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Abstract

Neo-classical model and most of the different versions of new generation growth models predict a positive effect of higher saving rate on economic growth at least in the medium term. In this paper, we investigate this hypothesis using panel data analysis for a sample of Central and East European countries. The specification tests (in particular, Hausman and Lagrange multiplier tests) revealed that optimal econometric specification of the model to be used for panel regression is given by Classical Pooled Regression model. The estimation results based on this model suggested that domestic saving rate has exerted a statistically significant effect on growth rate of GDP over the sample period. Given the likelihood of adverse effects of recent global crisis and the policy responses to it on saving and, therefore, investment rates in most countries, we discuss and recommend specific growth-enhancing policies that aim at increasing both the growth rate of total factor productivity and rate of accumulation of stock of human capital.

Keywords: saving rate, economic growth, panel data, global crisis.
JEL Classification: D1.

Introduction

The critical role that domestic savings rate could play in economic growth process has continued to attract the interest of economists both at theoretical and empirical levels particularly since the formulation of Harrod-Domar model that suggests that, for stability and full employment, the ratio of saving rate to capital output must always equal the natural growth rate of the economy which is given by the growth rate of labor force of the economy (Yeldan, 2009). However, it was the Solow's neoclassical growth model which has shown how the saving rate could affect the growth rate of output for a temporary period of time (Solow, 1957). In Solow's model even though an increase in saving rate has no effect on the steady state (long-run) growth rate of output per worker, it still positively affects the living standards permanently by increasing the steady state amount of stock of capital per worker which, in turn, allows an increase in output per worker in the long run. The only way to achieve a permanent increase in growth rate of output in this model is an increase in the exogenously given rate of progress of technology. Higher saving rate increases the growth rate of output per worker only at the transition stage as the economy moves from the old steady state to a new one. However, as Singh (2009) observes, in the new generation of growth models known as "endogenous growth models", higher rate of saving can have permanent positive effect on output growth as the resulting higher rate of accumulation of physical capital leads to permanently higher rate of progress of technological level (Romer, 1986, 1887; Lucas, 1988). It is worth noting that this postulated positive linkage between saving rate and economic growth would only be operational under the conditions of no mobility of capital between domestic economy and the rest of the world.

Some of the studies which have found some evidence of this postulated positive growth effect of saving rate include World Bank (1993), Rodrik (1998), Sepehri and Akram-Lodhi (2005) and Kuijs (2006). However, some authors have pointed out that the causality between saving rate and income growth is bi-directional meaning that as saving rate might positively affect income growth, an increase in the rate of income growth could raise the rate of savings (Carol and Weil, 1993; Singh, 2009; Attanasio, Picci, and Sorcu, 2000). On the other hand, it is worth noting the possibility of an adverse effect of an increase in saving rate on output growth in the short run which operates through its contractionary effects on growth of consumer spending (Gorner, 2006). Furthermore, as Monteil and Serven (2009) have observed, the hypothesized positive relationship between domestic saving rate and economic growth may be rather weak in today's financially open economies which might have lowered the correlation between domestic saving rate and the rate of investment. This possibility suggests that before the formulation of macroeconomic policies in the framework of a growth strategy the hypothesized positive growth effect of domestic savings should be subjected to careful empirical testing for the relevant countries. This, in turn, is the main motivation of the present study which attempts to shed further empirical light on this hypothesis using a panel data set of a sample of nine Central and East European countries most of which are currently EU members. And the sample period of our study is 1995-2003.

In particular, we focus on testing whether or not the domestic saving rate (as measured by the share of domestic savings in GDP) has had significant effect on the growth rate of real GDP over the sample period.

As argued by some authors, when the main motivation of a study is to investigate the nature of the individual

effect of a specific independent variable on a dependent variable (such as growth rate of output) one may prefer to run simple regression which includes only that specific independent variable as a regressor (Desphande, 1997; Ciftcioglu, Fethi and Begovic, 2007; Chubrik, 2005). This argument is particularly valid when the set of independent variables suggested by the relevant theoretical model chosen (which is highly subjective by itself) are likely to be highly correlated. This issue is particularly problematic in relation to empirical modeling and analysis of economic growth simply because most of the likely regressors such as saving rate, investment rate, the rate of inflation, level of financial development and the degree of trade openness would probably be correlated with each other. That's why we have preferred to include domestic saving rate as the only explanatory variable on the right hand side of our growth equation. However, when dealing with panel data the issue of which explanatory variables should be included as regressors is not the only specification problem associated with estimation process. The choice of appropriate econometric model for estimation requires the application of various statistical tests (known as specification tests) which include Hausman, Lagrange Multiplier (LM) and F tests.

