in this form (2005: 54.4%). Specifically, for Athens this percentage stood at 68%, while the corresponding percentages for Thessaloniki, the "other urban areas" and the semi-urban areas were 60%, 55% and 50% respectively. The increased use of credit cards as a means of payment[12] and the ready access to this type of loans within the limits of each card explain why they are so widespread, despite the fact that the interest rates on these loans are the highest among all categories of bank loans.[13]

The second most common category of loans in 2007 was housing-related loans, with 40.1% of all indebted households reporting a debt in this form (2005: 37.3%). This was consistent with the rapid expansion of housing loans, since new housing loans are contracted, as a rule, by new borrowers. Unsecured bank loans (mainly personal loans and loans against supporting documents) were the next most common category, with 31.7% (2005: 28.9%), followed by loans for car purchase, which, unlike the other main loan categories, decreased slightly in 2007 (2007: 19.1%, 2005: 20.8%), but, as in 2005, remained more frequent among household members aged 18-25 (33%) than among those aged 25+ (18.5%).

The proportion of households with outstanding loans from retailers exhibited some geographical variation but overall remained at a relatively low level (below 10%). Lastly, households with loans from friends accounted for a minimal and falling share (of generally below 1%) of indebted households in all geographical regions, except semi-urban areas.

4 BORROWING AND SOCIO-ECONOMIC CHARACTERISTICS OF HOUSEHOLDS: A LOGISTIC REGRESSION ANALYSIS

To provide a better understanding of how borrowing is related to the demographic and socio-economic characteristics of households, the following logistic regression model was estimated:

$$\ln(P_i/(1-P_i)) = \alpha_0 + \alpha_1 X_{1i} + \alpha_2 X_{2i} + \ldots + \alpha_N X_{Ni} + ui \quad (1)$$

where P_i is the probability that household i has taken out a loan or, in the case of given types of loans, the probability that household i owes a debt relating to a specified loan category, and

11 According to bank data, the outstanding amount per housing loan account stood at €40.3 thousand at the end of 2007, compared with €33.1 thousand at the end of 2005, i.e. rising at an average annual rate of 10.3%. The corresponding outstanding amount of housing loans per household (as per the survey, Waves 2 and 3) was €51.4 thousand in 2007, up from €42.4 thousand in 2005, having risen at an average annual rate of 10.1%. Therefore, the outstanding amount per account was lower than the outstanding amount per household, indicating that, as also suggested by the survey, a number of households may have more than one housing loan. Notwithstanding that, the ratio of the two amounts remained virtually unchanged, at around 78%, implying that the number of accounts per household was not significantly altered during this period. Moreover, the outstanding amount of credit card loans (and securitised loans), as recorded by banks, was €9.2 billion at the end of 2007, compared with €8.5 billion at the end of 2005, i.e. rising at an average annual rate of 4.3%. The corresponding outstanding amount of credit card loans per household (as per the survey) stood at €3,284 in 2007, up from €3,047 in 2005, which represents an average annual increase of 3.8%. If account is taken of the outstanding amount per household, then data are adjusted for the fact that the number of households is slightly different in the two survey waves, thus making the evolution of credit card loans as recorded by banks comparable with the evolution of credit card loans as recorded by the survey.

12 At end-2007, there were two credit cards for every three persons aged 20 and over. Moreover, data submitted by banks to the Bank of Greece show that in the five-year period from 2003 to 2007, the number of credit card transactions rose at an average annual rate of 10% and the value of these transactions at a rate of 23%, reaching €8.6 billion in 2007, from €3.1 billion in 2002. For the complete statistical series, see http://sdw.ecb.europa.eu/

13 At end-2007, the average interest rate on credit card loans was 15.31% (consumer loans: 8.4%, housing loans: 4.45%).

X_j (j = 1, N) the N characteristics of each household, i.e. of independent explanatory variables that determine the probability that household i has taken out a loan or owes a debt relating to a specified loan category.

In the analysis that follows, models were estimated for four independent variables, each of which indicates whether or not a household has had (a) a loan of any type, (b) a housing loan, (c) other, non-housing loans, and (d) a loan or credit card debt. The following were examined as explanatory (or independent) variables, i.e. variables likely to affect the probability of a household having any (or a specific type of) loan: degree of urbanisation of residence location, family status, income and net wealth group of the household, age and educational level of the household head, number of household members in employment, employment status of the household head, housing tenure (owned or rented), nationality of the household head and whether he or she is employed in the public or the private sector. For each dependent variable, two models, presented in Table 2, were estimated such that the one includes income (Model 1) and the other net wealth[14] (Model 2) as an explanatory variable, given that both significantly influence the probability of having a loan and are strongly correlated. The results of this analysis are compared with those of Mitrakos, Simigiannis and Tzamourani (2005) and Simigiannis and Tzamourani (2007), who had made use of the data from Wave 1 and Wave 2 respectively, to see if there are any differences in households' borrowing attitudes across the three waves.[15]

Table 2 presents the coefficients for the independent variables. These express the ratio of the odds of a household having a specific type of loan to the odds of a household in the reference group having such a loan, provided that all other variables in the model are held constant. Thus, in Model 1, the coefficient 1.26 for all loans of "Athens and Thessaloniki" indicates that the ratio of the odds of a household resident in Athens or Thessaloniki having a loan is 1.26 times greater than the correspon-

ding odds for households resident in other urban areas ("other urban areas" is the reference category for the "residence location" variable).

As noted above, households resident in other urban areas have a much lower probability of having a loan than households resident in Athens or Thessaloniki, and essentially the same probability as households living in semi-urban areas. The increased probability associated with Athens and Thessaloniki chiefly masks a higher probability of having a non-housing loan, especially a loan through credit card. In fact, the odds of a household resident in Athens or Thessaloniki having a credit card loan are 1.52 times greater than the corresponding odds for households resident in other urban areas. By contrast, the probability of a household having a housing loan does not seem to be influenced by the degree of urbanisation of the household's location of residence, since the relevant coefficients remain statistically insignificant, irrespective of whether household income or net wealth is controlled for in the model. These results agree with those from the previous two waves, except that the relatively high probability of a household in Athens or Thessaloniki having a non-housing loan was slightly limited compared with 2005, whereas the corresponding probability for households in semi-urban areas appeared to be increased, although this was statistically insignificant. This in turn seems to suggest that, in the period between the two most recent waves, the penetration rate of retail banking in the semi-urban and other urban areas gradually approached that of big cities like Athens or Thessaloniki.

Irrespective of whether household income or wealth is controlled for, the composition (size) of the household does not appear to have any significant effect on the probability of having

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[14] Net wealth is defined as total household assets minus liabilities for housing loans.

[15] Cross-wave comparability of the survey results has also determined, in part, the choice of the estimated models and the dependent and independent variables used in this analysis.

| Explanatory variables	All loans (a)	All loans (b)	Housing loans (a)	Housing loans (b)	Other loans (a)	Other loans (b)	Credit cards (a)	Credit cards (b)
Athens-Thessaloniki	1.26**	1.27**	1.14	1.22	1.38***	1.37***	1.52***	1.5***
Semi-urban areas	1.09	1.02	1.18	1.14	1.2	1.12	0.97	0.92
Single	0.88	0.72**	0.81	0.64**	0.88	0.78*	0.89	0.77*
Couple	0.89	0.87	1.18	1.13	0.83	0.81	0.68**	0.67***
Couple with one child	1.18	1.15	1.05	1.03	1	0.97	0.78*	0.77*
Couple with three children	1.35	1.37	1.13	1.12	1	1.01	0.61**	0.62*
Other households	1.19	1.14	1.01	0.92	1.05	1.05	0.88	0.86
Under 25 years old	0.49***	0.53***	0.61	0.58	0.56**	0.61**	0.44***	0.45***
25-29 years old	0.79	0.79	0.67	0.63*	0.84	0.86	0.73*	0.73*
40-49 years old	0.77*	0.78*	0.83	0.89	0.87	0.86	0.86	0.86
50-59 years old	0.71**	0.78*	0.78	0.89	0.72**	0.76*	0.67**	0.73**
60-69 years old	0.48***	0.5***	0.36***	0.38***	0.57**	0.6**	0.62**	0.67*
70-79 years old	0.25***	0.26***	0.18***	0.19***	0.32***	0.34***	0.45***	0.5**
80 years old and over	0.21***	0.21***	0.13***	0.12***	0.24***	0.25***	0.15***	0.15***
Primary education (incomplete or no education)	0.65*	0.54**	0.34**	0.27**	0.73	0.68	0.82	0.75
Primary education (complete)	0.89	0.85	0.92	0.85	0.84	0.84	0.78	0.76*
Upper secondary education (complete)	1.23*	1.36**	1.24	1.4*	1.09	1.18	1.12	1.22
Tertiary (higher) education (complete)	1.15	1.37*	1.19	1.53**	1.17	1.29*	1.44**	1.67***
Income up to €6,000	0.32***		0.55*		0.33***		0.38***	
Income from €6,001 to €12,000	0.7***		0.83		0.71**		0.8*	
Income from €18,001 to €24,000	1.1		0.98		1.2		1.2	
Income from €24,001 to €30,000	1.44**		1.29		1.28*		1.4*	
Income over €30,000	1.84***		1.49**		1.77***		2.35***	
Without assets		0.36***		0.7		0.36***		0.74
Assets from €1 to €10,000		0.66**		0.52*		0.8		1.01
Assets from €50,001 to €100,000		0.96		0.8		0.9		1.35*
Assets from €100,001 to €300,000		0.92		0.51***		1.25		1.73***
Assets over €300,000		1.34*		0.46***		1.94***		2.36***
One household member in employment	1.69***	2.24***	1.86***	2.4***	2***	2.48***	2.01***	2.55***
Two household members in employment	2.23***	3.79***	2.49***	3.94***	2.55***	3.93***	1.94**	3.3***
Three or more household members in employment	2.83***	5.68***	2.68***	4.81***	3.97***	7.02***	2.4**	5.05***
Self-employed	1.59***	1.38**	1	1.13	1.57***	1.3*	1.62***	1.42**
Employer	0.76	0.72	0.87	1.15	0.7*	0.58**	0.87	0.84
Pensioner	1.13	1.4*	1.56*	2.04***	1.21	1.37*	1.14	1.36
Other economically inactive	1.23	1.21	0.95	0.98	1.38	1.28	1.7*	1.59*
Homeowner	1.44***	1.04	9.36***	10.83***	0.92	0.61***	1.03	0.74**
Immigrant	0.43***	0.4***	1.2	1.03	0.37***	0.36***	0.18***	0.17***
Civil servant	1.21	1.26*	1.58***	1.68***	0.91	0.92	0.84	0.88

Note: *Reference categories*: Residence location: other urban areas; household type: couple with two children; age: 30-39; educational level: lower secondary (complete); income: from €12,001 to €18,000; wealth: from €10,001 to €50,000; number of household members in employment: zero; employment status: employee; housing tenure: owned; nationality: other than Greek; working in the public sector: no.
*, **, ***: Statistically significant at the 10% level, the 5% level and the 1% level, respectively.

a loan. Although this probability increases with family obligations, the estimated coefficients were not statistically significant except in the case of single-member households in type-2 models, which, in comparison to the reference group of couples with two children, had a significantly lower probability of having a loan. This had been even more apparent in Wave 2 data, where single-member households, couples without children and couples with one child had a far lower likelihood of having a loan than the reference group. In part, these differences can be attributed to the influence of demand and supply factors. On the demand side, the growth of real household income (at an average annual rate of 3.3% in the two-year period from 2006 to 2007), combined with the fall in bank interest rates to relatively low levels in the period between the second and the third wave, notwithstanding an upward trend, contributed to a favourable financial environment, supportive of strong loan demand. At the same time, keen competition among banks, which in particular forced them to offer a wide range of products to meet differing customer needs, helped banks to penetrate these diverse social groups and, thereby, increase their clientele – and all the more so that this, as noted above, is controlled for household income and net wealth.

The age of the household head also appears to have a significant effect on the probability of a household having a loan. Specifically, this probability is much lower if the household head is aged over 60 or under 25 than in the intermediate age groups. For instance, the odds of a household with a head aged 30-39 (reference age category) having a loan are four times higher than the corresponding odds for households headed by individuals aged 70 and over, and almost twice the odds of households headed by individuals under 25. The resulting bell-shaped odds curve[16] (see Chart 2) is perhaps to be expected, as it seems to reflect both supply and demand factors.[17] Specifically, on the supply side, it is most probable that banks are more reluctant to grant loans to households with a head under 30,

Chart 2 Estimated probability of borrowing by age group and type of loan

Source: Calculations based on survey data.
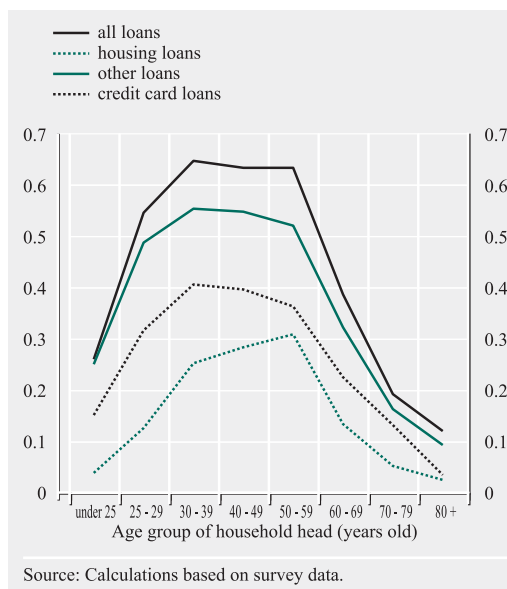
compared with households headed by individuals of intermediate age groups, due to the increased uncertainty that generally surrounds their future income flows. Younger households are also less likely to have accumulated enough assets to serve as collateral for the loans they take. On the other hand, households with a head over 60 are normally expected not to have any outstanding housing debt. Moreover, the majority of household heads of that age are pensioners and therefore their consumer expenditure must depend, according to the life cycle theory, apart from their savings (i.e. their wealth), chiefly on their current income, which they do not expect to change to a degree which would require them to change their standard of living correspondingly and to fund any possible shortfalls via borrowing. This is broadly consistent with the conclusions reached using data from the earlier two waves.

16 Shifting to Model 2, which includes net wealth as an explanatory variable, does not significantly alter the shape of the estimated odds curve. The odds shown in Charts 2 to 4 were estimated using the mean values of the other variables.
17 Similar results were obtained in a number of foreign studies. See, for example, Cox and Jappelli (1993), Del-Río and Young (2005), Girouard et al. (2007) and La Cava and Simon (2003).

Household income and wealth influence the probability of a household having a loan. Specifically, the results of the logistic regression point to the existence of a strong positive correlation between income and the probability of a household having some type of loan, given that the higher the income group, the higher this probability becomes (see Chart 3). For instance, the estimated odds of a household with an annual income of over €30 thousand having a loan are about 5.8 times greater than the corresponding odds for households earning less than €6 thousand per annum. This relationship persists irrespective of whether household borrowing is examined as a whole or housing loans are examined separately from other categories of loans, but seems to be somewhat more pronounced for credit card loans. Similar results were also obtained using data from Waves 1 and 2.

A positive correlation is also found between the probability of borrowing and household net wealth. Households with net assets in excess of €300 thousand are 3.7 times as likely to have a loan as households without assets. However, this applies only to non-housing loans; in the case of housing loans, there does not seem to be a similar relationship between the probability of having a loan and net wealth. This is perhaps to be expected, as (a) housing loans are mostly secured by mortgage over the real property for which the loan is made, and (b) it is a household's income, rather than its net wealth (i.e. assets minus housing liabilities), that guarantees the proper servicing of its loans.

