Macroeconomic Performance Before and After Euro and Results of Panel Regressions of Growth for Crisis Countries of Eurozone

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Abstract

The paper focuses on the macroeconomic analysis of ongoing crisis in five members of Eurozone: Spain, Italy, Greece, Portugal, and Ireland. To this end, first we carry out a comparative analysis of selected macroeconomic indicators (such as growth rate of GDP, unemployment rate, investment and saving rates, etc.) both between countries for the sample period (1986-2010) and also between two sub-periods (pre-Euro(1986-1999) and post-Euro(2000-2010) periods) for each country. Then we present and discuss results of panel regressions of economic growth based on 'fixed effects' model: Key finding is that inflation and,investment and saving rates are critical for economic growth. However trade openness seems to be uncorrelated with economic growth raising questions about the expected positive effects of the use of common currency (Euro) on economic growth through accelerated integration of the individual economies of Euro Zone.

1. Introduction

One of the fundamental questions that the crisis in Eurozone has raised is whether or not the policy response of Brussels in general (and Germany in particular) to the crisis in certain countries in terms of 'fiscal and monetary policy mix' is optimal in terms of long-term economic growth in these countries. Both neo-classical model of Solow (1957) and 'endogenous growth model' making up the 'new growth theory' hypothesize that at least in the medium term 'the rate of investment' is likely to be positively associated with output growth (Romer, 1990 and 1992, Mankiw, N.G. et al., 1995, and Grossman and Helpman, 1991). It is worth to note that while technological progress and therefore total factor productivity growth is exogenously given in neoclassical model, it is endogenously determined in endogenous growth models usually through positive externalities that may exist in higher rate of investment. Such externalities can operate through various channels such as learning by doing, and knowledge spillovers. However, it is worth to note that this postulated positive effect of the rate of investment on output growth may not be universally valid for all the countries and may depend on the income level of the country in question. Ahmed and Miller (2002) have reported that while output growth and the rate of investment are positively correlated for low and middle income countries, the share of investment in national income seems to be uncorrelated with economic growth in high-income countries.

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Given this empirical ambiguity about the nature of the relationship between investment rate and economic growth, the contention that the best way to improve the prospects for long term economic growth in particularly 'crisis countries' of Eurozone is through increasing national savings by fiscal discipline and lower private consumption needs to be considered as an empirical matter requiring statistical testing and verification. This is because, even if investment rate is found to be positively associated with economic growth in 'crisis countries' of Eurozone, there is no guarantee that higher volume of savings will automatically ensure higher volume of investment in these countries. In other words, economic growth and domestic saving rate may be uncorrelated or the correlation between the two variables may be rather weak, in these countries. Monteil and Serven (2009) have argued that openness to capital flows might have lowered the correlation between domestic saving rate and investment rate. Furthermore the possibility of a negative effect of an increase in saving rate on output growth (in the short-run) through its contractionary effects on the growth of consumption has to be taken into account when formulating macro policies aiming at improving the national saving rate (Gorner, 2006). The empirically ambiguous nature of the relationship between economic savings and investment rates seems to be valid (to a certain extent) also for the nature of the relationship between inflation and economic growth as well.

And in this case there are theoretical arguments both for positive and negative effects of higher inflation on output growth. Tobin (1965) has shown that higher inflation can induce agents to substitute capital in place of (non-interest earning) money in their portfolios and therefore lead to higher rate of capital accumulation and output growth. On the other hand, Harberger (1998) argued that lower inflation is likely to increase the rate of output growth through its positive effects on total factor productivity growth. His hypothesis is based on the argument that lower inflation is likely to enable agents to perceive the actual prices correctly which allows them to make rational investment decisions improving the allocative efficiency of the economy. Some of the past literature that have produced evidence of a negative effect of higher inflation on economic growth include Kormendi and Meguire (1985), Fischer (1993), Barro (1996) and Guerrero (2003). On the other hand, the work of Sarel (1996), Bruno and Easterly (1993) and Ghosh and Phillips (1998) have suggested that the relationship between inflation and economic growth is likely to depend not only on the sample of countries, but also on the sample period. Even some authors have argued that it's not the level of inflation but rather its volatility that has negative impact on economic growth (Al-Mahrubi, 1998). It seems that the strong anti-inflationary position of ECB (European Central Bank) is probably due to the assumption that relatively low inflation is critical for long-term macroeconomic stability and economic growth. However this position needs to be justified by empirical evidence particularly in relation to 'crisis countries' of Eurozone such as Greece, Italy, Spain, Ireland and Portugal.