The organization of the rest of the paper is as follows: the first section specifies the econometric model and the source of data, and discusses the important aspects of empirical methodology used for the specification of the econometric model. Estimation results and their interpretation are presented in the second section. The third section is devoted to the discussion of basic policy insights of the empirical result. The last section concludes with a brief summary of results.

1. Model specification and empirical methodology

The general form of the econometric model we used for estimation of the relationship between (annual) growth rate of GDP and (annual) rate of domestic savings is specified below by equation 1.

$$Y_{it} = a_i + bx_{it}\varepsilon_{it}, \quad (1)$$

where $i = 1,\ldots, n$ (n – the number of countries); $t = 1\ldots T$ (T – the number of periods); Y_{it} = the growth rate of GDP of country i for year t (the dependent variable); x_{it} = the domestic saving rate given by the share of domestic savings in GDP of country i for period t (the independent variable); b = the coefficient representing the marginal effect for x_{it} assumed to be common across i and t; a_i = intercept for country i which represents the individual (country-specific) effect on the dependent variable and is assumed to be constant over time; ε_{it} = error term for each observation distributed normally with 0 mean and constant variance

$\varepsilon_{it} \sim N(0, \sigma_\delta^2)$.

The optimal specification of the general form of the model described by equation (1) depends on the nature of the individual (country-specific) effects as captured by the values of intercept term (a_i).

As explained in Ciftcioglu and Begovic (2007), there are three possibilities for the values of a_i across cross-sectional units which are the nine Central and East European countries included in our sample; (A) They are 'fixed' and (in statistical sense) different from each other; (B) They are randomly drawn from a normal population distributed with 0 mean and constant variance; (C) They are 'fixed' and 'common' across the countries. The models described by (A) (B) and (C) are respectively known as 'Fixed Effects', 'Random Effects' and 'Pooled Classical Regression' models.

Each of these models is specified below by equations (2), (3) and (4), respectively:

(A) Fixed Effects model

$$Y_{it} = a_i + bx_{it} + \varepsilon_{it}, \quad (2)$$

(B) Random Effects model

$$Y_{it} = a_o + bx_{it} + \varepsilon_{it} + \mu_i, \quad (3)$$

where a_0 is a constant term and μ_i is the error (random) component of country-specific (individual) effect for country i which is assumed to be distributed normally with 0 mean and constant variance;

$\mu_i \sim N(0, \sigma_\mu^2)$,

(C) Pooled Classical Regression model

$$Y_{it} = a_0 + bx_{it} + \varepsilon_{it}. \quad (4)$$

The optimal choice of the econometric model to be used for panel estimation out of the three alternative models listed above as (A) (B) and (C) depends on the results of Hausman, Lagrange Multiplier (LM) and F tests (Hausman, 1978; Breusch and Pagan, 1979; Green, 1997). The statistical methodology in applying these (specification) tests involves estimating all three models and computing all relevant test statistics. Hausman test is applied to make a choice between 'Fixed Effects' and 'Random Effects' model. If the preferred model by this test is the 'Fixed Effects' model, then F test is applied to determine whether or not the individual (country-specific) effects given by a_i are common across countries. If F test suggests the presence of common individual effects across countries (i.e.,

$a_1 = a_2 = ... = a_n$), the optimal specification of the model is given by the Pooled Classical Regression model. In case F test suggests that individual (country-specific) effects are (statistically) different from each other, the optimal specification is given by the Fixed Effects model. On the other hand, if Hausman test preferred the Random Effects model, the next step is to apply LM (Lagrange Multiplier) test to choose between 'Random Effects' and 'Pooled Classical Regression' models.

The source of data used in our study is "World Bank Database of World Development Indicators"[1]. The dependent and independent variables have been described in the source, respectively, as the (annual) 'growth rate of GDP' and the (annual) 'share of domestic savings in GDP". The nine countries included in our sample are, respectively, Hungary, Slovakia, Czech Republic, Poland, Slovenia, Romania, Bulgaria, Croatia and Macedonia. The first seven of these countries have become members of EU either in 2004 or 2007. Given the possibility of structural shift in the value of coefficient of the regressor (the rate of domestic savings) in post EU membership era we limited our analysis to period prior to EU membership. Also, the limitations regarding the availability of reliable data for some countries for the year before 1995 made us choose the sample period of our study as 1995-2003. Due to the fact that some data are missing even for this sample period, total number of observations (data) in our panel data set is 78. And this, in turn, makes our panel data set an 'unbalanced panel". However, as Stock and Watson (2003) point out, an 'unbalanced panel" is also capable of yielding informative estimates.

We end this section by noting that, to deal with the possible problem of heterescedasticity we applied the White's correction for heteroscedasticity so that the estimated standard errors are heteroscedasticity-robust and corresponding t-statistics are heteroscedasticity-consistent (White, 1980).