The educational level of the household head seems to be positively correlated with the probability of a household having a loan, especially when net wealth, instead of income, is included as an independent variable (see Chart 4). This is broadly in line with the results from the previous two waves and may be due to the fact that the educational level partly determines not only a household's income but also its ability as a prospective borrower to analyse available loan information, thereby reducing its market entry cost. Indeed, when income is not

Chart 3 Estimated probability of borrowing by income group and type of loan

Source: Calculations based on survey data.
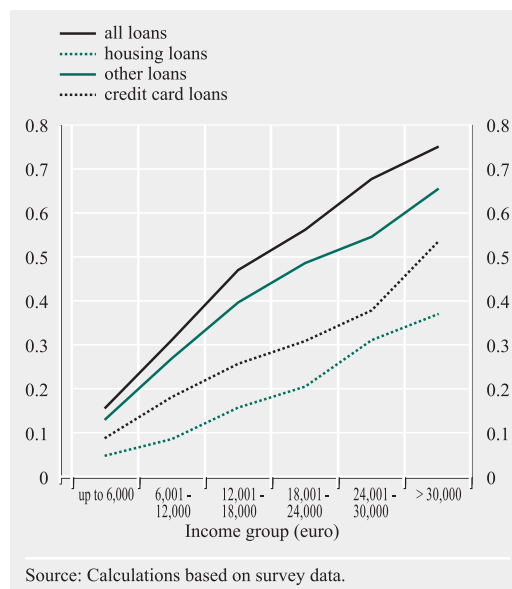
Chart 4 Estimated probability of borrowing by educational level and type of loan

Source: Calculations based on survey data.
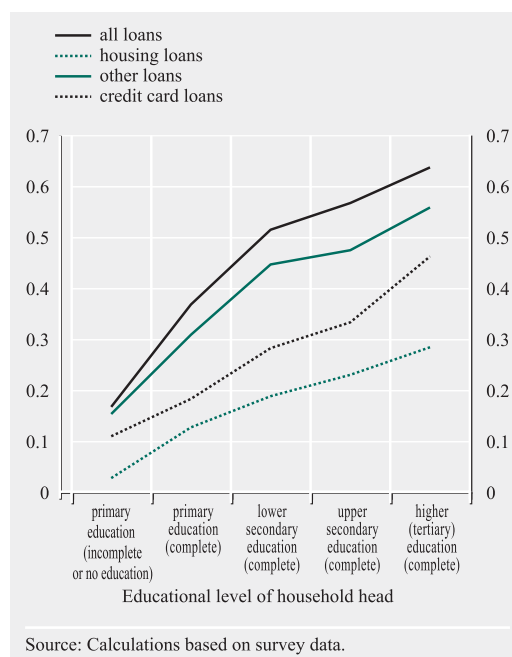
included in the model, the educational level is statistically significant in almost all cases and emerges as an essential determinant of the

probability of a household having a loan. For instance, households headed by a tertiary education graduate have an almost three times higher probability of having a loan compared with households in which the head has not completed primary education. The corresponding odds ratio is even greater (4.6) for housing loans.[18]

As in the previous waves, the likelihood of a household having a loan increases significantly with the number of household members in employment, and therefore, as can be seen in Table 2, households with more than one member in employment are more likely to have a loan, particularly a non-housing loan, irrespective of whether household income or net wealth is controlled for. This may reflect the fact that more members of the household usually have other loans, particularly consumer loans, than housing loans, for which just one member of the household is often liable.

Whether the household head works in the public or the private sector has an effect on the probability of the household having taken out a housing loan. Being a civil servant increases this probability but does not have an effect on the probability of having taken out other loans. This mainly seems to reflect supply-side effects, as the permanency of employment in the public sector provides sufficient guarantees as to the future income flow of civil servants, making it easier for them to access long-term bank lending, including housing loans. A similar result was also obtained in the previous two waves. Whether the household head is an economic migrant or not can also significantly influence the probability of the household having a loan. Specifically, economic migrants have a 2.5 times lower probability of having a loan, although this seems to apply only to non-housing loans (2.8 times lower), and particularly loans through credit cards (5.9 times lower), and it is unclear whether it reflects demand- or supply-side factors.

Finally, the profession (type of employment) of the household head does not seem, in gen-eral, to influence the probability of the house-hold having a loan, particularly a housing loan, irrespective of whether household income or net wealth is controlled for. Nonetheless, households whose head is self-employed are relatively more likely to have a non-housing loan, although this may at least partly reflect their business needs.[19]

5 ASSESSING FINANCIAL STRESS AMONG HOUSEHOLDS

As mentioned earlier, the Wave 2 and 3 questionnaires contained a number of questions asking respondents about their attitudes towards the regular servicing of their loans and their perceived difficulties. As can be seen from the relevant responses in the last wave, 12.6% of households do not pay their loan instalments regularly. This figure is a little higher than in 2005 (11.2%) and conceals significant variation across loan categories. The highest percentage is observed in consumer loans, where 16.8% (2005: 14.9%) of indebted households reported that they did not pay instalments for servicing these loans regularly, while the corresponding percentage for housing loans is 11.2% (2005: 8.6%). These percentages, though not entirely comparable with the percentages of corresponding bank loans, which according to data submitted by banks to the Bank of Greece are in arrears of at least three months,[20] lead to exactly the same conclusion, i.e. that consumer loans have an overall higher credit risk for banks than housing loans.

Table 3 presents the shares of households reporting "difficulty in regularly servicing their

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18 Similar conclusions are reached by Margi (2002) using data from an Italian household survey.

19 The results presented here with respect to age, income, wealth, number of household members, degree of urbanisation and educational level broadly concur with those of European Commission (2008) for the EU-25 and the individual countries examined.

20 The survey asked whether or not households paid their loan instalments regularly. Therefore, notwithstanding the general caveats applying to the evaluation of the results of such surveys, the households' responses covered arrears in the servicing of their loans of up to three months.

Difficulty in:	Total		<7,500		7,501-15,000		15,001-25,000		25,001-35,000		>35,000	
	2007	2005	2007	2005	2007	2005	2007	2005	2007	2005	2007	2005
– paying housing loan instalments	57.3	53.8	71.4	83.3	85.2	61.3	70.2	58.7	51.7	48.9	32.4	32.8
– paying credit card instalments	49.3	54.2	55.6	75.8	67.7	64.6	61.4	51.7	45.6	51.6	25.7	36.0
– paying other bank loan instalments	68.4	67.0	94.7	87.5	84.5	78.7	65.4	63.6	70.3	66.7	50.5	50.0
– paying instalments to retailers	51.4	53.5	66.7	85.7	54.5	47.6	60.5	50.0	35.7	-	46.7	-
– paying their rent	66.7	61.6	87.0	84.1	76.4	66.9	67.0	54.3	51.3	33.8	19.4	25.0
– paying their public utility bills	57.9	50.0	80.0	71.0	71.4	56.1	61.0	45.2	44.1	35.5	30.0	22.7

The top of the table above the income columns is headed: **Income group (in euro)**

* Comprising the households which reported that is "difficult" or "rather difficult" for them to meet their obligations.
- : The number of households in these groups is too small to be statistically assessed.

obligations".[21] These are relatively high and in 2007 were even higher overall compared with 2005. One notable exception is the decrease, from 54.2% in 2005 to 49.3% in 2007, in the proportion of households reporting difficulties in paying their card loan instalments. On balance, there is a very large proportion of households, particularly in the low-income groups, which have difficulties in servicing their obligations. The main reason for this is their low income and the resulting relatively high marginal utility they attach to each of its units. This is also the reason why the financial position of these households is more vulnerable to any rise in interest rates or change in economic conditions. Overall, the percentages derived from both waves of the Bank of Greece survey seem to confirm the result of the NSSG Household Budget Survey 2004/2005, where 77.3%[22] of households reported difficulties in meeting their needs, but are generally lower than that.

The "ability-to-pay" theory maintains that households will not have difficulties in regularly servicing their loan obligations provided that their income flow remains sufficient to meet these obligations without undue financial burden.[23] In this context, household indebtedness, defined as the ratio of household debt to household income, usually serves as a meas-ure of financial stress. The greater this ratio, the more difficult it becomes for a household to service its loans, ceteris paribus. The debt servicing ratio, which is the ratio of debt payments due by the household in a given (e.g. three-month) period to its income over the same period, represents another, more specialised, measure, which shows the proportion of the household's income devoted to the servicing of its loans. Obviously, ceteris paribus, the greater this ratio, the higher the financial stress on households, since they are left with lesser income to pay for other (possibly more vital) needs.[24]

According to the 2007 survey, for 78% of households the debt servicing ratio does not exceed 33%, while for 84% of households it does not exceed 40%. Although these data point to an increase in financial stress between

21 Comprising households which reported that it is "difficult" or "rather difficult" to meet their obligations.
22 This figure is the sum of the percentages of households that, to the question of the NSSG Household Budget Survey 2004/2005 "How do you meet your needs?", responded: "with great difficulty" (18.2%), "with difficulty" (23.8%) or "with some difficulty" (35.3%).
23 See Whitley et al. (2004).
24 May and Tudela (2005) found that when the mortgage debt servicing ratio is up to a level of around 20%, it has no effect upon payment problems; beyond this level, however, payment problems increase with it. Similarly, Whitley et al. (2004) found that the debt servicing ratio is the most important determinant of the totality of arrears on mortgage and credit card debt.

2005[25] and 2007,[26] for the vast majority of indebted households the direct financial stress lies within limits, which are generally not thought to create difficulties in the regular servicing of their loans.[27] It is, however, of interest to explore in greater detail the particular characteristics of households with a debt servicing ratio in excess of 40%, i.e. households which are —or are expected to be— under the greatest financial stress. This is all the more interesting in light of the observation that debt is heavily concentrated among these households given that, although they account for only 16% of indebted households, they contribute 36.6% to the total debt owed by the sample.

FINANCIAL STRESS AND SOCIO-ECONOMIC CHARACTERISTICS OF HOUSEHOLDS

In view of the above, and also on the basis of available evidence from the Bank of Greece 2007 survey wave, the financial stress on Greek households can be proxied by six indicators. Of the six indicators, four —constructed on the

basis of participants' responses to the question "Over the past six months how difficult has it been for you or a member of your household to pay instalments on this loan?"— measure the degree of difficulty experienced by a household in paying instalments on (a) any loan (b) a housing loan (c) other (i.e. non-housing) bank loans and (d) credit card loans. These indicators take the value 1 if the household responds "it has been difficult" or "it has been rather difficult" and 0 otherwise. The two remaining indicators are: a debt servicing ratio in excess of 40% and the irregular payment of

[25] According to Wave 2 data, for 81% of households the debt servicing ratio did not exceed 33%, while for 88% it did not exceed 40%. See Bank of Greece, *Annual Report 2005*, Annex to Chapter VI, Athens 2006.
[26] The increase in financial stress is directly linked to the evolution of the interest rates applied by banks to the outstanding amounts of the main categories of consumer and housing loans, which, on average, grew by 107 and 39 basis points respectively in the two-year period from 2005 to 2007, broadly mirroring a 175 basis point rise in key ECB interest rates between December 2005 and December 2007.
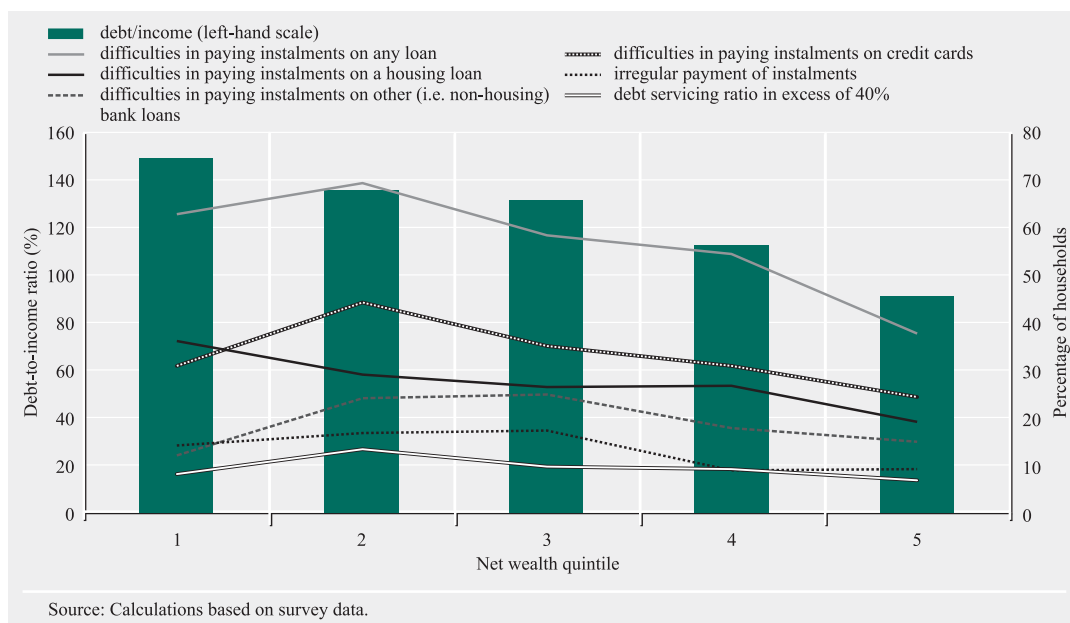[27] According to the international literature, a debt servicing ratio of up to 30% or 40% is not considered to impose significant difficulties in the regular servicing of household loans. See, for instance, DeVaney (1994) and Lytton et al. (1991).

Chart 5 Distribution of financial stress among households by income quintile
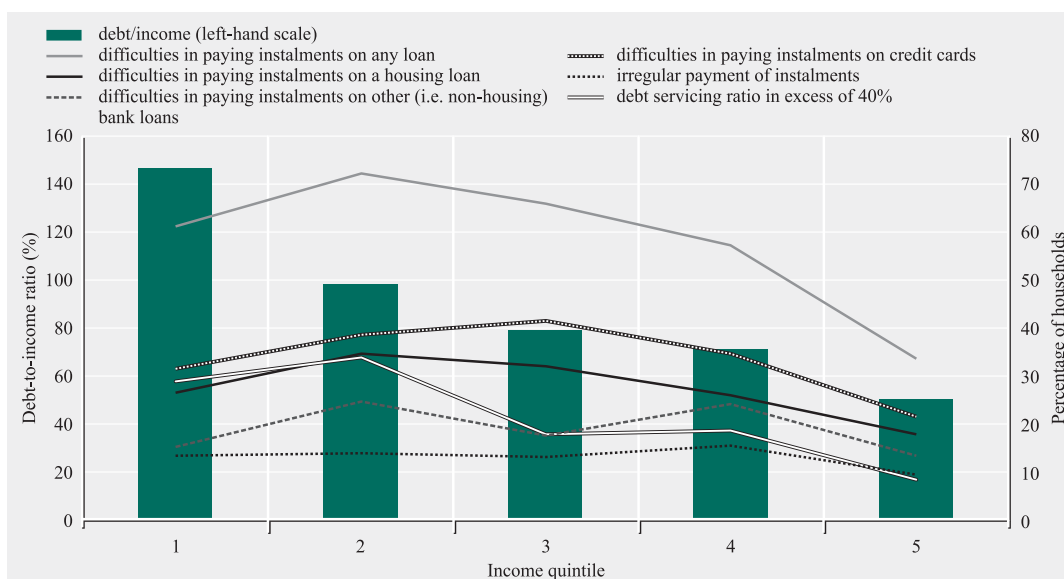
Source: Calculations based on survey data.

Chart 6 Distribution of financial stress among households by net wealth quintile

Legend:
- debt/income (left-hand scale)
- difficulties in paying instalments on any loan
- difficulties in paying instalments on a housing loan
- difficulties in paying instalments on other (i.e. non-housing) bank loans
- difficulties in paying instalments on credit cards
- irregular payment of instalments
- debt servicing ratio in excess of 40%

Y-axis (left): Debt-to-income ratio (%)
Y-axis (right): Percentage of households
X-axis: Net wealth quintile

Source: Calculations based on survey data.

loan instalments,[28] irrespective of the type of the loan.

Charts 5 to 8 present the distributions of the above indicators according to some key socio-economic characteristics of households. As seen in Chart 5 depicting the relationship between each of these indicators and income, the level of household indebtedness, as measured by the "debt-to-income" ratio, tends to decrease as household income increases. On average, this ratio is about three times higher for households in the first income quintile than for households in the fifth quintile. Moreover, as might have been expected, the proportion of households reporting difficulties in servicing their loan obligations tends to decrease in higher income quintiles. This tendency is, in general, more pronounced for households having difficulties in servicing any type of loan and those with a debt servicing ratio in excess of 40%. Notwithstanding that, households experiencing difficulties account for a considerably lower percentage in the top income group than in the other income groups, irrespective of loan category. A strong negative relationship is observed, as expected, between income and the proportion of households in each income group which have a debt servicing ratio in excess of 40%. This proportion is 3.5 times higher in the first quintile than in the fifth quintile. By contrast, the proportion of households in each income group reporting not servicing their loans regularly does not appear to be influenced by income, even though it is much lower in the fifth quintile than in the other quintiles.