There has been extensive research regarding the nature of the effect of 'trade openness' on economic growth. Theoretically one would expect that economies producing relatively larger percentage of their domestic output for exporting to global markets and allowing higher rate of penetration of foreign imported products in domestic markets should be associated with higher rate of income growth. In addition to the fact that producing for global economy may allow for relatively higher rate of output expansion due to the potentially much bigger size of the global market (relative to domestic market), the competitive pressures on exporting firms in global markets and on non-exporting firms facing the competition of imports in domestic firms are likely to force domestic firms to improve cost efficiency and therefore total factor productivity growth by improving resource efficiency, the rate of innovation, and adoption of new technologies (Weil, 2005). However, past empirical research have not always produced statistically significant evidence in support of this hypothesis: While results of some studies such as Thornton (1996), Doyle (1998) and Xu (1996) have been consistent with the prediction of 'trade openness' hypothesis, some other studies such as Ahmad and Kwan (1991) and Shan and Sun (1998) have reported that there is no statistically significant correlation between export growth and output growth.

It is interesting to note that Dar and Amilkhalkadi (2003) have suggested that at low levels of trade openness, export expansion is the least significant determinant of economic growth and its significance increases as the level of trade openness increases.

The ongoing crisis in Eurozone that has predominantly originated due to unsustainability of fiscal deficits and stock of government debt (in addition to financial sector related and other problems) in certain countries such as Greece, Spain, Italy, Portugal and Ireland has been continuing to be a source of instability for European Union. Germany's position regarding financial support to 'crisis stricken' countries (such as Greece) has been one of 'conditional support'. As it has been part of almost any 'conditionality package' of IMF, the fundamental goal of Brussel's 'conditionality package' is to increase the rate of national savings particularly through fiscal discipline that may involve spending cuts, tax hikes and privatization programs among other reforms. From strictly Keynesian perspective such strong austerity measures could be self-defeating leading to a lower (or even negative) income growth and higher rate of unemployment.

However this is a short-run perspective and a more fundamental question is whether or not higher rates of national savings and investment (assuming that higher savings are channeled to investment) are likely to increase the growth rate of gdp in the medium and long-term in these so-called 'crisis countries' of Eurozone. Parallel to this, another policy question in relation to Eurozone crisis in general and these 'crisis countries' in particular is whether or not ECB (European Central Bank) has been justified in pursuing strong anti-inflationary polic. Specifically whether or not higher inflation is correlated with lower output growth in these countries (as a group) is ultimately an empirical matter like the issues raised before and needs to be subjected to empirical testing. Another question of interest for Eurozone in general and the 'crisis countries' in particular is the extent to which the 'degree of trade openness' has been positively correlated with economic growth as certain versions of 'endogenous growth' theory would suggest. This, we believe, is one of the critical questions that needs to be investigated. so as to shed some light on the issue of whether or not further integration of Eurozone economies after adoption of 'common currency' (Euro) particularly in terms of goods and service markets have exerted positive effects on economic growt. Some of the past research that have reported positive effects of integration with other economies (on income growth) include Maudos et al. (1999) Badinger (2008) and Cuaresma et al. (2008).

Adoption of Euro, intuitively, would be expected to lead to higher degree integration of not only goods and services markets, but also financial and capital markets, as well. Therefore, one would expect to see an increase in the rate of development of financial sectors of member countries of Euro zone. Development of financial sector in likely to have effects on income growth through various channels such as increased level and efficiency of investment and changes in the volume of savings. The direction of the net changes in the rate of savings is ambiguous simply because a more developed financial sector can lead an increase in private savings through increased degree of competition in financial sector and also allow for higher rate of consumption for particularly liquidity-constrained households through increased availability of credit and borrowing possibilities.

