THE REAL EFFECTS OF SHIFTS BETWEEN PUBLIC AND PRIVATE DEBT

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Abstract

The aim of this paper is to investigate effects of structural changes of total gross debt on economic growth OECD countries during period from 1996 to 2016. In this paper it is the structural change within the national debt followed. The paper does not examine the effect of the level of gross debt, rather the effects of the shift within its structure. The simple panel data regression of chosen OECD countries is employed. We used within fixed effects estimator. From the results stem that the shift from the private debt to public debt is associated with the negative impact on the economic growth, and vice versa. When the sector decomposition of the private debt is made, it seems that the most positive shift is from public debt to debt to households, and vice versa. Hence, the structural shift within the gross debt of economy does lead to the impacts on the economic growth. Especially, if the government can take over the private liabilities the probability of "too-much-debt" rises and the moral risk could create risks toward the future economic growth development.

Keywords

Economic Growth, National Debt, Private Debt, Public Debt, OECD

I. Introduction

Last several decades have revealed the fragility of the world economic system, which might stem from the financial dependency among almost all countries. Both the Great Depression and the Great Recession might be triggered by a financial market failure. While historical development since the Great Depression had led to the employment of the economic policy that could led to the public debt, the Great Recession highlighted so called "too-much-debt" problem. Under the influence of study Reinhart and Rogoff (2010), many others have been looking for a threshold of such impact of the public debt. On the other hand, some authors have noted that not only the public debt, but the private debt can be evaluated under the principle of too-much too (Cecchetti et al., 2011). The criterion here is the debt impact on the economic growth. While there are not many authors whose deny the positive effects of the debt in short run, the debate of the impact over the long run is not resolute. The discussion is made due to non-linearity of the nexus from debt to growth. These studies tend to have a problem with an endogeneity. Furthermore, as Izák (2015) pointed out, during the crisis the private and public debt are more likely to spill over. For these reasons this study focuses on the real impacts of such a spillover between sector gross debts. The main aim is to investigate the effect of structural change of total gross debt on economic growth in OECD countries. To fulfil the aim an approach of Acosta-Ormaechea and Yoo (2018) is employed. This allows capturing real effect of shift from private debt to public debt, and vice versa, which is not influenced by the effect of change in level of total gross debt. There are 3 sectors follows. Private sector is divided into the sector of households and sector of non-financial private corporations. Financial corporations are not including for the reason of a double counting (Cecchetti et al., 2011, or Izák, 2015). Public sector is proxy by sector of general government. From the methodological point of view, the panel data regression analysis is used. The research sample consists of OECD from 1996 to 2016. All data are captured from OECD database. The within fixed-effects model is employed. From the results it stems that the structural change of total the debt matters for the growth.

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II. Debt and Growth

Among the literature it seems to be a consensus to utilize the gross debt as an indicator of an indebtedness of the national economy, however there are some opinions that another indicator should be take in consideration.[2] In this paper the gross debt is an indicator of indebtedness, too. We use IMF (2013) definition of gross debt, which means that total gross debt consists of all liabilities that are debt instruments. A debt instrument is defined as a financial claim that requires payment(s) of interest and/or principal by the debtor to the creditor at a date, or dates, in the future. The total debt is divided by sectors (and units) to 3 sectoral categories. Hence, the private debt consists of the household's debt, which is a debt of the sector of households (S.14) and non-profit institutions serving households (S.15) and the debt of non-financial private corporations (S.11). Public debt does not consist of the debt of whole public sector. Public financial and non-financial corporations are excluded. Public debt is a debt of the general government sector (S.13). The financial sector's debt is excluded, because otherwise it would lead to double counting. Nieuwenhuyze (2013, p. 127) explains this as follows, "*the debt of the financial corporations sector (S.12), which consists largely of financial intermediaries, is ultimately held by a domestic or external non-financial sector."* The institution of debt is a tool, which allows an entity to meet its needs sooner than without debt, especially if an amount of saving is not satisfied. From the neoclassical point of view, especially if the private debt is considered, the debt adjusts the one's preference of a current spending with the one's subjective evaluation of the future income outflows. If some details could be excused, the mechanism is similar by both consumers and producers. However, the situation is not so unambiguous while the public debt is under consideration. For example, the mechanism of creating debt is different. In simplicity, there is no such individual action which leads to the debt. Public debt could be considered as a society debt and how the society makes decisions is not the purpose of this contribution, however, for more information see e.g. Buchanan (1999).