Controlling for net household wealth does not materially alter these distributions and thus, as the fairly close link between income and wealth might have led one to expect, the debt-to-income ratio tends to decrease with higher net wealth (Chart 6). As for the percentage of households that reported difficulties in servicing their loans, it, too, tends to decrease with higher net wealth, as also does the percentage

28 Irregular loan servicing refers only to cases where borrowers fall into arrears or have defaulted on their loan payments and not to cases in which borrowers pay their loan instalments regularly but have difficulty in making up and paying the amounts due, i.e. cases where respondents report difficulties in paying their loan instalments.

debt/income (left-hand scale)
difficulties in paying instalments on any loan
difficulties in paying instalments on a housing loan
difficulties in paying instalments on other (i.e. non-housing)
bank loans

difficulties in paying instalments on credit cards
irregular payment of instalments
debt servicing ratio in excess of 40%

Source: Calculations based on survey data.

debt/income (left-hand scale)
difficulties in paying instalments on any loan
difficulties in paying instalments on a housing loan
difficulties in paying instalments on other (i.e. non-housing)
bank loans

difficulties in paying instalments on credit cards
irregular payment of instalments
debt servicing ratio in excess of 40%

Source: Calculations based on survey data.
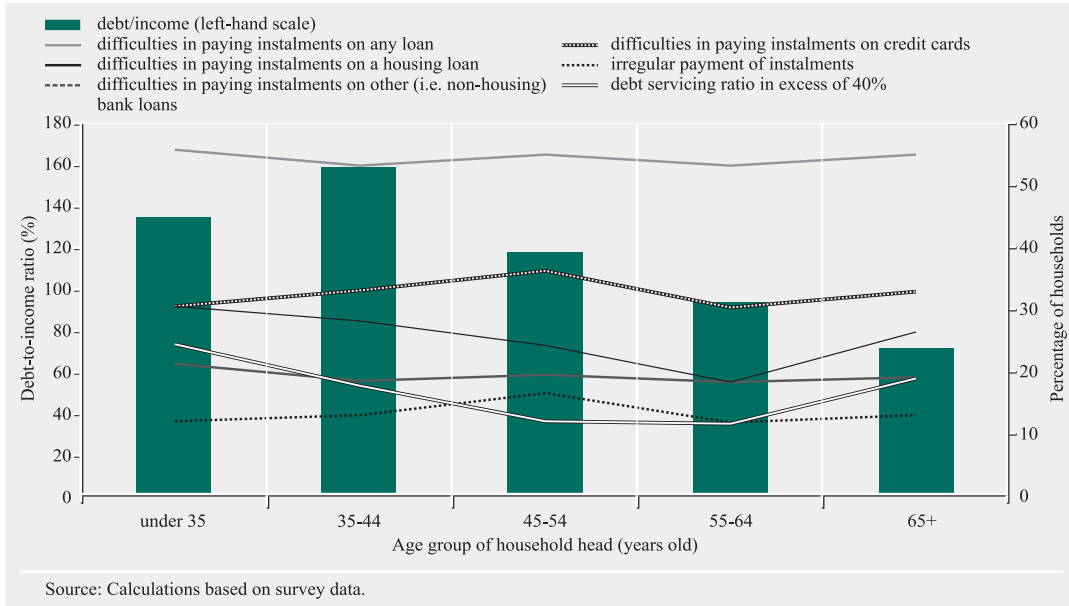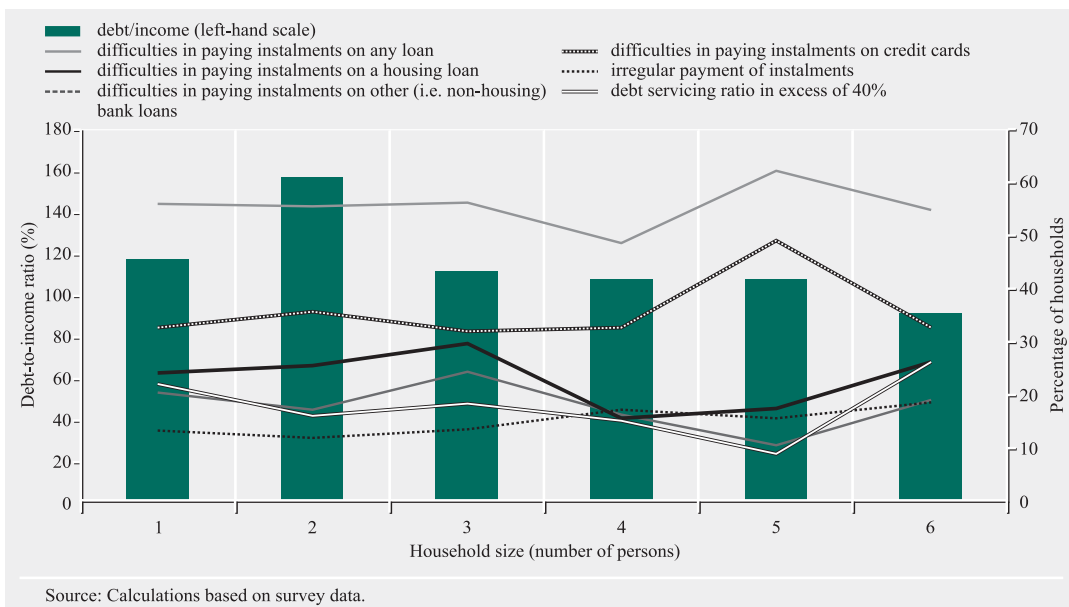
of households with a debt servicing ratio in excess of 40%. Lastly, net wealth, just like income, does not appear to have an effect on irregular loan servicing.

Chart 7, exploring the relationship between the age of the household head and the financial stress indicators, reveals that the debt-to-income ratio tends to increase in the two

youngest age groups (up to 34 and 35-44) and then gradually declines in every age group up to 65 and over. Payment difficulties do not seem to vary substantially across age groups when all loans are taken into account. However, in the analysis by type of loan a negative relationship is found for housing loans, as the proportion of households experiencing related payment difficulties tends to decline with age. This seems to be associated with the fact that housing loans are generally taken out at a younger age and therefore households headed by older individuals tend to have no or little outstanding debt in this form. The same fact seems to be responsible for the negative relationship between age and the proportion of households with a debt servicing ratio in excess of 40%. Moreover, the age of the household head, just like income and net wealth, does not seem to be associated with irregular loan servicing.

Lastly, a positive relationship is found between household size and loan payment difficulties (Chart 8). It is important to note, however, that this result masks a positive relationship for credit cards and a stronger negative relationship for housing loans. A negative relationship also emerges in the case of a debt servicing ratio in excess of 40%. The percentage of households with a debt servicing ratio of that order is relatively high among single-member households and couples without children and tends to decrease with larger household sizes. By contrast, household size is positively associated with irregular loan servicing, as the latter is more frequent among larger households.

LOGISTIC REGRESSION ANALYSIS OF FINANCIAL STRESS

Alternative logistic regression models, similar to the ones used in the preceding section (on borrowing and the socio-economic characteristics of households), were also estimated to gain insights into the socio-economic factors that explain the borrowing attitudes of households reporting difficulties in servicing their

loan obligations. Results are presented in Table 4 and the independent variable coefficients have the same explanation as in the analysis of household borrowing.

The figures in Table 4 confirm expectations that income and wealth are key determinants of the difficulties the servicing of loan obligations imposes on households. Households in the top income group (over €30,000) are 5 times less likely than households in the reference income group (€12,000 to €18,000) to have difficulties in servicing their loan obligations. It is essential to note, however, that this strongly negative relationship between loan servicing difficulties and income results largely from household attitudes towards the servicing of credit card loans. In the case of housing loans, there is no statistically significant relationship between difficulties and household income for incomes lower than €24,000. This finding seems to be more closely related to supply-side factors than demand-side factors, possibly suggesting that banks' information requirements about the income earning capacity of their prospective borrowers are more demanding for the granting of housing loans than for the granting of credit card loans, for which a negative relationship between difficulties and income is observed in the lower earning groups. In other words, in the case of housing loans, it is a fuller assessment of the income earning capacity of prospective borrowers that eventually ensures the regular servicing of loans extended by banks. A similar result is obtained for households in the two wealthiest groups (over €100,000), as they too are much less likely to have difficulties in servicing a loan of any type.

Due to its overall positive association with income and wealth, the educational level of the household head appears to have the potential to ease loan payment difficulties faced by households. Indeed, households headed by a tertiary education graduate have a much lower likelihood of experiencing difficulties than those headed by a lower secondary education

Table 4 Logistic regression results (The ratio of the odds of a specific household group having loan payment difficulties to the odds of the reference group)

Explanatory variables	All loans (a)	All loans (b)	Housing loans (a)	Housing loans (b)	Other loans (a)	Other loans (b)	Credit cards (a)	Credit cards (b)
Athens-Thessaloniki	0.61***	0.63***	0.56**	0.64*	0.62***	0.62***	0.57**	0.61*
Semi-urban areas	0.85	0.89	0.84	1	1.37	1.39*	0.67	0.79
Single	0.52***	0.65*	0.49	0.72	0.65*	0.73	0.35***	0.45**
Couple	0.9	0.98	0.75	0.76	1.42*	1.49*	0.75	0.82
Couple with one child	0.74*	0.79	0.5**	0.55*	1.2	1.23	0.45**	0.54**
Couple with three children	0.56**	0.56**	0.28**	0.3**	1.09	1.04	0.43**	0.37**
Other households	0.85	0.92	0.76	0.85	0.98	1	0.44***	0.48**
Under 25 years old	0.64	0.64	0.52	0.35	1.16	1.24	0.63	0.88
25-29 years old	1.26	1.38	1.03	1.13	1.44	1.61*	1.23	1.71
40-49 years old	1.16	1.15	0.94	0.99	1.2	1.22	1.6*	1.74**
50-59 years old	0.76	0.66*	0.49*	0.45**	0.78	0.75	1.88*	1.76*
60-69 years old	0.66	0.59*	0.89	0.86	0.44**	0.43**	1.3	1.4
70-79 years old	0.59	0.49*	0.23*	0.24*	0.45*	0.43*	0.77	0.68
80 years old and over	0.45	0.39			0.66	0.59		
Primary education (incomplete or no education)	0.69	0.71			1.32	1.24	0.39	0.25*
Primary education (complete)	1.7**	1.72**	2.44*	2.35*	1.88**	1.92**	1.35	1.32
Upper secondary education (complete)	0.78	0.66**	1.14	0.79	0.76	0.7*	0.64	0.55*
Tertiary (higher) education (complete)	0.64**	0.48***	1.38	0.76	0.56**	0.46***	0.63	0.5*
Income up to €6,000	0.86		1.47		0.97		1.07	
Income from €6,001 to €12,000	0.84		1.8		0.76		0.65	
Income from €18,001 to €24,000	0.62**		0.85		0.76		0.43**	
Income from €24,001 to €30,000	0.43***		0.3***		0.66*		0.32***	
Income over €30,000	0.2***		0.16***		0.31***		0.15***	
Without assets		0.74		1.85		0.33***		0.39*
Assets from €1 to €10,000		1.34		2.07		1		0.93
Assets from €50,001 to €100,000		0.83		0.66		0.99		0.52*
Assets from €100,001 to €300,000		0.51***		0.49*		0.59**		0.32***
Assets over €300,000		0.36***		0.42*		0.43***		0.32***
One household member in employment	1.88**	1.37	1.74	0.88	2.44***	1.94**	2.91**	2.08*
Two household members in employment	2.26**	1.02	1.94	0.49	3.48***	1.99**	2.45*	0.87
Three or more household members in employment	3.04***	0.91	3.01	0.47	5.82***	2.24**	2.53	0.65
Self-employed	1.18	1.35*	1.7*	1.66*	1.17	1.26	1.03	1.1
Employer	0.73	0.7	1.47	1.36	0.56	0.53	0.72	0.61
Pensioner	1.74*	1.38	1.79	1.07	2.64***	2.26***	1.14	0.82
Other economically inactive	2.55**	2.35**	0***	0***	1.46	1.54	2.08	2.01
Homeowner	0.99	1.34*	0.85	1.15	0.97	1.07	0.52***	0.73
Immigrant	1.36	1.63*	1.44	2.62*	1.63	1.93*	0.87	1.19
Civil servant	0.72*	0.7*	0.77	0.73	1.11	1.07	0.56**	0.47**

Note: *Reference categories*: Residence location: other urban areas; household type: couple with two children; age: 30-39; educational level: lower secondary (complete); income: from €12,001 to €18,000; wealth: from €10,001 to €50,000; number of household members in employment: zero; employment status: employee; housing tenure: owned; nationality: other than Greek; working in the public sector: no.
*, **, ***: Statistically significant at the 10% level, the 5% level and the 1% level, respectively.

graduate (reference group), and particularly a primary education graduate. This may be partly due to more educated individuals being able to better comprehend and analyse the exact terms of the loans they contract with credit institutions.

Household size emerges as another significant determinant of the probability of a household having difficulties in servicing its loans, especially when income is controlled for. Single-member households and couples with three children are less likely overall to have difficulties in servicing their loans compared with other households. Specifically, this probability is about twice lower for couples with three children than for couples with two children (reference category), which seems to primarily reflect differences in their respective attitudes towards the servicing of housing loans. Since income and other household characteristics are controlled for, this latter result must be associated with the economies of scale that larger households achieve in their spending (on both durable and non-durable goods), which, ceteris paribus, improve their ability to regularly service their loans.

Pensioners also have an increased likelihood of having difficulty servicing loans, particularly non-housing loans, and the same is true, but to a smaller extent, for households headed by self-employed individuals, mostly in relation to housing loans. Looking at the degree of urbanisation of residence location, households located in Athens or Thessaloniki are likely to experience much less difficulty than households residing in other urban or semi-urban areas.

In addition, this paper attempted an analysis of the socio-economic characteristics of households reporting not servicing their loans regularly. As shown by Table 5 presenting the results of the relevant logistic regressions, the probability of a household not servicing its loans regularly does not seem to be influenced by the income or size of the household or the urbanisation of its location of resi-

dence. By contrast, irrespective of whether household income or wealth is controlled for, households headed by relatively young[29] individuals (under 30) and households with three or more members in employment have a higher probability of not servicing their loans regularly. This could suggest that working household members act independently from one another in the context of their financial independence.

Finally, the last two columns of Table 5 present the results of the logistic regression on the socio-economic characteristics of households which have a debt servicing ratio in excess of 40%. As might have been expected, the probability of a household having a debt servicing ratio in excess of 40% declines sharply with higher income and maybe wealth. Specifically, households in the top income group have a more than six times lower probability of having a debt servicing ratio in excess of 40% compared with the reference group (€12,001 to 18,000), whereas the corresponding probability for the bottom income group is almost 5.5 times as much as that for the reference group. The age of the household head also appears to have an effect on this probability. Older individuals (50 and over) are much less likely to have a debt servicing ratio in excess of 40%. By contrast, homeownership increases this probability. More than 78% of the total debt owed by households with a debt servicing ratio in excess of 40% comes from secured housing loans, which means that the relevant borrowers must own their homes. Lastly, this probability is greater if the household head is self-employed or employer, while the size of the household, the urbanisation of its location of residence and the educational level of the household head do not seem to influence it.

29 Besley et al. (2008), using data from the UK Family Expenditure Surveys for the years 1975-2005, found that households with younger heads were more exposed to the terms on which they accessed the credit market than households with older heads. Similar results were reported by Brown and Taylor (2008), Hull (2003) and La Cava and Simon (2003) using data from household panel surveys for (i) Germany, Great Britain and the United States, (ii) New Zealand and (iii) Australia, respectively.

Table 5 Logistic regression results - Irregular payment of loan instalments and debt servicing ratio in excess of 40%

Explanatory variables	Irregular payment		Debt servicing ratio in excess of 40%	
	(a)	(b)	(a)	(b)
Athens-Thessaloniki	0.7*	0.75	1.15	1.16
Semi-urban areas	1.13	1.18	1.04	1.15
Single	0.64	0.59*	0.91	1.25
Couple	0.94	0.96	1.49*	1.74**
Couple with one child	0.86	0.88	0.9	1.01
Couple with three children	0.94	0.91	0.98	0.94
Other households	0.7	0.67	0.82	0.96
Under 25 years old	1.18**	1.18**	0.97	1.19
25-29 years old	2.1**	2.21**	1.34	1.49
40-49 years old	1.37	1.45	0.93	0.91
50-59 years old	1.63*	1.69*	0.52**	0.42***
60-69 years old	1.12	1.17	0.2***	0.2***
70-79 years old	2.33	2.21	0.5	0.36*
80 years old and over	0.92	0.78	0.16*	0.15*
Primary education (incomplete or no education)	2.02	1.94	0.99	1.64
Primary education (complete)	1.81*	1.76*	1.5	1.7*
Upper secondary education (complete)	1.57*	1.52*	1.01	0.87
Tertiary (higher) education (complete)	0.93	0.89	1.02	0.72
Income up to €6,000	1.08		5.48***	
Income from €6,001 to €12,000	1.35		1.18	
Income from €18,001 to €24,000	1.31		0.48***	
Income from €24,001 to €30,000	1.38		0.59*	
Income over €30,000	0.64		0.16***	
Without assets		0.7		1.15
Assets from €1 to €10,000		1.71*		0.98
Assets from €50,001 to €100,000		0.84		0.86
Assets from €100,001 to €300,000		0.4***		0.55*
Assets over €300,000		0.3***		0.59*
One household member in employment	1.67	1.67	1.58	0.95
Two household members in employment	1.58	1.46	1.37	0.46*
Three or more household members in employment	3.67**	2.48*	2.12	0.44*
Self-employed	1.24	1.55*	1.88***	2.12***
Employer	1.27	1.6	2.55**	1.9*
Pensioner	1.33	1.43	1.28	0.81
Other economically inactive	1.67	1.79	1.18	1.28
Homeowner	1.1	1.88**	2.92***	3.64***
Immigrant	1.04	0.92	1.05	1.26
Civil servant	1.57*	1.65*	0.95	0.84

Note: *Reference categories*: Residence location: other urban areas; household type: couple with two children; age: 30-39; educational level: lower secondary (complete); income: from €12,001 to €18,000; wealth: from €10,001 to €50,000; number of household members in employment: zero; employment status: employee; housing tenure: owned; nationality: other than Greek; working in the public sector: no.
*, **, ***: Statistically significant at the 10% level, the 5% level and the 1% level, respectively.