In light of the points raised above, it may be a fruitful exercise to investigate and compare the behavior of key macroeconomic indicators such as growth rate of gap, investment and saving rate, 'degree of trade openness' unemployment rate, inflation rate, government debt (as a % of GDP) and budget balance (as a % of GDP) in pre and post-Euro periods of the 'crisis countries' of Eurozone. This exercise can allow for a quick observation regarding whether or not there has been a systematic and non-marginal change in certain parameters in post-Euro period. This is the first goal of our paper which is the subject matter of the second section of the paper; for each one of the 'crisis countries' namely Greece, Spain, Italy Ireland and Portugal, we present historical averages of each indicator listed above both for the entire sample period of our study (1986-2010) and its two sub-periods (1986-1999 and 2000-2010) representing pre-Euro and post-Euro periods.

The second and the major goal of the present study is to empirically investigate the relationship between economic growth and the rates of domestic investment and savings, inflation rate and trade openness for the five so-called crisis countries of Eurozone as a group. Given this, the organization of the rest of the paper is as follows: As stated earlier, the second section is devoted to the presentation of historical average of each country (in our sample) for the key macroeconomic indicators not only for the entire sample period of our study (1986-2010) but also for its two sub-periods (1986-1999 and 1999-2010) namely pre-Euro and post-Euro periods. In the third section we present and comment about the results of panel estimation of alternative specifications of a 'growth equation' based on 'cross-section and time fixed effects' version of panel regression model. The fourth and the last section concludes with a brief summary and discussion of policy implications of the fundamental results of the paper.

2. Historical averages of selected macroeconomic indicators for 1986-2010 andpre-Euro and post-Euro periods.

In this section we present summary statistics representing the historical averages if selected macroeconomic indicators for each country in our sample, namely Portugal, Italy, Ireland Greece, and Spain, for the sample period (1986-2010) and its two sub-periods corresponding[2] to pre-Euro (1986-1999) and post-Euro (2000-2010) periods. Annual average of growth rate of GDP, domestic investment and saving rates, unemployment rate, stock of central government debt (as % of GDP), budget balance (as % of GDP), the ratio of exports plus imports to GDP (as a proxy for trade openness) and inflation rate of each country is presented in the form of tables 1-8. The main motivation of this exercise is two-fold; first to see whether or not there are systematic differences across five countries in terms of the performance of key indicators for the entire sample period and secondly to observe the nature of the change in the average performance of each country (for each indicator) in post-Euro period relative to pre-Euro period.

Table 1: Average GDP growth (annual %)

	Portugal	Italy	Ireland	Greece	Spain
1986-2010	2.48	1.36	4.75	2.00	2.92
1986-1999	3.71	1.93	6.14	1.79	3.29
2000-2010	0.91	0.64	3.36	2.27	2.45

Two of the striking observations one can make from table 1 are as follows: first, with a notable exception of Greece, all the remaining four countries have experienced a dramatic decrease in their average growth performance in post-Euro period relative to pre-Euro period. And secondly, Ireland has been the fastest growing country in the sample not only for the entire sample period but also over the pre-Euro and post-Euro period.

The fact that the output growth has fallen in four of the five countries in post-Euro period suggests that the monetary union by itself can not automatically ensure higher rate of economic growth. In other word, dynamics of economic growth are ultimately be driven by fundamental macroeconomic parameters that both neo-classical and new growth theories have been emphasizing. Two of such parameters are domestic investment and saving rates. The average (annual) performances of each one of these two critical parameters (which are respectively measured by the respective shares of domestic investment and domestic saving in GDP) have been reported bellow in table 2 and 3:

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[2] Sources of annual data we used in our study are as follows: world development indicators (databank.worldbank.org) world economic outlook database of IMF (www.imf.org) and electronic statistical database of OECD (stats.oecd.org)

Table 2: Average Investment Rate (Annual %)