2. The empirical results

The application of specification tests (in particular Hausman and LM tests) revealed that the optimal econometric model for the panel estimation of the relationship between domestic saving rate and the growth rate of GDP for our sample of Central and East European countries is the "Pooled Classical Regression" model.

This model, as explained in the previous section, assumes that the individual (country-specific) effects are common for all the countries. In other words, the panel regression assumes a common intercept (which is fixed over time) for all the countries in the sample. The computed values of relevant (specification) test statistics as well as the respective estimates of the coefficient of the regressor (domestic saving rate) and intercept, and their corresponding t statistics, are reported below in Table 1.

Table 1. The relationship between growth rate of GDP and domestic saving rate

Independent variable	H [1]	LM [2]	Specification [3] (model)	Adj. R [2]	Coefficient [4]	Intercept [4]
Domestic saving rate	2.15	0.19	Classical Pooled Regression	0.045	0.11 (2.14) [5]	1.01 (1.0)

Notes: 1 − Hausman test statistic. 2 − LM test statistic. 3 − Model selected as a result of Hausman and LM tests. 4 − Values in parentheses under coefficient estimates are Heteroscedasticity-consistent t-statistics. 5 − Significant at 5% level.

As Table 1 shows, optimal specification of the econometric model to be used for estimation is the "Pooled Classical Regression" model. The estimation results based on this specification and reported above in Table 1 suggested that the economic growth (as measured by the growth rate of GDP) and domestic saving rate are positively correlated for our sample of Central and East European countries over the sample period.

In particular, the coefficient estimate of the regressor (domestic saving rate) is not only positive as theoretically expected but also statistically significant at 5% level.

This, in turn, implies that despite liberalization of capital flows the domestic savings have continued to be an important source of domestic investment which is ultimately the parameter that links savings to output growth in neo-classical growth model.

The estimated value of the coefficient (0.11) suggests that a 10 percentage points increase in domestic saving rate is likely to be accompanied by approximately 1.1 percentage points increase in the growth rate of GDP. At the first sight this magnitude could seem economically insignificant in terms of the potential growth effect of savings. But this is true only from a short-run perspective for the living standards of a country. In other words, this estimate means that increasing the national saving rate by 10 percentage points (let's say, from 20% to 30%) will increase the average (annual)

[1] The World Bank Database: http://devdata.worldbank.org/dataonline/

growth rate of GDP only by 1.1 percentage points (let's say from 3% to 4.1%) in the medium term.

From a short-run perspective, one can question whether or not the sacrifice in terms of lower private and public consumption levels (that are necessary to raise the saving rate by a substantial magnitude) is worth it in order to attain only such a small increase in the rate of income growth. However, when one considers the cumulative positive effects of this supposedly small increase in income growth on per capita income levels over the medium and long term, one can see better that the short-run perspective in relation to dynamic effects of macroeconomic policies on living standards through savings channel could be misleading. This insight suggests that any long-term growth strategy that aims at increasing per capita income levels at a sustainable rate over the next 10-15 years needs to envision policies and reforms that are likely to foster domestic savings both in terms of private savings (household and enterprise savings) and public savings.

In the next section we discuss both the possible factors that can affect the saving rates in general and the implications of the recent global crisis for the behavior of savings and policy making particularly for the countries included in our sample in the short run.

3. Factors affecting savings and policy implications of empirical results

As the reported estimation results have suggested, economic growth and domestic saving rate seem to be positively correlated in a statistically significant manner. Therefore, focusing on factors that are likely to affect saving rates and the policies which could affect at least some of these factors can yield insights regarding the policy trade off's that the policy makers might be facing today and in the near future.

The most important of these factors include GDP per capita, GDP per capita growth, the public saving, the share of industry in GDP, the real interest rate, the inflation rate, the credit to GDP ratio, the young age dependency ratio, the old age dependency ratio, the urbanization rate, terms of trade, the bank density and the real wealth (Kuijs, 2006).

Theoretically, domestic saving rate is expected to be positively affected by GDP per capita, growth rate of GDP per capita and the share of industry in GDP and terms of trade. The demographic factors (the young age dependency ratio and the old age dependency ratio), credit to GDP ratio, the bank density, the urbanization rate and the real wealth are expected to exert negative effects on saving rate. On the other hand, the qualitative nature of the individual effects of the remaining two factors, namely the inflation rate and the real interest rate, are ambiguous.