6 CONCLUSIONS

From the above analysis, the following main conclusions can be drawn about Greek household borrowing.

According to Wave 3 data, nearly half households (48.6%) do not have loan obligations, although the proportion of respondents reporting an outstanding loan debt was significantly increased compared with 2005 (2007: 51.4%, 2005: 46.9%). This was in principal consistent with the rapid expansion of bank credit to households in the period between the two waves. Credit card loans were the most common category of loans, followed by housing loans. The proportion of indebted households reporting a loan of either type was increased in Wave 3. This increase was more pronounced, however, for credit cards, since about two-thirds of all indebted households reported a debt in this form.

The 2007 wave, just like the previous waves, shows that average household debt increases with income and wealth. This relationship is particularly strong for housing loans and much weaker for other loans as a whole. In greater detail, according to the results of all three waves, access of low-income households to the banking system remains relatively limited and falling, while an increase is observed in both the percentage of indebted higher income households and their contribution to total household debt. This may be due to banks being more aware of their customers' characteristics. At the same time, however, it seems to reflect a significant shift in banks' lending policy, which, in the context of more effective credit risk management, appears to concentrate more now than in the past on attracting customers from upper income groups who are believed to better manage their debt. Meanwhile, robust credit expansion has pushed up the debt-to-income ratio (or household indebtedness) in all income groups. Indebtedness, mainly in the form of unsecured loans, is very increased for households in the bottom income group, although

they make only a minimal contribution to total household debt.

The analysis (using all three waves) suggests that, for the majority of indebted households, the direct financial stress, as measured by the debt servicing ratio (i.e. the instalment-to-income ratio), lies within limits which are generally thought to be acceptable and should not result in difficulties in the regular servicing of household loans. Nevertheless, financial stress deteriorated slightly in the period between the last two survey waves. The shares of households for which the debt servicing ratio does not exceed 33% and 40% fell from 81% and 88% in 2005 to 78% and 84% respectively in 2007, reflecting the rise in bank interest rates over the same period. Notwithstanding that and the strong growth of bank credit to households, the curve of the debt servicing ratio remained relatively low overall, probably reflecting more effective credit risk management by banks, in compliance with the guidelines of the Bank of Greece calling for the implementation of a more far-reaching and forward-looking risk management policy in this area than what competition would lead banks to implement to preserve or increase their share in retail banking.

The econometric estimation of logistic regression models showed that degree of urbanisation, household composition, number of household members in employment and household income and wealth are all significant in determining the probability of a household having a loan. Specifically, this probability is greater for households resident in the two largest cities of Greece, couples with two or more children and households where the head is in an intermediate age group or is more educated or works in the public sector and increases with household income and wealth and the number of household members in employment.

Financial stress, as measured by a range of indicators, is strongly associated with the various socio-economic characteristics of households

and generally tends to decline with higher household income and net wealth. However, this negative relationship originates solely from the component of non-housing loans (it is not statistically supported for housing loans) and may reflect the fact that banks' information requirements about the special characteristics of their prospective customers are more demanding for the granting of housing loans than for the granting of non-housing loans, a view also supported by the previously mentioned observation that the very high indebtedness of low-income households is mainly in the form of non-housing loans. Therefore, reinforcing information available to banks in the area of non-housing loans would enable them to assess the credit quality of their customers and the resulting risk exposure in a more comprehensive and accurate manner. The recent expansion of Tiresias S.A. database has been an important step in this direction, as it reduces the costs incurred by banks for collecting and managing this information. Obviously, improving information available to banks is necessary but not enough to ensure better credit risk management. Banks must also pursue a prudent and forward-looking lending policy based on adequate eligibility criteria and risk pricing. Households, on their part, must carefully balance their personal needs and financial capacity against any other financial obligations they may have and ask banks to provide them with a detailed explanation of the special characteristics of each loan and the risks it incorporates, as appropriate.

Since the last survey wave of the Bank of Greece, bank credit to households has risen further, albeit at a markedly slower pace, reflecting the recent financial turmoil, which has had a pervasive impact on all aspects of household borrowing. Despite the impact of the turmoil, the general conclusions on the borrowing attitudes of households remain valid, although financial stress is probably greater, as interest rates have increased — and continue to remain — above their end-2007 levels notwithstanding a recent fall, while GDP growth decelerated sharply in 2008 and is projected to fall to zero in 2009, thereby inevitably affecting disposable household income and household expectations.

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IS GREECE'S EXPORT PERFORMANCE REALLY LOW?*

Christos Papazoglou
Economic Research Department

1 INTRODUCTION

In spite of Greece's participation in the European Union (EU – initially European Economic Community) since 1981, the opening up of the Greek economy to international trade remains relatively limited. To a large extent, this is attributable to Greece's poor performance regarding goods exports. Indicatively, Table 1 shows receipts from goods exports in million dollars, as a percentage of corresponding payments for imports and of GDP, for the period since the establishment of the Single Market in 1992. Greece's poor export performance is easily ascertained from the fact that during this whole period receipts from goods exports have been stuck on average at 1/3 of payments for goods imports and also steadily below 10% of Greece's GDP.

The basic argument in favour of the establishment of the EU and the Single Market in 1992 was the enlargement of the free trade zone and the creation of a large Single Market within which national production could utilise scale economies to the maximum. This would imply reduced costs per unit of output, enhanced effectiveness of the production process and, at the same time, a possibility for greater product differentiation and thus larger variety of choice for European consumers. Such enlargement was expected to bring about changes in the existing structure of trade between Member States, and chiefly between the regional ones, such as Greece, and the more developed countries of the EU. Particularly for regional Member States, this would lead to tighter economic integration with the other Member States, which would entail changes in the structure of their external trade that would reflect the adjustment of their production patterns.

In spite of all this, however, Table 1 data demonstrate a low export performance of Greek products, which implies that they continue to face problems of effective penetration in foreign, mainly developed, markets. But, is Greece's export performance really low? In other words, given its geographical location, its economy's characteristics and degree of development, its major trading partners and the fact that it has been a member of the EU since 1981, can its export performance be considered low? This is the key question the present study attempts to address by forming an objective criterion as to what the size of Greece's trade flows should be. Specifically, it estimates the size of potential trade flows and then compares it with that of corresponding actual ones.

Table 1 Greek goods exports

Years	Exports (million dollars)	Exports (% of imports)	Exports (% of GDP)
1992	9,842	39.1	9.9
1993	8,777	38.5	9.4
1994	9,175	43.9	9.2
1995	10,960	42.3	9.3
1996	11,001	40.9	8.8
1997	11,167	41.4	9.2
1998	10,868	35.9	8.9
1999	10,693	36.3	8.5
2000	10,961	36.8	9.7
2001	10,303	36.6	8.8
2002	10,766	33.1	8.1
2003	13,518	30.2	7.8
2004	15,224	29.1	7.7
2005	17,500	31.9	7.2
2006	20,908	31.5	7.5
2007	23,900	29.6	7.6

Source: OECD.

The "gravity model" is the methodological tool used for estimating an equation for bilateral export flows between EU Member States. Subsequently, the estimated coefficients are applied in the case of Greece so as to calculate potential Greek exports. In essence, according to the methodology employed, the size of Greece's potential exports is derived based on the assumption that the structure of Greek exports is fully adapted to the EU average. This yields an estimate of the sizes of Greece's potential exports and imports, which are then compared with the actual figures. Furthermore, on the basis of the gravity model the same estimates are made for Portugal, a country with similar characteristics, and then compared with the results for Greece.

The analysis includes the following four sections: Section 2 presents the theoretical foundations of the gravity model, as well as its specific forms employed in the present study. Section 3 considers the methodology used for estimating the potential bilateral trade flows. Section 4 analyses the results on Greece's potential trade flows and compares them with corresponding actual ones. Finally, Section 5 attempts to interpret the findings of the study and formulates the conclusions of the analysis.

2 THE GRAVITY MODEL

The gravity model constitutes a rather simple yet robust approach to estimating bilateral trade flows on cross-section and panel data (see Anderson and van Wincoop, 2003).[1] This model was originally employed by Linnemann (1996), who introduced three key determinants to explain the size of bilateral trade flows: a) importers' demand, b) exporters' supply, and c) the cost associated with the conduct of international trade, with respect to either transport or information. In other words, the model is based mainly on "natural" factors for explaining bilateral trade flows, while economic factors remain constant. Bergstrand (1985) formulates the model as follows:

$$X_{ij}=A_0(Y_i)^{\alpha_1}(Y_j)^{\alpha_2}(N_i)^{\alpha_3}(N_j)^{\alpha_4}(D_{ij})^{\alpha_5}(R_{ij})^{\alpha_6}u_{ij} \ (1)$$

where X_{ij} is the value of exports from country i to country j, $Y_{i(j)}$ is the nominal GDP of country i (j), $N_{i(j)}$ is the population of country i (j), D_{ij} is the distance between country i and country j, R_{ij} denotes dummy variables which restrict (or foster) trade between countries i and j, and u_{ij} represents the random error.

The logarithmic form of equation (1) yields the empirical form of the model, which is the same as that estimated by Sapir (1981) and Brada and Mendez (1985) and can be formulated as follows:

$$\log X_{ij}=\alpha_o+\alpha_1\log Y_i+\alpha_2\log Y_j+\alpha_3\log N_i+\alpha_4\log N_j$$
$$+\alpha_5\log D_{ij}+\alpha_6 ADJDM_{ij}+\alpha_7 INTDM_{ij}$$
$$+\alpha_8 INTD_i+\log u_{ij} \qquad (2)$$

This formulation includes two dummy variables R_{ij}. The dummy variable *ADJDM* takes the value 1 when country i is adjacent to country j, and the value 0 otherwise. The dummy variable *INTDM* takes the value 1 when the country is an EU Member State, and value 0 otherwise. Furthermore, for the reasons explained below, this formulation also includes the variable *INTD*, which denotes the effect arising from the degree to which the exports of country i represent intra-industry trade.

Each of the variables included in equation (2) has a defined impact on the level of trade flows between trading partners. Specifically, the variables representing the income level are expected to have a positive effect on the size of trade flows. On the supply side, larger domestic production implies higher potential for the production of exportable products, while on the demand side, a rise in income, through the mar-

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[1] Gravity models have often been employed to study the structure of international trade flows. Baldwin (1994) used the gravity model to study the impact of EU enlargement, with the accession of the countries of Central and Eastern Europe, on the trade flows between the two regions. Frankel (1997) employed the specific model to estimate the impact of the various regional economic cooperation schemes on the level of trade flows. Finally, Rose (2000) used the gravity model to estimate the impact of a monetary union on the bilateral trade flows between its member states.

ginal propensity for imports, leads to increased imports. Consequently, both coefficients α_1 and α_2 are expected to have a positive sign.

The impact of the variables representing population is unclear. In other words, population size may have either a positive or a negative effect on trade flows size. Specifically, on the one hand, a large population size may imply extensive availability of production resources, and thus a higher possibility of needs being met by domestic production rather than by international trade. If this result is more valid, then coefficients α_3 and α_4 are expected to have a negative sign. On the other hand, a large domestic market (due to a large population) may favour the specialisation of work, which leads to the creation of opportunities for conducting trade on a wider variety of goods. According to this argumentation, coefficients α_3 and α_4 are expected to have a positive sign.

As concerns the distance between countries, a long distance between trading partners implies higher costs and lower profit margins for importers. In general, entrepreneurs prefer to trade more with neighbouring countries, for historical and cultural reasons, which also contribute to the similarity of consumption patterns. Consequently, the sign of coefficient α_5 is expected to be negative.

The dummy variable *ADJDM* represents the existence or non-existence of a common borderline. Specifically, it takes the value 1 when trading partners are adjacent and the value 0 otherwise. Common borders imply a lower cost and easier access to the trading partner's domestic market and consequently coefficient α_6 is expected to have a positive sign.

As concerns the last two variables of equation (2), it can be seen that the gravity equation has been augmented to include the impact of two important economic factors affecting the structure of bilateral trade flows.

One variable regards the impact of the increasing degree of economic integration on bilateral trade flows, and thus refers to the importance of participation in some form of economic regional cooperation, such as the EU. Consequently, the dummy variable *INTDM* takes the value 1 if both trading partners participate in some international regional cooperation scheme, which mainly refers to mutual EU membership, and the value 0 otherwise. Mutual membership implies lower commercial transaction costs as a result of limited or lifted barriers to free trade, and for this reason coefficient α_7 is expected to have a positive sign.

The other variable refers to the degree of intra-industry trade that characterises trade relations of EU Member States, both between them and with their major trading partners. According to OECD data on exports and imports based on a three-digit product classification, the average share of intra-industry trade in the EU-15 countries amounted to about 70% of the total trade of these countries in 2007. The existence of a high degree of intra-industry trade constitutes an important comparative advantage for the trade relations of EU Member States, as it implies that their production systems focus on advanced technology products, a fact also reflecting the preference of these communities for a larger variety of differentiated products. Thus, the last variable, *INTD*, refers to the effect of the degree of intra-industry trade on bilateral trade flows, which is expected to be positive, i.e. $\alpha_8 > 0$.

The model includes the effect of intra-industry trade primarily because of the observation that, while trade relations of the other EU Member States, both between them and with most of their trading partners, are mainly of an intra-industrial form, this is not the case for Greece, in which inter-industry trade characterises most of its trade relations. Indeed, according to the intra-industry trade index based on the classical Grubel and Lloyd (1975) equation and referring to 14 of the EU-15 countries, the average share of intra-industry trade in Greece's total trade in the 1991-2007 period was less than 35%, i.e. the lowest

recorded among Member States.[2] This shows that in spite of Greece's close trade relations with the other EU Member States its degree of intra-industry trade remains low, and thus highlights the importance of examining this as a factor limiting Greece's potential export capacity.

In the analysis that follows, gravity model (2) is first estimated without taking account of the impact of intra-industry trade. Equation A, as it is called, to a large extent constitutes the typical gravity equation, different versions of which have been estimated in many cases in the literature. Then the gravity model is estimated as it appears in equation (2), i.e. with the inclusion of the effect of intra-industry trade. The estimation of equation B aims at investigating the extent to which the lack of a considerable degree of intra-industry trade in Greece's trade relations with its major trading partners limits its potential export capacity.

3 METHODOLOGY AND STATISTICS

The empirical methodology adopted aims at estimating the gravity model so as to empirically investigate the significance of the factors affecting the bilateral trade flows of the EU-15 countries.[3] Then, the coefficients estimated are applied in the case of Greece in order to calculate its potential trade flows. Finally, comparison between potential and existing flows allows for the examination of the degree to which the structure of Greek exports converges to the European average. For estimating the gravity model, the analysis employs cross-sectional data with time-series referring to the bilateral trade relations of the EU-15 countries for the period 1993-2006.

Initially, as already mentioned, the gravity equation must be used for the EU-15 countries. The sample consists of 26 countries: 14 EU Member States (as data for Belgium and Luxembourg are examined together) and their 12 major trading partners outside the EU. On the whole, the sample countries absorb at least 85% of total exports of each EU-15 country. Specifically, the countries outside the EU are: Switzerland, the United States, Japan, Canada, China, Korea, Norway, Hungary, Poland, Russia, Turkey, and the Czech Republic. According to the gravity model, regression is conducted between the exports of each of these EU-15 countries and each of the rest 25 countries of the sample. This corresponds to 350 observations (14x25=350) for each year. Consequently, the total size of the sample for the 14 years examined amounts to 4,900 observations.

The data on bilateral trade flows come from the Direction of Trade publication issued by the International Monetary Fund (IMF), and are expressed in dollar terms. Deflation of these data was performed on the basis of unit export value, published also in dollar terms (1995=100) in IMF's International Financial Statistics publication. Data on actual GDP come from OECD's Main Economic Indicators publication and are expressed in dollars, in 1995 prices and exchange rates. Data on inflation come from the OECD's Quarterly Labour Force Statistics and the IMF's International Financial Statistics. The data on intra-industry trade relate to imports and exports based on the SITC products three-digit classification and come from the OECD's Foreign Trade by Commodity Statistics (available on the Internet). Finally, the distances between countries (their capitals) were calculated on the basis of World Atlas (third edition, 2003).