	Portugal	Italy	Ireland	Greece	Spain
1986-2010	25	20.8	20.46	22.96	25.04
1986-1999	25.93	20.71	18.64	22.86	23.21
2000-2010	23.82	20.91	22.27	23.09	27.36

Table` 3: Average Saving Rate (Annual %)

	Portugal	Italy	Ireland	Greece	Spain
1986-2010	17.08	21.92	31.53	11.96	22.88
1986-1999	18.71	22.64	27.14	12.71	22.29
2000-2010	15.00	21.00	35.91	11.00	23.64

Historically averages for investment and saving rates presented in table 2 and 3 allow us to make the following observations: First, Ireland which has had historically highest GDP growth also has had the highest rate of domestic saving. However, interestingly enough, its investment rate has been the lowest for the sample period (1986-2000). Secondly, Greece singles out as the country which has had lowest rate of savings for both the entire sample period and its sub-periods. Thirdly, investment rates in all countries (except Portugal) have increased in post-Euro period. But only in Spain and Ireland this increase seems to be significant relative to pre-Euro period. And finally, saving rates in post-Euro period while increasing in some countries (Ireland and Spain), they have decreased in others (Portugal, Greece and Italy).

Table 4: Average Unemployment Rate (Annual %)

	Portugal	Italy	Ireland	Greece	Spain
1986-2010	6.60	9.65	9.92	9.37	15.83
1986-1999	5.93	11.00	13.79	8.79	19.57
2000-2010	7.28	8.31	6.06	9.95	12.09

There are at least two critical observations: one can make from Table 4: First, the behavior of unemployment rate in post-Euro period (relative to pre-Euro averages) is not same across countries; while in Spain, Italy and (particularly) Ireland, there has been a non-marginal reduction in the average rate of unemployment in post-Euro period, in Greece and Portugal the opposite is true. Secondly, Ireland has managed to cut its unemployment rate by more than half from 13.74 % in pre-Euro period to 6.06 % in post-Euro period. And this remarkable performance deserves careful analysis particularly in relation to the extent to which this reduction in unemployment can be attributed to the use of common currency, Euro.

In tables 5 and 6 below we present historical averages of the budget balance and stock of central government debt (both as percentage of GDP) for each of the five countries in our sample:

Table 5: Budget balance (% of GDP)

	Portugal	Italy	Ireland	Greece	Spain
1986-2010	-5.20	-5.83	-2.60	-8.54	-3.20
1986-1999	-5.80	-8.33	-3.50	-9.37	-4.80
2000-2010	-4.49	-2.64	-1.72	-7.49	-1.11

Table 6: Central government debt (% of GDP)

	Portugal	Italy	Ireland	Greece	Spain
1986-2010	63	110	65	105	49
1986-1999	57	108	87	85	52
2000-2010	70	113	44	130	46

While the data in table 5 suggests that all five countries have managed to lower their budget deficit (as % of GDP) in post-Euro period, stock of government debt (as % of GDP) has displayed a similar decrease in only Ireland and Spain. And in the rest, this ratio has increased. And in the case of Greece this increase has been substantial; an increase from 85% in pre-Euro period to 130% in post-Euro period. The performance of Ireland in lowering its debt from 87% to 44% parallel to its success in reducing budget deficit in post-Euro period explains partly the source of the substantial increase in its saving rate in the same period.

Table 7: Share of exports plus imports (% of GDP)

	Portugal	Italy	Ireland	Greece	Spain
1986-2010	60.16	46.28	145.01	52.64	48.36
1986-1999	61.64	40.86	126.57	48.62	41.64
2000-2010	67.36	53.18	163.45	57.83	56.90

As the figures in table 7 clearly show, post-Euro period has been accompanied a significant increase in the degree of openness (as measured by the share exports plus imports in GDP) in all the countries in our sample. This can intuitively, be attributed to the likely positive effects of adoption of common currency (Euro) on integration of goods and services markets that can operate through the corresponding decline in transaction costs and elimination of exchange rate uncertainty. However, whether or not this increase in the 'degree of trade openness' is likely to have positive effects on economic growth in these 'crises countries' of Eurozone (as a group) is an empirical matter which we econometrically investigate in the third section of the paper.