As the variety of the likely factors that can affect domestic savings listed above suggests, it is a challenging task for any policy maker to formulate specific policies that can raise savings and, based on these policies, project the future behavior of the respective rates of saving, investment and output growth. In light of this, it is possible to make the following intuitive analysis about savings growth nexus and the possible effects of recent global crisis in this context, particularly in relation to Central and East European countries included in our sample. The global crisis that dramatically slowed down economic growth in most countries across the globe (and particularly motor countries of EU such as Germany, France, UK, Spain and Italy) undoubtedly implies a parallel decline in national saving rates particularly for two reasons: The first one is the decline in the growth rates of national incomes and the possible decline in per capita income levels of some countries which have experienced negative growth during crisis. The second factor that is likely to lower national saving rates in most of these countries in the short run is the inevitable nature of the policy response to the crisis; expansionary fiscal and monetary policies that most crisis stricken countries have implemented should have lowered national savings both through their adverse effects on budget deficits (public savings) and possibly on private savings through the increased availability of cheap credit for households and firms.

Another factor that might be exerting adverse effects on saving rates, particularly in the Central and East European countries included in our sample, is the accelerated integration of their financial sector both within EU and with the rest of the world. This, in turn, is likely to increase respective bank densities and the credit to GDP ratios in these countries particularly by allowing liquidity constrained households (and firms) to borrow more easily against future income. The improved macroeconomic stability provided by EU membership or candidacy could also affect domestic saving rates negatively through its adverse effects on the volume of precautionary savings of households.

All of the points discussed above suggest that the national saving rates of the Central and East European countries included in our sample are more likely than not, to stay below their respective historical averages that particularly prevailed before the global crisis of 2009 in the coming a few years following the crisis. The implication of this likely scenario is that the investment rates and, therefore, economic growth are also likely to stay depressed not only because of the possible slow recovery in the volume of global and intra-EU trade but also due to low saving rates in the near future. The only way domestic investment rates in these countries can be boosted (while facing the possi-

ble constraint of lower domestic saving rates) is to use foreign savings as a supplement to domestic savings to finance increased rates of investment. This, in turn, entails either increased rate of foreign borrowing and/or implementing policies that encourage higher rates of foreign direct investment. Given this uncertainty about the extent to which domestic investment rates can be raised back to levels prevailing prior to global crisis, policy makers in these countries should be advised to focus on alternative growth enhancing policies for the short and medium terms: One important source of economic growth for the most advanced countries has been the growth of total factor productivity which is a fact that has been overlooked by policy makers in many developing countries. As Weil (2005) points out, the level of total factor productivity can be taken as the product of respective levels of technology and efficiency with which resources are used together with a given level of technology. In the short run, improvements in efficiency in resource allocation might prove to be a significant factor in achieving higher rates of total factor productivity growth which can lead to a rapid increase in income growth and living standards.

The experience of both financial and real sectors of even the most advanced countries during the global crisis brought to surface the hidden inefficiencies not only in the public but also in private sectors of most countries. One important and paradoxically positive implication of this aspect of global crisis is the realization of potential welfare improving and growth enhancing effects that efficiency based micro reforms could generate.

These reforms, among other things, should essentially focus on encouraging both financial and real sector firms to adopt better investment appraisal and risk management techniques. In addition, particularly the Central and East European countries could possibly raise growth of total factor productivity through efficiency channel by continuing to eliminate what Harberger (1998) calls ill-conceived regulations and bureaucratic hurdles so as to lower real costs.

And finally, we note that positive growth effects of efficiency-based micro policies could be further enhanced by the implementation of deliberate policies targeting an increase in the rate of accumulation of human capital which is likely to be adversely affected as a result of increase in the rate of poverty and unemployment (during global crisis) which could have adverse effects on education, training, nourishment and health-care levels of lower classes and income distribution. Such policies may include not only tax incentives and directed credit for training programs of both real and financial sector firms but also introduction of new programs for the training of unemployed and subsidies for the education, health-care and nourishment of particularly the children of poor families. However, we need to point out that these policies aimed at increasing the rate of accumulation of stock of human capital would probably have their desired positive effects on output growth not so much in the short term but in the medium and long term. And, furthermore, there is always the risk that the additional human capital stock generated by the improvements in the skill, specialization, training and the education level of the workforce may choose to move out of the country. This risk is probably relevant for most of our sample countries whose labor force to a great extent has gained mobility within EU.

Conclusions

We can summarize the basic insights of our study as follows: Domestic saving rate seems to be positively correlated with the rate of income growth for the sample of Central and East European countries that we used for our empirical investigation. And since the global crisis and policy response to the crisis in most countries (as well as other factors) might be leading to lower saving rates, at least in the near future, the negative effects of contraction in global demand for exports in these countries on economic growth could be further aggravated by the possible decline in investment rates. Policy makers of countries which might be facing this kind of domestic savings constraint (in financing desirable rates of investment) could find it beneficial to focus on formulating new growth strategies that puts additional emphasis on micro policies aiming at both improving the resource efficiency and increasing the rate of accumulation of stock of human capital.

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