The results of the estimation appear in Table 2. Equation A includes all the variables except intra-industry trade, while equation B includes all the variables appearing in the gravity model (2). It should be noted that all variables are in logarithmic form. Based on the results of Table 2, all variables have the expected signs and are statistically significant at a 5% significance

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[2] See Foreign Trade by Commodity Statistics, OECD.
[3] The estimates regard the EU-15, not the EU-27, as they refer to the period 1993-2006, and thus mainly concern EU Member States before the 2004 enlargement (and of course that of 2007).

level. According to these results, the income effect, expressed through coefficients α_1 and α_2, appears to be positive and strong, while the effect of both export country population and distance between the countries, expressed through coefficients α_3 and α_5 respectively, appears to be negative and similarly strong. The effect of the population of the import country is positive but less strong, as coefficient α_4 shows. The dummy variables appear to be particularly significant, and the one regarding participation in the EU has a stronger effect than that for adjacency. As concerns equation B, intra-industry trade appears to have a particularly strong positive and statistically significant effect (coefficient α_8). Finally, it should be noted that the estimated results are similar to earlier corresponding estimates (see, for instance, Sapir, 1981, and Oguledo and MacPhee, 1994).

4 GREECE'S POTENTIAL AND ACTUAL TRADE FLOWS

The results regarding Greece's potential trade flows and their comparison with the corresponding actual ones for the years 1993, 1998, 2003 and 2007 appear on Table 3 and Charts

1 and 2. This comparison mainly aims at discovering the extent to which Greece's EU membership and the operation of the Single Market since 1992 have led to a convergence of the above two aggregates. In principle, according to the results, the course of exports is considerably different from that of imports, and this applies in relation to both equations of the sample. Specifically, according to equation A, in 1993 —both export and import— potential sizes are larger than the corresponding actual ones by roughly the same percentage (9% for exports and 8% for imports). Subsequently, however, as potential exports increased at a faster rate than actual exports, the difference grew considerably. By contrast, in the case of imports actual size increased faster than potential size, and thus actual imports reached a level higher than that of potential imports. In other words, the differential between potential and actual sizes appears to widen in favour of the former in the case of exports and in favour of the latter in the case of imports. Thus, it appears that while foreign products have utilised the opportunities created by the establishment of the Single Market in the EU and have suc-

Chart I Greece's potential-to-actual-exports ratio
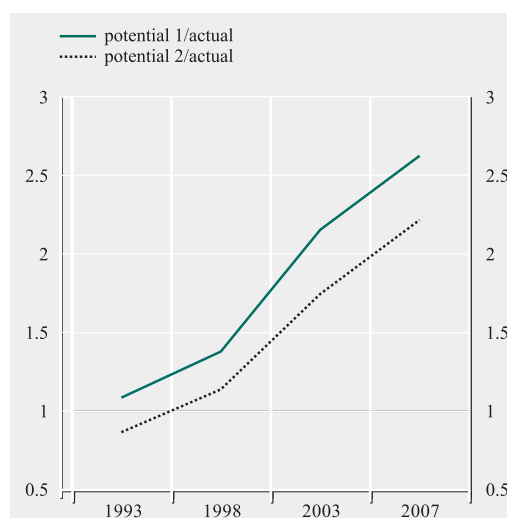
Note: Potential (flows) 1 are those derived from equation A and potential (flows) 2 are those derived from equation B.

Table 3 Greece's trade flows

(million dollars)

	1993			1998			2003			2007		
	EU	Non-EU countries	Total	EU	Non-EU countries	Total	EU	Non-EU countries	Total	EU	Non-EU countries	Total
Exports												
Actual	5,765	1,155	6,920	5,730	1,655	7,385	6,140	2,550	8,690	10,200	3,630	13,830
Potential 1	4,885	2,655	7,540	6,780	3,420	10,200	12,235	6,445	18,680	22,620	13,580	36,200
Potential 2 (with intra-industry trade)	3,875	2,165	6,040	5,585	2,840	8,425	9,970	5,280	15,250	18,880	11,855	30,735
Potential 1/Actual	0.85	2.30	1.09	1.18	2.07	1.38	1.99	2.53	2.15	2.22	3.74	2.62
Potential 2/Actual	0.67	1.87	0.87	0.97	1.72	1.14	1.62	2.07	1.75	1.85	3.27	2.22
Potential 1/Potential 2	1.26	1.23	1.25	1.21	1.20	1.21	1.23	1.22	1.22	1.20	1.15	1.18
Imports												
Actual	13,085	4,255	17,340	18,047	5,050	23,097	25,965	12,905	38,870	39,585	19,755	59,340
Potential 1	12,435	6,360	18,795	16,470	7,080	23,550	22,630	9,595	32,225	37,890	16,930	54,820
Potential 2 (with intra-industry trade)	12,190	4,530	16,720	16,060	5,340	21,400	21,455	7,125	28,580	36,450	12,510	48,960
Potential 1/Actual	0.95	1.49	1.08	0.91	1.40	1.02	0.87	0.74	0.83	0.96	0.86	0.92
Potential 2/Actual	0.93	1.06	0.96	0.89	1.06	0.93	0.83	0.55	0.74	0.92	0.63	0.83
Potential 1/Actual 2	1.02	1.40	1.12	1.03	1.33	1.10	1.05	1.35	1.13	1.04	1.35	1.12

Note: Potential (flows) 1 are those derived from equation A and potential (flows) 2 are those derived from equation B.

cessfully penetrated the Greek market, this is not the case as regards the course of Greek exports and the degree of their penetration in foreign markets. It should be noted that, on the basis of the results presented in Table 3 and Charts 1 and 2, the same conclusions apply also to equation B.

In more detail, according to equation A, in 1993 Greece's potential exports were 9% higher than actual exports. This was attributable to the fact that potential exports to third countries outside the EU were considerably higher than actual ones, while in the case of exports to EU Member States the actual size outweighed the potential size. Later, however, (according to Table 3 and Chart 1), potential exports to EU Member States increased at a much faster rate than actual exports. In 2003 and 2007 the size of potential exports to EU-15 countries was almost double the corresponding size of actual exports. In the case of exports to third countries, the differential between potential and actual sizes remains significant for the whole period, while it is further widened in 2007. In the case of equation B, the results show that Greece's estimated potential export capacity is reduced if the impact of intra-industry trade is taken into account. However, the more general trend of potential sizes in relation to actual ones does not change, and this is proven by the fact that the ratio of potential exports to actual exports according to equation B does not change noticeably.

As mentioned above, developments in potential and real sizes differ in the case of imports, although the initial relationship between the two sizes is roughly the same as that of exports. Specifically, unlike exports, the actual size of imports grew at a faster rate in relation to the corresponding potential size (see Table 3 and Chart 2). In more detail, as also in the case of exports, in 1993 the size of potential imports from the EU-15 was smaller than that of actual imports, but this was offset by higher potential imports from the rest of the world. Subsequently, however, the situation changes radi-
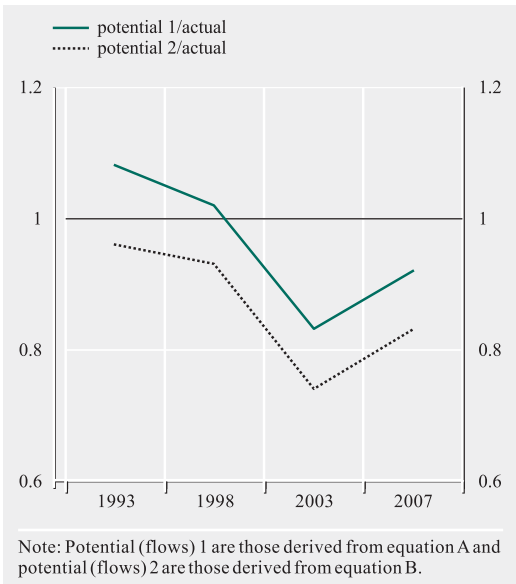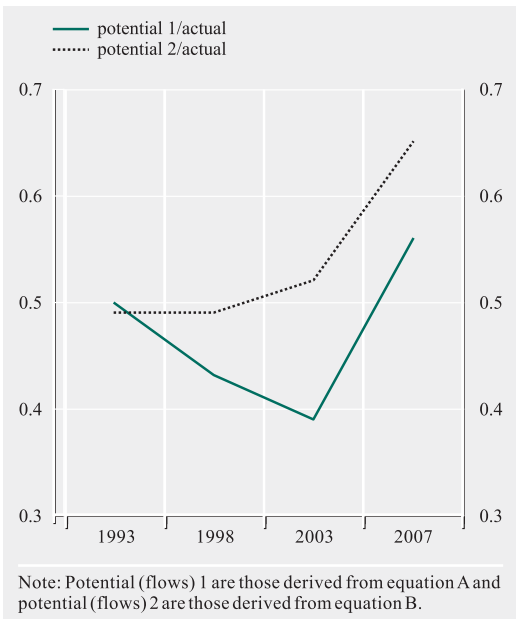
Chart 2 Greece's potential-to-actual-imports ratio

Note: Potential (flows) 1 are those derived from equation A and potential (flows) 2 are those derived from equation B.

Chart 3 Portugal's potential-to-actual-exports ratio

Note: Potential (flows) 1 are those derived from equation A and potential (flows) 2 are those derived from equation B.

cally. The actual size of imports increased at a faster rate. Actual imports from the EU-15 remained higher than corresponding potential imports, yet the difference between the two

sizes was limited in 2007.[4] As also in the case of exports, intra-industry trade limits the size of potential imports, without, however, changing the essence of the analysis conclusions.

It was interesting to repeat the above exercise for Portugal and compare results with those for Greece, so as to examine whether the relationship between potential and real sizes, both for exports and imports, follows the same pattern in the two countries. Portugal was chosen based on the fact that these two EU Member states are both regional, with similar characteristics and roughly the same degree of development. It arises that, while import results for Portugal do not differ from those for Greece, this is not the case with respect to exports. In particular, Chart 3 (which refers to actual and potential export sizes for both equations in the case of Portugal for the years 1993, 1998, 2003 and 2007) shows that in Portugal, unlike the case of Greece, the evolution of exports over time is the same as that of imports.[5] Indeed, in Portugal, the actual size of exports appears to be higher than the corresponding potential size, a fact denoting a more profound penetration of Portuguese products in foreign markets. Furthermore, although at the starting point potential exports with intra-industry trade (equation B) are at the same level as potential exports without intra-industry trade (equation A), they then increase at a faster rate. Specifically, the ratio of potential exports without intra-industry trade to those with intra-industry trade (Potential Exports 1/Potential Exports 2) starts from value 1 in 1993 and declines considerably thereafter. This development denotes a high convergence degree of the Portuguese exports structure to the EU average. Besides, this is largely confirmed by the notable increase in the share of intra-industry trade in Portugal's total external trade in the period under review.[6]

5 CONCLUSIONS

In the above analysis, a gravity model was estimated on the basis of cross-section panel data

for the bilateral trade flows of the EU-15 countries, both between them and with their major trading partners outside the EU, for the 1993-2006 period. Then, the estimated coefficients, which describe the key determinants of the EU Member States' external trade, were applied in the case of Greece in order to estimate, according to the specific methodology, the potential size of Greece's bilateral trade flows. In other words, the potential size of Greece's trade flows reflects the structure of Greek trade flows, on condition that these converge to the average structure of trade flows of the EU-15 countries.

The analysis employed two versions of the gravity model. The first was more traditional, in the sense that it comprised the variables usually included in such a model. The second version was expanded to include the impact of the degree of intra-industry trade on total trade. In order to estimate the gravity model, the analysis used cross-section panel data on the period 1993-2006. Finally, the potential trade flows derived from the estimation results were compared with the corresponding actual trade flows for the years 1993, 1998, 2003 and 2007.

Given Greece's participation in the EU and the creation of the Single Market since 1992, one would expect that Greece's potential trade flows would more or less converge to its actual ones. More specifically, this would reflect the convergence of Greece's trade flow patterns to those of the EU, as a result of convergence in the structure of the corresponding production structures. The results of the analysis, however, show that the course of Greece's actual trade flows moves away from that of potential trade flows, especially in the case of exports. Furthermore, the results show that exports and (to a lesser extent) imports deviate in opposite

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4 The greater difference between actual and potential imports from the EU-15 in 2003 reflects to a considerable extent the higher imports of capital goods in view of the 2004 Olympic Games.
5 The results for Portuguese imports are available by the author on request.
6 Specifically, according to OECD data on Portugal, the intra-trade industry share increased from 40.4% of total external trade in 1993 to about 60% in 2006.

directions. More specifically, while with respect to exports the actual size falls short of the potential size, i.e. only a partial adjustment is observed, the reverse holds in the case of imports where the actual size exceeds the potential one, although the two tended to converge somewhat in 2007.

With reference to goods exports in particular, potential sizes seem to exceed actual ones and their differential to considerably widen over time. If the impact of intra-industry trade is also taken into account, potential exports continue, although to a lesser extent, to outweigh actual exports. Developments in imports demonstrate an opposite trend. In more detail, while in 1993 the ratio of potential imports to actual imports did not differ notably from the corresponding exports ratio, subsequently actual imports increased at a higher rate, and exceeded potential imports. Finally, in the case of imports as well, the inclusion of intra-industry trade limits the size of potential imports.

The Greek products' difficulty to penetrate in foreign markets and the foreign products' easy penetration in Greece constitute two major problems of the Greek economy, for which there are various explanations. According to one view, both these problems stem from the Greek economy's chronic structural weaknesses, which are the root cause of the low competitiveness of domestic products. This largely means that neither Greece's participation in the EU nor the creation of the Single Market have led to major structural changes which would have strengthened the competitiveness of Greek products in international markets in terms of both price and quality. This could be the result of: a) the rise in the country's production cost per unit of output in relation to its main trading partners; b) its limited share of intra-industry trade in total trade; c) the inadequate capital inflows for foreign direct investment and consequently the delay in applying new technologies; d) long-standing problems of the educational system and its high degree of mismatch with market requirements; e) structural problems in product and

labour markets; and finally, f) the bloating of an ailing public sector which trammels any effort to boost entrepreneurship and innovation. These factors have been pointed out in many international reports on competitiveness, as well as in Greek ones (e.g. Bank of Greece Annual Reports).

Indicative of the Greek economy's competitiveness problem is the fact that the share of exports of high and intermediate technology products in its total industrial product exports in 2006 amounted to 30%, the lowest share among EU Member States (in which the average was higher than 65% that same year). On the other hand, the share of exports of low technology products came to 42% of total industrial product exports in 2006. That was the second highest in the EU-15, while the corresponding average share for EU-15 countries reached 21% (OECD, STAN Indicators database). These data justify to a great extent the results of the study and show that the structure of Greek exports considerably limits their possibility to penetrate in foreign markets, mainly developed ones, a fact which leads to the increasing deviation between actual and potential exports.

Furthermore, the Greek economy's limited capacity to produce high and intermediate technology industrial products implies increased reliance on the corresponding imported products for the fulfilment of the country's needs in capital goods, which explains why actual imports exceed by far potential imports.

The respective results for Portugal demonstrate a much greater convergence of its external trade structure to the average structure of the EU-15. It is indicative that, although the share of low technology industrial product exports topped 40% of Portugal's total industrial product exports in 2006 (a share marginally higher than the corresponding Greek one), the share of high and intermediate technology industrial product exports approached 50%, i.e. was considerably higher than the corre-

sponding Greek share (OECD, STAN Indicators database).

According to the above results, Greece seems not to have fully utilised the export opportunities arising from the creation of the Single Market. This is evident from the course of its real exports in comparison with potential exports, as well as from the comparison of the above with corresponding results for Portugal. In principle, the study may be underestimating the negative effect of Greece's geographical position in relation to the other EU-15 countries. Specifically, as Greece is located in a comparatively remote area and surrounded by countries with low development levels and limited volumes of external trade, the estimate of the level of its potential flows may be affected by an upward bias. Moreover, there is no documented argumentation that the structures of the production and trade of the member states of an economic union must converge, even in the long-term.

A final issue arises from the fact that potential exports and imports estimated by means of gravity models refer to the long-run and do not take account of changes resulting from the economic cycle or developments regarding the medium-term period. However, in the case of the present analysis on Greece, the fact that in the period under review the country's economy has been growing at a much higher rate than the EU-15 average may have contributed to the deviation of its actual and potential imports. Also, this is explained by the fact that Greece, as less developed compared to most of the EU-15 countries, is in a process of real convergence and thus in higher need for capital goods.