Table 8: Average Annual Inflation Rate

	Portugal	Italy	Ireland	Greece	Spain
1986 - 2010	5.20	3.48	2.66	8.60	4.08
1986 - 1999	7.36	4.43	2.50	12.71	5.00
2000 - 2010	2.45	2.27	2.82	3.36	2.91

The historical averages presented in Table 8 suggest that inflation rate has fallen in all the countries except Ireland in post-Euro period. This can be largely attributed to strong anti-inflationary monetary policy of ECB and partly to the general appreciation of Euro against Dollar over the post-Euro period which might have reduced the cost of imported inputs; petroleum and consumer products.

3. Panel Estimation of Economic Growth with Fixed Effects Model

The main purpose of this section is to present empirical results that can shed some light on at least some of the policy dilemmas facing policy makers in EU relation to the process of economic growth in 'crisis countries' of Eurozone. In particular, we want to investigate higher rates of domestic investment and domestic savings, lower inflation and higher 'degree of trade openness' is statistically significant determinants of economic growth in these countries as a group. We use two alternative measures for 'degree of trade openness'; the respective shares of exports and, exports plus imports in GDP.

Using panel (annual) data for the sample period of 1986-2010, we estimate a growth equation based on "fixed effects" model for each one of the four alternative specifications of the independent variables stated above. Cross-sectional units of our panel data set is the five countries making up our sample; Portugal, Italy, Ireland, Greece and Spain. The general specification of the 'fixed effects' model we used for our model is given below in the form of equation (1):

$$y_{it} = b' x_{it} + a_i + c_t + u_{it} \quad (1)$$

Where

$i = 1,\ldots\ldots,n$ (n – the number of countries);

$t = 1,\ldots\ldots,T$ (T – the number of periods);

y_{it} = growth rate of GDP for country i in period (year) t;

x_{it} = the vector of k regressors (independent variables);

b' = the vector of k coefficients;

a_i = country – specific (entity) fixed effects;

c_t = time fixed effect

u_{it} = error term for each observation distributed normally with "0" mean and constant variance.

In the context of our growth equation, a_i captures the effect of unobserved (omitted) country-specific effects on economic growth that vary across five countries (making up our sample) but fixed over time for each country. Such country-specific effects may particularly include the cultural values and norms such as degree of trust between members of the society, ethical values, openness to new ideas, altruistic motives for saving for future generations, and internal value of hard work. In addition to cultural values and norms, country-specific fixed effects may include initial per capita income levels and characteristics of political culture.

On the other hand, time fixed effects (c_t) capture those unobserved (or omitted) effects on annual growth rate of GDP (independent variable) that are approximately constant across Eurozone countries but may change over time. In the context of our sample, such variables may include changing monetary policies of ECB, changing agricultural, industrial and trade policies and regulatory framework of EU (particularly in relation to financial sector and pollution and safety standards in various sectors), the respective annual growth rates of GDP of major EU countries such as Germany and France, the global prices of petroleum and other commodities and the variations in global output. As Stock and Watson (2007) argues using entity (country-specific) and time-fixed effects regression model is expected to eliminate the omitted variables bias resulting from unobserved variables that are constant overtime and from unobserved variables that are constant across countries (entities).

In what follows we list the independent variables (regressors) that we used (in alternative combinations) in specifying our growth equation in running the panel regression:

Independent Variables

a. INV (the share of domestic investment in GDP)
b. SAV (the share of domestic savings in GDP)
c. IR (Inflation rate)
d. EGDP ('Trade Openness' as measured by the share of exports in GDP)
e. EM GDP ('Trade Openness' as measured by the share of sum of export plus imports in GDP)

In order to avoid the serious implications of high degree of multicollinearity we estimate out growth equation with four alternative specifications of regressors, each of which includes only three of the independent variables listed above; each specification is such that neither INV and SAV, nor E and EM appear together as a pair simultaneously in the same regression equation.