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AN ANALYSIS OF THE REVISIONS OF FIRST (FLASH) QUARTERLY NATIONAL ACCOUNT DATA RELEASES FOR GREECE*

Nikos G. Zonzilos
Bank of Greece, Economic Research Department

Zacharias G. Bragoudakis
Bank of Greece, Economic Research Department

Georgia E. Pavlou
Bank of Greece, Economic Research Department

1 INTRODUCTION-SYNOPSIS

This study examines the reliability of the first (flash) quarterly national account data estimates compiled and released by the NSSG. In particular, it attempts to quantify the revisions using several indicators to assess the size, the direction and the volatility of revisions with a view to evaluating the reliability of the first (flash) quarterly national account estimates. This revisions analysis is considered informative for the following reasons:

(a) Flash estimates, owing to their nature and their relatively timely release, shape the views of policy makers and provide them with the most comprehensive information for the assessment of the current state of the economy.

(b) First (flash) estimates are considered as the most up-to-date available information for total macroeconomic aggregates and therefore usually represent the initial conditions of macroeconomic projections. As a result, even small national account data revisions can significantly affect the profile of macroeconomic projections throughout the forecast horizon.

Taking into account that policy makers should be aware of the data reliability, as well as of the extent and frequency of possible revisions, the Bank for International Settlements (BIS) and the European Central Bank (ECB) have carried out studies on the revisions of the first quarterly GDP estimates. The BIS study —Wood (2008)— covers a large sample from the Bank's member states, while the ECB study —ECB (2009)— is carried out for the 6 major euro area countries and the euro area as a

whole. The BIS study focuses exclusively on the examination of total GDP revisions without going into revisions to individual elements of demand, whereas the ECB study also examines revisions to demand components. Greece is among the countries examined in the BIS study.[1] It is worth noting that even if quarterly GDP growth rates in Greece are among the highest in the group of countries examined, the revision indices calculated with respect to size, direction and volatility record exceptionally low values compared to those of other countries.

Small revisions are not necessarily a proof of accurate measurement, as this can be attributed to the fact that the latest estimates do not incorporate up-to-date information, changes in seasonal adjustment parameters, base effects, methodological improvement etc., or it can be considered that limited revisions of total GDP result from counterbalancing revisions of its components.

The present study, as also the recently published ECB study (ECB 2009), is not confined only to the examination of total quarterly GDP revisions, but also evaluates revisions to all the components of demand. The main conclusions drawn by the study are the following: (1) revisions of year-on-year ("y-o-y", i.e. quarter on the same quarter in the previous year) GDP growth rates with respect to size, direction and volatility are very limited, despite the two large revisions of the national account statistics in

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1 An earlier unpublished ECB study (Haine and Labhard 2008) covered 11 euro area countries, including Greece.

2006 and 2007;[2] (2) revisions of quarterly ("q-o-q", i.e. quarter on previous quarter) GDP growth are also small, though the size of revisions is significant in absolute terms only between the flash and the current estimate;[3] and (3) flash estimates of demand components, and in particular flash estimates of foreign trade aggregates in real terms as well as of investment are revised significantly in the subsequent national account releases. The estimate of the rate of change in GDP (on annual and quarterly basis) can be considered as an unbiased estimate of GDP growth rate. The real external balance is systematically overestimated in the first (flash) estimate, and this overestimation is counterbalanced by the systematic underestimation of domestic demand (mainly total consumption). Revisions are higher when the rates of change are calculated on a quarterly basis.

The study of the revisions refers to the period from the first quarter of 2001 up to the first quarter of 2008. It should be noted that the National Accounts Department of the General Secretariat of the NSSG completed in November 2008 the compilation of a detailed system of quarterly national accounts and released the first estimate of quarterly GDP for the third and the fourth quarters of 2008 based on the new methodology. According to the former system of compilation of quarterly national accounts, the estimates of quarterly GDP were based on the method of expenditure, while the new detailed system calculates quarterly, as well as annual GDP using all three methods for its calculation, i.e. output, expenditure and income. These methods are combined, making best use of all the available statistical sources and data for the production of the quarterly results. According to the new system of compilation of quarterly national accounts, the first announcement of results (estimates) in each quarter releases exclusively the estimate for GDP at current and constant prices, with 2000 as the base year. The data are made available both seasonally adjusted and unadjusted. According to the former system, the announcement of the first (flash) estimate

included estimates of both GDP and its components. According to the new system, with the second announcement of results in each quarter (provisional data) along with GDP, estimates for the components of demand are released as well.

2 REVISION INDICES AND THE RESULTS

The NSSG periodically revises its estimates of the quarterly national accounts. It releases the first flash estimate for a specific quarter approximately six weeks after the end of that quarter. Roughly 15 days after the release of the first flash estimate, the provisional estimate follows. The second estimate is available with the release of the first flash estimate for the next quarter. For analysis purposes, three categories of revisions are calculated: (1) those between the first (flash) estimate and the preliminary estimate, available roughly 15 days after the release of the first estimate; (2) those between the first estimate and the "second" estimate, i.e. the one available one quarter later; and, finally, (3) those between the first estimate and the latest available vintage of data (the "current estimate"). Revisions to the first estimates were calculated in both y-o-y (quarter on the same quarter in the previous year) and q-o-q (quarter on the previous quarter) terms.

Thereafter, the analysis of the revisions uses simple descriptive statistics that record size, direction (positive or negative revision), and volatility. These statistics were calculated for all three aforementioned types of revision in both annual and quarterly terms. The annex explores the possibility of any bias in flash estimates, using formal statistical methods.

2.1 SIZE OF THE REVISION

In order to assess the size of revisions we use the mean absolute revision (MAR), calculated

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2 It should be noted that the BIS and ECB studies take no account of the substantial revision to Greek GDP in 2007.
3 This finding runs contrary to the results of the study by Haine and Labhard (2008).

as the absolute value of the revisions on average across all revisions, using the formula:

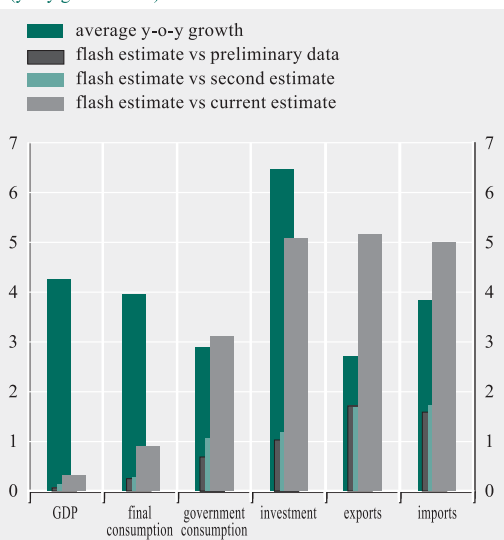$$MAR = \frac{1}{n} \sum_{j=1}^{n} |g_j - g_i| \qquad (1)$$

where n is the number of revisions considered, g_j is the rate of change of GDP and its components in the period *j* in both an annual and a quarterly basis, so that the absolute revision between first and preliminary, first and second and first and current estimate is $|g_j - g_i|$ respectively. By using absolute values, this measure focuses on the size of the revisions, regardless the sign. The results of these calculations are presented in Tables 1 and 4 for y-o-y and q-o-q national accounts data rates of change respectively. The results are presented in the tables in relative terms, i.e. the average absolute revisions of GDP (and demand components) are divided by the average GDP growth rate (and demand components) for the period under study. This presentation gives an immediate feeling of revision size. For instance, a value equal to 1 shows that the initial estimate is revised on average as much as the average rate of change in the relevant variable. Charts 1 and 2 display absolute aggregates calculated by formula (1).

The assessment of revisions results as presented in the aforementioned Tables and Charts concludes that the size of revisions of total GDP growth rate (in both y-o-y and q-o-q terms) is clearly very limited. The size of revisions is significant just between first and current estimate of total GDP in q-o-q terms, while it is much smaller when the quarterly rates of change are calculated on an annual basis. Consequently, the first estimate of quarterly total GDP at annual rates of change constitutes a more reliable measure for assessing current total economic activity than the first quarterly estimate. This may be attributed to the fact that estimates at annual rates of change have already incorporated the revisions of three quarters, which is not the case for estimates on a quarterly basis.

Furthermore, it is observed that domestic demand components are revised significantly. In particular, flash estimates of the real external balance are clearly updated in subsequent national accounts releases. For instance, on average, the revisions to exports and imports between flash estimate and current estimate

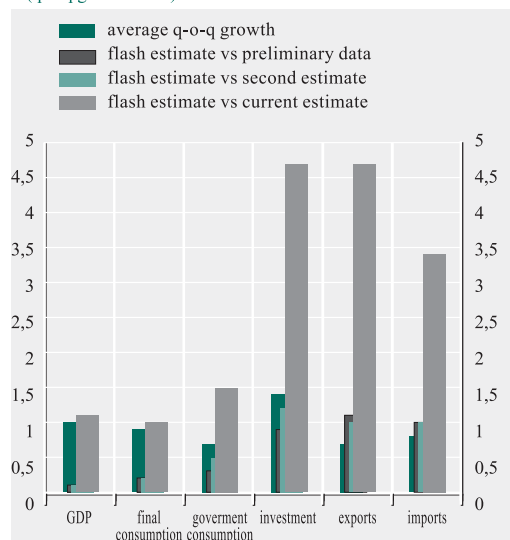## Chart 1 Average absolute revisions (2001Q1-2008Q1)

(y-o-y growth rates)

- average y-o-y growth
- flash estimate vs preliminary data
- flash estimate vs second estimate
- flash estimate vs current estimate

Sources: NSSG and Bank of Greece calculations.

Chart 2 Average absolute revisions (2001Q1-2008Q1)

(q-o-q growth rates)

- average q-o-q growth
- flash estimate vs preliminary data
- flash estimate vs second estimate
- flash estimate vs current estimate

Sources: NSSG and Bank of Greece calculations.

Table 1 Average absolute revisions relative to the average y-o-y growth rate of GDP and its components, 2001 Q1-2008 Q1

	GDP	Final consumption	Government consumption	Investment	Exports	Imports
Flash estimate vs preliminary data	0.02	0.06	0.23	0.16	0.64	0.41
Flash estimate vs second estimate	0.03	0.07	0.37	0.18	0.62	0.45
Flash estimate vs current estimate	0.08	0.22	1.08	0.78	1.91	1.30
Average y-o-y growth	*4.27*	*3.95*	*2.89*	*6.47*	*2.70*	*3.84*

Table 2 Average revisions relative to the average y-o-y growth rate of GDP and its components, 2001 Q1-2008 Q1

	GDP	Final consumption	Government consumption	Investment	Exports	Imports
Flash estimate vs preliminary data	-0.01	-0.04	-0.20	0.01	-0.01	-0.10
Flash estimate vs second estimate	0.01	-0.04	0.04	-0.04	0.23	-0.11
Flash estimate vs current estimate	-0.03	-0.19	0.04	0.00	0.54	-0.05
Average y-o-y growth	*4.27*	*3.95*	*2.89*	*6.47*	*2.70*	*3.84*

Table 3 Average dispersion of revisions relative to the average y-o-y growth rate of GDP and its components, 2001 Q1-2008 Q1

	GDP	Final consumption	Government consumption	Investment	Exports	Imports
Flash estimate vs preliminary data	0.02	0.07	0.49	0.26	0.87	0.56
Flash estimate vs second estimate	0.06	0.11	0.66	0.27	0.87	0.61
Flash estimate vs current estimate	0.10	0.23	1.32	1.02	2.42	1.69
Average y-o-y growth	*4.27*	*3.95*	*2.89*	*6.47*	*2.70*	*3.84*

Table 4 Average absolute revisions relative to the average q-o-q growth rate of GDP and its components, 2001 Q1-2008 Q1

	GDP	Final consumption	Government consumption	Investment	Exports	Imports
Flash estimate vs preliminary data	0.10	0.22	0.43	0.64	1.57	1.25
Flash estimate vs second estimate	0.10	0.22	0.71	0.86	1.43	1.25
Flash estimate vs current estimate	1.10	1.11	2.14	3.36	6.71	4.25
Average q-o-q growth	*1.00*	*0.90*	*0.70*	*1.40*	*0.70*	*0.80*

	GDP	Final consumption	Government consumption	Investment	Exports	Imports
Flash estimate vs preliminary data	0.00	-0.11	-0.43	0.14	0.00	-0.13
Flash estimate vs second estimate	-0.10	-0.11	-0.57	-0.36	0.57	-0.50
Flash estimate vs current estimate	-0.10	-0.33	-0.29	0.07	0.86	-0.25
Average q-o-q growth	*1.00*	*0.90*	*0.70*	*1.40*	*0.70*	*0.80*

Table 6 Average dispersion of revisions relative to the average q-o-q growth rate of GDP and its components, 2001 Q1-2008 Q1

	GDP	Final consumption	Government consumption	Investment	Exports	Imports
Flash estimate vs preliminary data	0.10	0.22	0.86	1.07	2.14	1.88
Flash estimate vs second estimate	0.40	0.33	1.29	2.07	2.71	2.50
Flash estimate vs current estimate	1.20	1.33	2.86	4.50	8.29	5.75
Average q-o-q growth	*1.00*	*0.90*	*0.70*	*1.40*	*0.70*	*0.80*

clearly exceed the corresponding average growth rate in these aggregates.

Besides, as expected (and highlighted in the BIS's and ECB's studies), the further apart the national accounts release is from the first estimate, the higher the average absolute revision becomes. Small revisions to the first estimate of real GDP growth rate for the Greek economy is also the finding of ECB's and the BIS studies, even if these studies have not taken into account the large revision to national account levels in 2007.

Thus far, it was concluded that y-o-y real GDP revisions are minor and somewhat more pronounced in q-o-q terms, whereas generally large revisions are registered in demand components. Thus, an issue arises as to whether there is a systematic compensation of demand components' revisions leading to minor GDP revisions. This is dealt with in what follows.

2.2 DIRECTION OF THE REVISION

Revisions to first estimates of national accounts should be unbiased, that is they are not supposed to systematically underestimate or overestimate "final" data. In order to assess the direction or sign of revisions, we compute the mean revision for the period under consideration according to the formula:

$$MA = \frac{1}{n} \sum_{j=1}^{n} (g_j - g_i) \qquad (2)$$

where (as above) n is the number of revisions considered, g_j is the rate of change of GDP and its components in period j in both an annual and a quarterly basis, so that the revision between first and preliminary, first and second and first and current estimate is ($g_j - g_i$) respectively. The average revision negative/positive sign implies an under/overestimation of the first (flash) estimate of the relevant aggregate.

Chart 3 Average revisions (2001Q1-2008Q1)
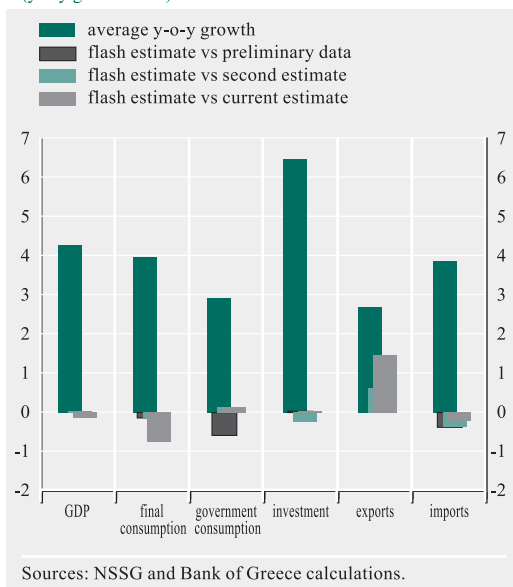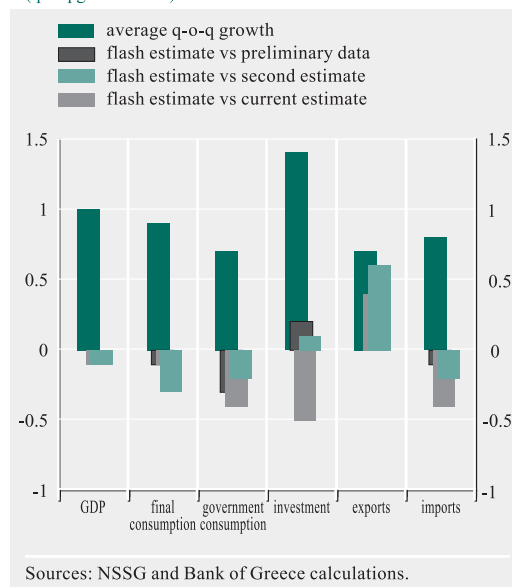
(y-o-y growth rates)

- average y-o-y growth
- flash estimate vs preliminary data
- flash estimate vs second estimate
- flash estimate vs current estimate

Sources: NSSG and Bank of Greece calculations.

Chart 4 Average revisions (2001Q1-2008Q1)

(q-o-q growth rates)

- average q-o-q growth
- flash estimate vs preliminary data
- flash estimate vs second estimate
- flash estimate vs current estimate

Sources: NSSG and Bank of Greece calculations.

The results of the average revisions with respect to average annual and quarterly rates of change in GDP and its components are presented in Tables 2 and 5, while Charts 3 and 4 display average revisions calculated according to formula (2). These tables and charts convey that in general average revisions to the rate of change in total GDP are very limited. Overall, there is no bias in the estimation of the rate of change in quarterly GDP. There is though an offsetting bias in the estimate of external sector figures and domestic demand aggregates leading to unbiased GDP estimates.

Specifically, there is a systematic, though minor, underestimation of the first (flash) estimate of total GDP resulting from a compensation between a relatively significant overestimation of external demand aggregates and a fairly considerable underestimation of domestic demand components. This result is valid for all three measures of revisions in both y-o-y and q-o-q terms.

The annex of the study presents the results of some additional tests for a possible bias existing in the revisions of GDP and its compo-

nents, based on formal statistical methods according to the methodology suggested by Mankiw, Runkle and Shapiro (1984).[4] The results of these tests show that there is no bias in the estimation of total GDP, at both annual and quarterly rates of change. However, there is some bias in the components of GDP, more pronounced in y-o-y terms. In addition, when calculations are on a q-o-q basis, in most cases unbiasedness cannot be rejected.

Finally, we examined the extent to which the size and the direction of the revisions' change between first and current estimate depend on the quarter of estimation. The average revisions often have opposite signs between quarters (in both y-o-y and q-o-q terms). The mean absolute revisions exhibit a small fluctuation between the quarters. Thus, the size and the direction of the revisions do not seem to depend on the quarter of estimation (see Charts 7 to 10).

4 However, it should be noted that unbiased estimates do not necessarily also imply efficient first (flash) estimates (i.e. that first estimates contain all the available information). Therefore, as first (flash) estimates do not include all the available information, revisions are not predictable.
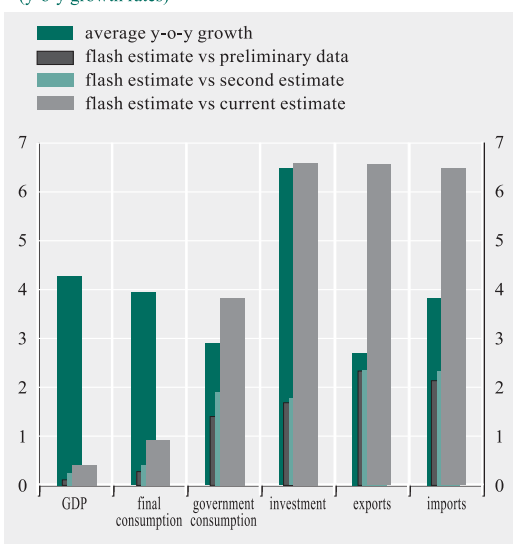
2.3 VOLATILITY OF THE REVISION

This section examines whether the size of the revisions changes. This could be helpful in providing an indication of the size of a possible revision upon the release of flash estimates.

In order to assess the volatility of revisions, we use the standard deviation of the revisions, computed according to the following formula:

$$\sigma = \sqrt{\frac{1}{n}\sum_{j=1}^{n}\left(g_j - g_i - MAR_{j,i}\right)^2} \qquad (3)$$

Chart 5 Average dispersion of revisions (2001Q1-2008Q1)

(y-o-y growth rates)

- average y-o-y growth
- flash estimate vs preliminary data
- flash estimate vs second estimate
- flash estimate vs current estimate

Sources: NSSG and Bank of Greece calculations.

Chart 6 Average dispersion of revisions (2001Q1-2008Q1)

(q-o-q growth rates)

- average q-o-q growth
- flash estimate vs preliminary data
- flash estimate vs second estimate
- flash estimate vs current estimate
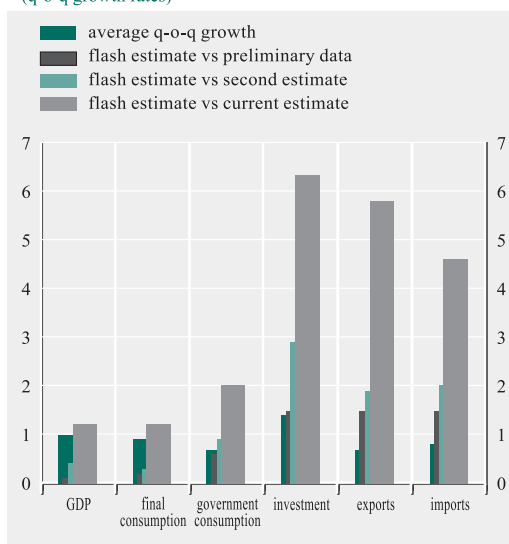
Sources: NSSG and Bank of Greece calculations.

Chart 7 Average revision, first vs current estimate (2001Q1-2008Q1)
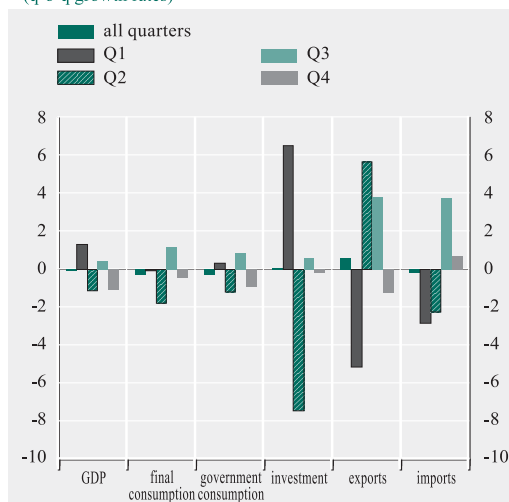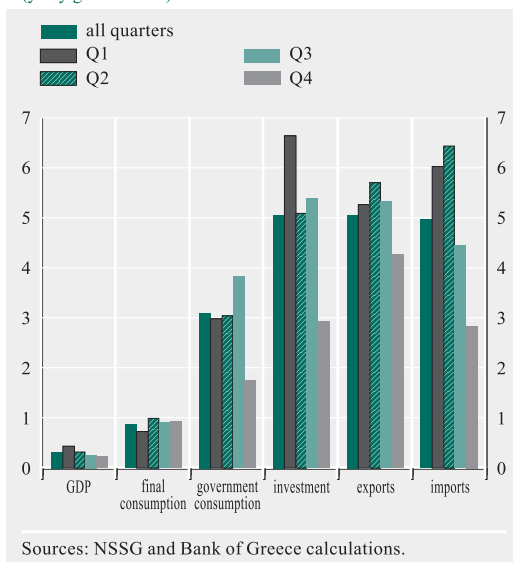
(y-o-y growth rates)

- all quarters
- Q1
- Q2
- Q3
- Q4
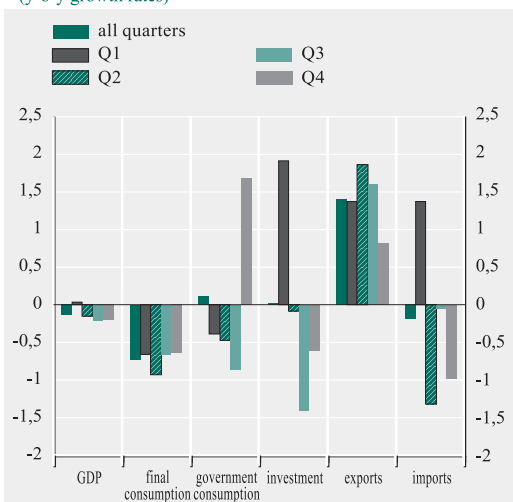
Sources: NSSG and Bank of Greece calculations.

Chart 8 Average revision, first vs current estimate (2001Q1-2008Q1)

(q-o-q growth rates)

- all quarters
- Q1
- Q2
- Q3
- Q4

Sources: NSSG and Bank of Greece calculations.

Chart 10 Average absolute revision, first vs current estimate (2001Q1-2008Q1)

(q-o-q growth rates)

all quarters
Q1
Q2
Q3
Q4

Sources: NSSG and Bank of Greece calculations.
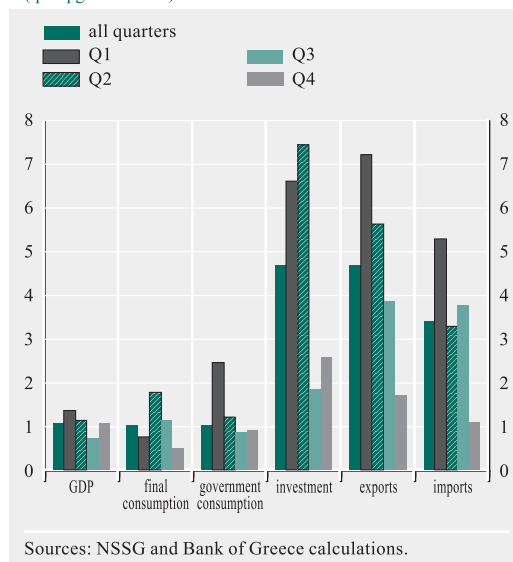
where g_j is the GDP (and its components') rate of change in the period j and $MAR_{j,i}$ denotes the average revision between the first estimate g_j and the preliminary, the second and the current estimate.

The results of calculations as a ratio of average growth rates of corresponding aggregates are shown in Tables 3 and 6 in y-o-y and q-o-q terms accordingly.

Charts 5 and 6 display results as computed according to formula (3). Results show that the volatility of revisions increases over time: i.e. the least volatile revisions are those between first and second estimate, whereas the most volatile revisions are those between first and current estimate. Moreover, while the volatility of revisions to total annual GDP rate of change is relatively limited, higher volatility is observed in the revisions to demand components and mainly in foreign trade aggregates. Volatility is clearly higher in q-o-q terms. The rate of change of domestic demand components and especially of foreign trade aggregates appears to be extremely volatile.

3   CONCLUSIONS

This study mainly focuses on exploring the reliability of the first (flash) estimates of the national accounts, while in parallel it aims at providing to users of flash estimates a guide that will allow them not only to shape their views on the current economic situation but also to forecast relatively accurately the 'final' national accounts outcome.

It also seeks to assist those making projections of national accounts aggregates to incorporate relatively accurately the initial conditions that are so decisive for the forecasting process.

Results can be summarised as follows: the first (flash) y-o-y estimate of total GDP is barely revised in prospective NSSG releases when the GDP rate of change is calculated on an annual basis. The revision of first quarterly GDP estimate (in y-o-y terms) from the current/final estimate does not exceed on average 0.3 percentage point. There is a marginal bias (underestimation) in the first quarterly GDP estimate (in y-o-y terms) of 0.1 percentage point. The volatility of the flash estimate is also very low.

Revisions to first GDP estimates (in q-o-q terms) are quite limited as well, with the exception of the absolute revisions between the first and current estimate calculated to 1.1 percentage points on average.

The flash annual rate of change in exports of goods and services is revised (in absolute terms) considerably; in fact, compared with the current —final— estimate the mean absolute revision exceeds the average growth rate in exports in the period under study. The flash annual (or quarterly) rate of change in exports of goods and services systematically overestimates by 1.5 percentage points (0.6 pp in q-o-q terms) the final rate, and deviates by 5.2 percentage points (4.7 pp in q-o-q terms) from the final estimate. On the contrary, the annual rate of change in imports of goods and services systematically underestimates by 0.2 percentage point the final rate, while it deviates by 5 percentage points from the final estimate. Total consumption (public and private) in absolute terms is revised by 0.9 percentage point in the annual estimates of the rates and by 1 percentage point in the quarterly ones (again on average). Total consumption systematically underestimates the final estimate by 0.8 percentage point when the rates are calculated on an annual basis and by 0.3 percentage point when on a quarterly basis. On average, the growth rate in investment is revised in absolute terms significantly, by 5.1 and 4.7 percentage points on an annual and a quarterly basis, respectively. Revisions are highly volatile, still unbiased.

ANNEX

BIAS TEST OF THE REVISIONS TO GDP AND ITS COMPONENTS

This part of the study presents the results of a series of statistical tests which assess the reliability of the revisions to both total GDP and its individual components. In more detail, according to the methodology of Mankiw, Runkle and Shapiro (1984), but also in line with the more recent papers by Garrat and Vahey (2004) and Sleeman (2006), we estimate the following equation:

$$Y_t^k = \alpha + \beta X_t^f + \varepsilon_t^k, \qquad t=1,...,T \qquad (1)$$

where $Y_t^k = X_t^f - X_t^k$ is defined as the total revision in the period t; X_t^f is defined as the latest available (final) estimate released each time (provisional, second, or current) for the rate of change in the variable under examination; and X_t^k is defined respectively as the flash estimate of the variable under examination. This means that model (1) uses as explanatory variable the latest available estimate.

We thereafter test the validity of the hypothesis: H_0: $\alpha=\beta=0$. The H_0: $\alpha=\beta=0$ hypothesis is tested using the Wald statistic, asymptotically distributed as $\chi^2(q)$ with q degrees of freedom. Non rejection of the H_0 hypothesis provides evidence of unbiased revisions to the rates of change in GDP and its components.

The results of the estimates are presented in Tables T1 and T2. Table T1 displays the estimates of revisions in y-o-y terms and Table T2 the estimates of revisions in q-o-q terms.

The test results show that in general there is no bias in the GDP estimate, both in y-o-y and q-o-q terms. There is though an offsetting bias (more pronounced in y-o-y terms) between the estimates of the variables of the external sector and the domestic demand aggregates, possibly leading to unbiased GDP estimates.

Annual rate of change		(1)	(2)	(3)
Variable	Sample	α	β	$Pr(\alpha=\beta=0)$
GDP	2002 Q3 - 2008 Q1			
Flash estimate vs preliminary data		0.020 (0.127)	0.002 (0.073)	0.1854
Flash estimate vs second estimate		0.309 (0.739)	-0.073 (-0.659)	0.4231
Flash estimate vs current estimate		-0.980 (2.270)	0.292 (2.707)	0.0020*
Final consumption	2002 Q3 - 2008 Q1			
Flash estimate vs preliminary data		0.038 (0.095)	0.029 (0.255)	0.0094*
Flash estimate vs second estimate		-0.581 (-0.666)	0.233 (0.907)	0.0243*
Flash estimate vs current estimate		-3.378 (-3.393)	1.026 (3.903)	0.0000*
Public consumption	2002 Q3 - 2008 Q1			
Flash estimate vs preliminary data		-2.267 (-4.661)	0.946 (5.736)	0.0000*
Flash estimate vs second estimate		-2.576 (-6.841)	1.048 (10.451)	0.0000*
Flash estimate vs current estimate		-2.258 (-8.332)	0.936 (30.336)	0.0000*
Investment	2002 Q3 - 2008 Q1			
Flash estimate vs preliminary data		-0.883 (-1.759)	0.163 (2.650)	0.0195*
Flash estimate vs second estimate		-0.444 (-1.315)	0.144 (3.773)	0.0006*
Flash estimate vs current estimate		-0.197 (-0.225)	0.332 (3.510)	0.0000*
Exports	2002 Q3 - 2008 Q1			
Flash estimate vs preliminary data		-0.787 (-1.976)	0.210 (1.586)	0.1181
Flash estimate vs second estimate		-1.176 (-2.586)	0.226 (1.636)	0.0294*
Flash estimate vs current estimate		-2.181 (-2.565)	0.644 (6.128)	0.0000*
Imports	2002 Q3 - 2008 Q1			
Flash estimate vs preliminary data		-0.491 (-1.382)	0.269 (3.144)	0.0016*
Flash estimate vs second estimate		-0.450 (-0.880)	0.294 (3.307)	0.0032*
Flash estimate vs current estimate		0.197 (0.423)	0.463 (3.214)	0.0041*

Notes: The numbers in parentheses are the t-statistics values.
The numbers in column 3 are the p-values of Wald statistics under the null hupothesis H_0: $\alpha=\beta=0$.
* Asterisks indicate rejection of the null hypothesis H_0:$\alpha=\beta=0$ at significance level $\alpha=5\%$.