The estimation results for all four alternation growth regressions are summarized below in Table 9:

Table 9: Regression Analysis of the Effects of Selected Macroeconomic Parameters on Economic Growth

Dependent Variable: Annual Growth Rate of GDP				
Regressor	(1)	(2)	(3)	(4)
INV	0.42* (0.087)	0.40* (0.096)		
SAV			0.39* (0.090)	0.34* (0.084)
IR	-0.30* (0.108)	-0.29* (0.108)	-0.27* (0.111)	-0.28* (0.115)
EGDP	0.08 (0.064)		-0.06 (0.081)	
EMGDP		0.05 (0.039)		-0.02 (0.049)
$\bar{R}^2$	0.685	0.684	0.662	0.658

-These regressions are estimated using balanced panel data for the five countries in our sample from 1986-2010 (125 observations total).
-Heteroskedasticity-robust standards errors are given in parenthesis under the coefficients.
-The individual coefficient is statistically significant at 1% level.

Each column in Table 9 reports a different regression and each row reports a coefficient estimate and standard error. And adjusted R-squared value of each regression is given at the bottom of the corresponding column.

The most fundamental insights of the estimation results based on these four alternative specifications of the growth equation are as follows:

1) Domestic investment and saving rates are statistically and economically significant determinants of economic growth for an average country in our sample of five 'crisis countries' of EU In other words, as theoretically expected, estimation results suggested that (for an average country in our sample) higher rates of investment and savings are (individually) associated with higher rate of GDP growth. And furthermore, the estimate coefficients of INV and SAV variables are not only statistically significant (at 1% level) but also economically meaningful in terms of their magnitudes: The coefficient estimates for INV variables reported in column (1) and (2) (0.42 and 0.40 respectively) suggest that a five percentage point increase in investment rate is likely to be accompanied by approximately two percentage points increase in the annual GDP growth in the long-run. Comparable estimates for the coefficient of SAV variable in columns (3) and (4) are 0.39 and 0.34 respectively implying that a five percentage point increase in saving rate is likely to be accompanied by an economically meaningful increase in the growth rate of GDP; about 2 percentage points in case of regression reported in column (3) and 1.7 percentage points in case of alternative regression reported in column (4).

2)   Inflation has a statistically significant negative impact on long-run economic growth; higher rates of inflation are likely to be associated with lower growth rate of GDP for the average country in our sample. The estimated values of coefficient of IR variable in columns (1), (2),(3) and (4) are respectively -0.30,-0.29,-0.27 and -0.28.These numerical estimates suggest that a 5 percentage point increase in the average inflation rate is likely to be accompanied by respectively 1.5,1.45,1.35 and 1.4 percentage point reduction in (average) growth rate of GDP. In other words, the adverse effects of higher inflation on the long run economic growth of an average country in our sample are likely to be non- marginal.

3)   'Trade Openness', regardless of whether it is measured by 'the share of export in GDP' or 'the ratio of sum of export and import in GDP' has not been found to be associated with growth in a statistically significant manner.

Each one of these estimation results has important implication and insight both in terms of policy dilemmas (facing ECB, individual governments of these so-called crisis countries of Euro-zone and E.U in general), and discussion regarding the cost and benefits of adoptions of common currency, Euro. In the conclusion section of the paper we elaborate on these issues in addition to summarizing the key finding of our work.

4. Conclusions

The first major goal of our work was to carry out a comparative analysis of the macroeconomics performance of five so-called 'crisis countries' of the Eurozone both with respect to each other over the period 1986-2010 and also for the pre-Euro (1986-1999) and post-Euro (2000-2010) periods of each individual country. The major finding of the paper in this respect can be summarized as follow: both for the entire sample period and its two sub-periods, Ireland has had highest (average) growth rate of GDP. In the post-Euro period, with a notable exception of Greece, the growth rates of GDP in all remaining four countries have fallen below the level attained in pre–Euro period. And what is equally striking is the fact that the reduction in growth rate of GDP in three of these four countries has occurred despite of the increase in investment rate in the post-euro period. Portugal is the only country which experienced a decrease in investment rate in post-euro period. With respect to saving rate, while Ireland has experienced a remarkable increase in post euro period, Portugal's rate has fallen sharply over the same period relative to pre-euro period. The changes in saving rates of the remaining three countries in post-Euro period seem to be relatively less significant. While inflation rate has fallen in all five countries; after euro, unemployment performance over the same period vary across five countries, it has risen in Greece and Portugal and fallen in the remaining three countries. Particularly the performance of Ireland in this respect seems to be impressive.