Table T2 Test for bias in the revisions of GDP and its components

Quarterly rate of change		(1)	(2)	(3)
Variable	Sample	α	β	$\Pr(\alpha=\beta=0)$
GDP	2002 Q3 - 2008 Q1			
Flash estimate vs preliminary data		-0.0009 (-0.030)	0.010 (0.589)	0.6738
Flash estimate vs second estimate		0.107 (1.143)	-0.0002 (-0.093)	0.4052
Flash estimate vs current estimate		1.468 (1.030)	-1.327 (-1.008)	0.583
Final consumption	2002 Q3 - 2008 Q1			
Flash estimate vs preliminary data		0.142 (3.593)	-0.011 (-0.339)	0.0016*
Flash estimate vs second estimate		0.232 (2.792)	-0.024 (-0.708)	0.0202*
Flash estimate vs current estimate		-0.1029 (-0.379)	0.399 (1.802)	0.0851
Public consumption	2002 Q3 - 2008 Q1			
Flash estimate vs preliminary data		0.295 (1.554)	-0.115 (-2.057)	0.0559
Flash estimate vs second estimate		0.690 (2.167)	-0.223 (-1.863)	0.0937
Flash estimate vs current estimate		-0.102 (-0.244)	0.623 (6.693)	0.0000*
Investment	2002 Q3 - 2008 Q1			
Flash estimate vs preliminary data		-0.191 (-0.607)	0.0136 (0.501)	0.7528
Flash estimate vs second estimate		0.495 (0.586)	0.007 (0.153)	0.5718
Flash estimate vs current estimate		0.200 (0.202)	0.186 (0.681)	0.6813
Exports	2002 Q3 - 2008 Q1			
Flash estimate vs preliminary data		0.0007 (0.002)	-0.024 (-0.452)	0.8952
Flash estimate vs second estimate		-0.501 (-1.009)	0.050 (1.008)	0.2059
Flash estimate vs current estimate		-0.107 (-0.119)	0.305 (0.538)	0.8607
Imports	2002 Q3 - 2008 Q1			
Flash estimate vs preliminary data		0.066 (0.171)	0.006 (0.108)	0.9813
Flash estimate vs second estimate		0.720 (1.324)	-0.050 (-0.878)	0.3058
Flash estimate vs current estimate		0.823 (0.994)	0.226 (0.746)	0.491

Notes: The numbers in parentheses are the t-statistics values.
　　　　The numbers in column 3 are the p-values of Wald statistics under the null hupothesis H_0: $\alpha=\beta=0$.
* Asterisks indicate rejection of the null hypothesis H_0:$\alpha=\beta=0$ at significance level $\alpha=5\%$.

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WORKING PAPERS
(SEPTEMBER 2008 – APRIL 2009)

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's website (www.bankofgreece.gr).

CONTENTS

The classification and performance of alternative exchange-rate systems

Working Paper No. 90
George Tavlas, Harris Dellas and Alan Stockman

Owing to dissatisfaction with the IMF's de jure classification of exchange-rate regimes, a substantial literature has emerged presenting de facto classifications of exchange-rate systems and using the latter classifications to compare performances of alternative regimes in terms of key macroeconomic variables. This paper critically reviews the literature on de facto regimes. In particular the paper describes the main methodologies that have been used to construct de facto codings and then surveys the empirical literature generated by de facto regime codings. Finally it lays out the problems inherent in constructing de facto classifications.

The empirical literature is found to yield few robust findings. We argue that the as yet unfulfilled objective of this literature, and the major research agenda for the future in this area, lies in the need for a more thorough investigation of the degree of monetary policy independence without relying exclusively on movements in exchange rates. The attainment of such an agenda is made especially challenging because of the lack of comprehensive and reliable data on reserves and interest rates.

A note on the use of moving average trading rules to test for weak form efficiency in capital markets

Working Paper No. 91
Alexandros E. Milionis and Evangelia Papanagiotou

The possible existence of predictive power in the moving average trading rule has been used extensively to test the hypothesis of weak form market efficiency in capital markets. This work focuses on the study of the variation in the performance of the moving average (MA) trading rule depending on the MA length employed. Empirical analysis of daily data from NYSE, the Vienna Stock Exchange and the Athens Stock Exchange reveal high variability of the performance of the MA trading rule as a function of the MA length for all these markets. On several occasions the series of successive trading rule total returns is non-stationary. These findings, though they do not cast any doubt on the validity of the results themselves regarding the predictive performance of the MA trading rule for specific combinations of MA lengths, as presented in previous published papers, they do have implications on the way that these results are interpreted in terms of the hypothesis of weak form market efficiency. Indeed, given the high variability of the performance of the MA trading rule as a function of the length of the longer MA, as documented in this work, by just finding out that trading rules with some specific combinations of MA lengths can or cannot beat the market is not enough evidence for or against weak form market efficiency. Further, evidence is presented that the MA trading rule has predictive power in the Athens Stock Exchange and the Vienna Stock Exchange, but not in NYSE.

Assessing output and productivity growth in the banking industry

This paper assesses the evolution of output and productivity in the Greek banking industry during the period 1990-2006. In particular, we estimate three main categories of output (financial intermediation, payment services and "other" services), recognizing in this way the special characteristics of the productive structure of banks, and two categories of inputs (labour and capital) for which we estimate both partial and total factor productivity (TFP). The index number method (Tornqvist index) is applied for the estimation of total output, labour and capital productivity and TFP. In addition, we consider the influence of labour quality on productivity growth, and, based on a growth accounting framework, we estimate the contribution of TFP to output growth as well.

Between 1990 and 2006, total bank output increased significantly, outpacing Greek GDP growth. In particular, it is found that financial intermediation output remained strong in Greece, recording the highest rates of growth in comparison to payment and "other" services offered by banks. However, these last two output categories have increased considerably since 1999, due to technological advances in payment systems as well as the development of investment services.

Bank inputs increased rather moderately, even though capital recorded a relatively stronger rise. As a result, the Greek banking industry became gradually more capital-intensive during the period under review, although it remains a labour-intensive one. It is also worth noting that since the mid-1990s the quality of labour (human capital) in the industry has been improving at a substantial rate.

Labour productivity growth was also more than double that of the Greek economy as a whole, a result of structural adjustments and capital deepening in the banking industry especially after 1999, along with improvements in labour quality. Capital productivity also accelerated after 1999, reflecting increased returns from bank investments in fixed capital in previous years, and the enhanced contribution of the productivity of "other" fixed assets (mainly IT equipment). TFP growth was sluggish until 1999, when it subsequently recorded a notable increase. Finally, the contribution of TFP and capital to total bank output growth gradually intensified during this period, while the respective role of labour decreased accordingly.

Bank-level estimates of market power

Evaluating competition at the industry level is a standard preoccupation of research in industrial organisation in general and a central concern of banking research in particular. Accordingly, several studies have assessed the level of competition in banking markets at different levels of aggregation. In many circumstances, however, the researcher may be interested in obtaining bank-level measures of market power, so as to address questions regarding the potential relationship of market power with certain elements of the behaviour of banks, the structure of the industry and the macroeconomic environment.

This paper proposes a new method for measuring the market power of individual banks, by combining well-established econometric and theoretical frameworks. Specifically, the non-parametric estimation technique of local regression is used to estimate the Panzar and Rosse model, which relies on the premise that banks will employ different pricing strategies in response to a change in input costs. In this model, market power is measured by the extent to which changes in bank input prices are reflected in revenue. The sum of all input price elasticities of bank revenue represents a measure of competition, the "H statistic", which can be calculated for each bank. The method is applied to bank-level data from 20 transition countries so as to get some insight into the power of the new method. In particular, the choice of the sample is motivated by (i) the existence of a recent body of literature on industry-level competition for these countries that allows comparison of the results; and (ii) the well-documented transitional characteristics of these banking systems, which are usually associated with considerable differences of conduct across banks. Our findings suggest that country averages for the H statistic are very close to their parametric equivalents, as derived in recent literature, implying that the proposed methodology is a useful tool for future analysis of the competitive conditions of the banking industry. In addition, the intra-industry bank-specific estimates suggest a significant variation of market power estimates across banks, mainly reflecting wide differences in elasticities with respect to the price of deposits and labour.

MONETARY POLICY AND FINANCIAL SYSTEM SUPERVISION MEASURES (JULY 2008 – APRIL 2009)

MONETARY POLICY MEASURES OF THE EUROSYSTEM

3 JULY 2008

The Governing Council of the ECB decides to increase the minimum bid rate on the main refinancing operations by 25 basis points to 4.25%, starting from the operation to be settled on 9 July 2008. In addition, it decides to increase by 25 basis points the interest rates on both the marginal lending facility and the deposit facility, to 5.25% and 3.25% respectively, with effect from 9 July 2008.

7 AUGUST, 4 SEPTEMBER AND 2 OCTOBER 2008

The Governing Council of the ECB decides that the minimum bid rate on the main refinancing operations and the interest rates on the marginal lending facility and the deposit facility will remain unchanged at 4.25%, 5.25% and 3.25% respectively.

8 OCTOBER 2008

The Governing Council of the ECB decides to decrease the minimum bid rate on the main refinancing operations by 50 basis points to 3.75%, starting from the operations to be settled on 15 October 2008. In addition, it decides to decrease by 50 basis points the interest rates on both the marginal lending facility and the deposit facility, to 4.75% and 2.75% respectively, with immediate effect. Moreover, the Governing Council decides that, as from the operation settled on 15 October, the weekly main refinancing operations will be carried out through a fixed rate tender procedure with full allotment at the interest rate on the main refinancing operation (i.e. currently to 3.75%). Furthermore, as of 9 October, the ECB will reduce the corridor of standing facilities from 200 basis points to 100 basis points around the interest rate on the main refinancing operation. Therefore, as of 9 October, the rate of the marginal lending facility will be reduced from 100 to 50 basis points above the interest rate on the main refinancing operation i.e. cur-

rently to 4.25% and the rate of the deposit facility will be increased from 100 to 50 basis points below the interest rate on the main refinancing operation, i.e. currently to 3.25%.

The two measures will remain in place for as long as needed, and at least until the end of the first maintenance period of 2009, on 20 January.

15 OCTOBER 2008

The Governing Council of the ECB decides to further expand the collateral framework and enhance the provision of liquidity. To do so, the Governing Council decides: (i) to expand the list of assets eligible as collateral in Eurosystem credit operations, with this expansion remaining in force until the end of 2009, (ii) to enhance the provision of longer-term refinancing, with effect from 30 October 2008 and until the end of the first quarter of 2009, and (iii) to provide US dollar liquidity through foreign exchange swaps.

6 NOVEMBER 2008

The Governing Council of the ECB decides to decrease the interest rate on the main refinancing operations by 50 basis points to 3.25%, starting from the operations to be settled on 12 November 2008. In addition, it decides to decrease by 50 basis points the interest rates on both the marginal lending facility and the deposit facility, to 3.75% and 2.75% respectively, with effect from 12 November 2008.

4 DECEMBER 2008

The Governing Council of the ECB decides to decrease the interest rate on the main refinancing operations of the Eurosystem by 75 basis points to 2.50%, starting from the operations to be settled on 10 December 2008. In addition, it decides to decrease by 75 basis points the interest rates on both the marginal

lending and the deposit facility to 3.00% and 2.00% respectively, with effect from 10 December 2008.

18 DECEMBER 2008

The Governing Council of the ECB decides that the main refinancing operations will continue to be carried out through a fixed rate tender procedure with full allotment beyond the maintenance period ending on 20 January 2009. This measure will be in place for as long as needed, and at least until the last allotment of the third maintenance period in 2009 on 31 March. Moreover, as of 21 January 2009, the corridor of standing facility rates, which on 9 October 2008 was reduced to 100 basis points around the prevailing interest rate of the main refinancing operation, will be re-widened symmetrically to 200 basis points. Therefore, as of 21 January, the rate of the marginal lending facility will be increased from 50 to 100 basis points above the interest rate of the main refinancing operation, and the rate of the deposit facility will be reduced from 50 to 100 basis points below the rate of the main refinancing operation.

JULY-DECEMBER 2008

With a view to supporting the normalisation of the euro money market, the Governing Council of the ECB decides to conduct supplementary open market operations, further to the regular main and longer-term refinancing operations.

15 JANUARY 2009

The Governing Council of the ECB decides to decrease the fixed rate on the main refinancing operations by 50 basis points to 2.00%, starting from the operations to be settled on 21 January 2009. In addition, it decides that the interest rates on the marginal lending and the deposit facility will be 3.00% and 1.00% respectively, with effect from 21 January 2009, in line with the decision of 18 December 2008. These decisions are in accordance with the Governing Council's decision on 18 December 2008 to restore the width of the corridor of standing facility rates around the interest rate on the main refinancing operation to 200 basis points.

5 FEBRUARY 2009

The Governing Council of the ECB decided that the interest rate on the main refinancing operations and the interest rates on the marginal lending facility and the deposit facility will remain unchanged at 2.00%, 3.00% and 1.00% respectively.

5 MARCH 2009

The Governing Council of the ECB decides to decrease the fixed rate on the main refinancing operations by 50 basis points to 1.50%, starting from the operations to be settled on 11 March 2009. In addition, it decides that the interest rates on the marginal lending and the deposit facility will be 2.50% and 0.50% respectively, with effect from 11 March 2009. Moreover, the Governing Council decides to continue the fixed rate tender procedure with full allotment for all main refinancing operations, special-term refinancing operations and supplementary and regular longer-term refinancing operations for as long as needed, and in any case beyond the end of 2009. In addition, the Governing Council decides to continue with the current frequency and maturity profile of supplementary longer-term refinancing operations and special-term refinancing operations for as long as needed, and in any case beyond the end of 2009.

2 APRIL 2009

The Governing Council of the ECB decides to decrease the fixed rate on the main refinancing operations by 25 basis points to 1.25%, starting from the operations to be settled on 8 April 2009. In addition, it decides that the interest rates on the marginal lending and the deposit facility will be 2.25% and 0.25% respectively, with effect from 8 April 2009.

BANK OF GREECE DECISIONS ON THE ESTABLISHMENT AND OPERATION OF CREDIT INSTITUTIONS AND THE SUPERVISION OF THE FINANCIAL SYSTEM

21 JULY 2008

– Further clarifications on credit institutions' obligation to provide information to customers with respect to the terms and conditions that govern their transactions.

– The Greek branch of Cetelem bank is renamed to BNP Paribas Personal Finance.

26 AUGUST 2008

National Bank of Greece S.A. is authorised to establish five new branches in Albania.

15 SEPTEMBER 2008

– Approval is granted to the renaming of the American Bank of Albania – Greek Branch to Intesa Sanpaolo Bank of Albania – Greek Branch.

– Approval is granted to the renaming of the representative office of IBI Bank to J&T Bank Switzerland Ltd.

21 OCTOBER 2008

– Approval is granted for the merger by absorption of ETBA Finance SA by Piraeus Bank SA.

– Approval is granted for the merger by absorption of Laiki Attalos AEPEY by Investment Bank of Greece SA.

– Approval is granted for the merger by absorption of P&K AEPEY by the National Bank of Greece SA.

3 NOVEMBER 2008

Piraeus Bank is authorised to acquire a qualifying holding in the capital of Proton Bank SA.

4 NOVEMBER 2008

Approval is granted to the renaming of the representative office of DVD Bank AG to DVD Bank SE.

19 NOVEMBER 2008

TT Hellenic Postbank SA is authorised to increase its qualifying holding in the capital of Attica Bank SA.

26 NOVEMBER 2008

Cash Direct SA Money Transfer Mediation is authorised to operate in Greece.

27 NOVEMBER 2008

Amendment to Monetary Policy Council Act 54/27 February 2004 on the instruments and procedures for the implementation of monetary policy by the Bank of Greece.

5 DECEMBER 2008

Amendment to Bank of Greece Governor's Act 2558/7 February 2005 on the monthly financial statements submitted by credit institutions to the Bank of Greece.

19 DECEMBER 2008

– Preference and redeemable shares issued by credit institutions are recognised as Lower Tier 1 Capital.

– The authorisation granted to the representative office of the Swiss-based J&T Bank Switzerland Ltd is withdrawn.

23 JANUARY 2009

Completion of the liquidation procedures of the Greek branch of Société Générale.

27 JANUARY 2009

Amendment to Monetary Policy Council Act 54/27 February 2004 on the instruments and

procedures for the implementation of monetary policy by the Bank of Greece.

29 JANUARY 2009

The Greek branch of BNP PARIBAS PRIVATE BANK is renamed to BNP PARIBAS WEALTH MANAGEMENT as of 19 September 2008 following the change of the bank's name in its home country, pursuant to Banque de France's notification of 27 January 2009.

25 FEBRUARY 2009

– BESTLINE CARDS SERVICES SA is authorised to convert into a credit company under the name HELLENIC POST CREDIT SA, and TT HELLENIC POSTBANK SA is authorised to acquire a qualifying holding in the company under establishment.

– The authorisation granted to the representative office of the Germany-based DRESDNER BANK AG is withdrawn.

– Amendment to a previous decision on the renaming of EFG FACTORS SA to EUROBANK EFG FACTORS SA.

– ETHNIKI FACTORS SA is granted authorisation and approval not to establish an audit committee.

27 FEBRUARY 2009

Sanctions are imposed by the Bank of Greece on credit and supervised financial institutions for violations related to transparency rules on disclosures to customers; inadequate anti-money laundering procedures; and compliance with the Code of Conduct and the Securities Underwriting Regulation.

17 MARCH 2009

Revision of the supervisory framework on the prevention of the use of credit and financial institutions, supervised by the Bank of Greece, for the purpose of money laundering and terrorist financing.

(The full text of the Decision of the Banking and Credit Committee No. 281/17 March 2009 is available in Greek at www.bankofgreece.gr)

7 APRIL 2009

Establishment of a framework for the supervision of credit institutions' liquidity adequacy by the Bank of Greece.

(The full text of the Bank of Greece Governor's Act 2614/7 April 2009 is available in Greek at www.bankofgreece.gr)

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