Historical average of budget deficit and stock of government debt (both as percentages of GDP) obtained for pre-Euro and post-Euro period showed that, while the former has fallen in countries in past-Euro period, the debt ratio has declined over the same period only in Ireland and Spain. Particularly, the increase in the debt ratio of Greece in post-Euro period has been substantial And finally, all of these five countries have experienced an increase in respective 'degree of trade openness' as measured by the share of the sum of exports plus imports in GDP. In post-Euro period relative to pre-Euro period this observation seems to be consistent with theoretically expected macroeconomic consequences of adoption of a common currency for the member of monetary union: a monetary union is expected to increase the degree of integration of not only financial but also goods and service market of individual countries (in the union) by eliminating exchange rate uncertainty and lowering transaction cost in trade and therefore allowing an increase in the volume of trade between member of the union. And this, is turn, is expected to have positive effect on economic growth. However, despite of this increase in the 'degree of openness' and lower inflation in all five countries in post-Euro period, it is interesting to see that the average rate of GDP growth has fallen in all of them.

This observation is even more puzzling when one considers the fact that investment rate (another important determinant of growth) has risen in three of these countries and has fallen in a non-significant manner in the remaining two countries in post-Euro period. In other words the behavior of investment rate, inflation and trade openness in post-euro period was largely (if not entirely) in favor of higher rate of GDP growth and definitely not against it. Naturally one possible explanation could be that these parameters might not have been statistically and economically significant determinants of economic growth in these countries as a group. To investigate this issue we ran panel regressions of economic growth based on country 'country-specific' (entirely) and 'time fixed effects' model. Estimations results have suggested that for the average country in our sample of 'crisis countries', higher rates investment and saving, and lower are (individually) likely to be positively associated with higher rate of GDP growth in the long-run. On the other hand, 'trade openness' (either measured by the share of exports in GDP or by the share of sum of exports and imports in GDP) has not found to be correlated with economic growth in a statistically significant manner.

The fundamental policy insights of these econometrics results with respect to the ongoing crisis in Eurozone can be summed up as follows:

Fiscal discipline aiming at cuts in budget deficits and policies targeting higher private saving at the expense of lower private consumption seem to be fundamentally right policies as long as the resulting increase in domestic savings could be channeled to private investment. If the investment does not respond to a given increase in private and public savings proportionately, one possible outcome of such policies could be an increase in net capital outflows. In addition, the finding that inflation and economic growth are negatively correlated suggests that the short-term benefits of monetary expansion that ECB has been and will be undertaking as part of 'crisis management' in Eurozone has to be carefully weighed against its possible long-term growth retarding effects operating through higher inflation.

And the fact that our estimation results have not produced a statistically significant positive association of 'trade openness' and economic growth is critical particularly in terms of theoretically expected benefits of forming a monetary union such as Eurozone. As mentioned earlier, this is intuitively expected to increase the volume of trade by eliminating exchange rate uncertainty and lowering transaction costs. And this is expected to have positive effects on output growth through various channels which particularly operate through improvements in allocative resource efficiency of domestic firms and higher rate of technological progress both of which are made possible through the increase in the degree of competition by domestic firms and availability of larger range of imported products in general and 'capital goods' in particular.

The fact that our panel estimation results have not produced evidence of this hypothesized 'positive association' between 'trade openness' and 'economic growth' for the sample of five 'crisis countries' of Eurozone may suggest that the use of a common currency (Euro) might not have generated the positive effects as economic growth in some countries simply because, in these countries economic growth might not be positively correlated with further integration of goods and services markets of these countries with each other through higher volume of trade. Why this may be the case is both a theoretical and empirical matter and in our opinion points out one of the possible directions for future research on Eurozone crisis.

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