Current research of private and public debt and their impact on the economic growth has been mainly focusing on too-much-debt phenomena. From the theoretical point of view, there are few suggestions trying to explain such a relation, for instance Batini et al. (2015), Cherherita-Westphal et al. (2014) or Roberts (2017). From the empirical point of view, it seems that there are many proofs suggested for non-linearity between public or private debt and economic growth, for instance Afonso and Alves (2015), Chen et al. (2017), or Lombardi et al. (2017). However, the additional contribution to the literature of such empirical researches might be diminishing by the relevance of an endogeneity problem. Among the first who have revealed the nexus from public debt to economic growth to be not significant are Panizza and Presbitero (2014). They showed that if the relation is control for the endogeneity more than just using lags values of the public debt, the impact of public debt on economic growth turns to be rather insignificant. Private debt to GDP is usually used in studies of financial development to economic growth as a proxy of a financial depth (Cafiso, 2017), and among these studies the problem of the endogeneity might exist too. On the other hand, more recent studies actively dealing with the endogeneity reveal that the nonlinear impact of private debt on economic growth could be present (e.g. Lombardi et al., 2017).

It seems that while Cecchetti et al. (2011), who use 18 OECD countries in 1980-2006, point out the possibility that the debt of non-financial corporations has threshold around 90% to GDP, the public debt around 85% to GDP, and the debt of households tend to be insignificant, Batini et al. (2016) claims that, according to their model specification, surges in private debt might be more harmful to the economy than surges in public debt, thus more risks could come from the development of the private debt than comes from the public debt. In this way Lombardi et al. (2017) suggest that the debt of households is more detrimental that the debt of non-financial corporations. If the households' debt

[2] Bloch and Fall (2016) show other approaches to capturing the level public sector indebtedness. Nieuwenhuyze (2013) suggests that the gross debt does not highlight the real debt pressures and the net debt should be examined. However, both cited authors agree there are more methodical problems banded with the reporting of the net debt than with reporting the gross debt.

exceeds 60% of aggregate consumption or 80% of GDP it starts to diminish the economic growth in long run. The effect is even more pronounced in short run. It could mean that the economy might handle more of public debt than the private one.

The main conclusion from the paragraph above for this contribution is that the debt of households and public debt could be expected to be the most negative debt of all 3 examined debts. The debt of non-financial corporations might be the one which can be consider as less harmful, nevertheless, there are some papers which suggest the opposite. With all this said, es not go against the too-much-debt hypothesis. With all these said it makes interesting to examine the effects of shifts within the structure of total debt of economy from sector to sector.

III. Methodology and Data

The aim of this paper is to investigate the effect of structural changes of the total gross debt on economic growth in OECD countries. Datasets consists of 26 OECD countries in the period from 1996 to 2016. To fulfil the aim of this contribution it relies on the panel data regression methods with a single equation model. This approach is commonly used across studies which are dealing with the nexus between any kind of debt and economic growth. For that reason, the estimates can be described as follows. Equation 1 is the basic model:

$$y = X\beta + DEBT\varphi + \varepsilon, \tag{1}$$

where the dependent variable *y* is the real GDP per capita growth. There are two sets of independent variables in equation 1. The first one, donated by **X**, is a set of control variables. The second is donated by **DEBT** and it consists of all variables of research interest. Parameters β and φ are estimated vectors of parameters of a given set. Finally, the symbol ε represents an error term of estimate, which is assumed to be:

$$\varepsilon_{it} = \mu_i + u_{it}, \tag{2}$$

where the index *i* represents the cross-sectional unit and index *t* is the time unit. From equation 2 stems that error terms ε is assumed to have a country-specific component μ and the residual *u*. To decide whether the assumption about the presence of time-invariant component the robust test of Welch statistics for differing group intercepts is used. There are two possibilities. The first is the model with the random effects and the second is the model with fixed effects. The Hausman test is performed to conclude right about the feasibility of the random effects model (Baltagi, 2013).

An evaluation of the impact of the structural change of the debt structure, or the shift from one sector debt to other, on the economic growth comes out from the modification of the omitted variable approach (Murín, 2016). It is yielded from Acosta-Ormaechea and Yoo (2018). The authors employ this method to examine the effect of tax shift with neutral tax level impact on economic growth of advanced economies. The idea behind this could be explained using equation:

$$y_{it} = \sum_{j=0}^{J-1} \beta_j X_{it} + \beta_j Total\_debt_{it} + \sum_{k=1}^{K-1} \varphi_k \, DEBT\_ratio_{kit} + e_{it}, \tag{3}$$

where parameters β represent parameter of control variable *j*, and φ is the parameter of variable of research interest, *k*. Error term *e* is of equation 2 process. Main difference between equation 1 and equation 3 is that now the *Total_debt* is incorporated into the set of control variables **X** with parameter β.[3] This means that all estimates are controlled for the effect of the total gross debt development. *DEBT_ratio*, which is now the set of variables of research interest, consists of the ratios of sector debt to the *Total_debt*. *Total_debt* is a sum of private and public debt. It is useful to repeat that there are 3

[3] Equation 3 shows *Total_debt* separately from the **X** only for the purpose of better presentation. The idea behind is that it is one of the control variables now.

types of sectors examined as suggests Izák (2015) or Nieuwenhuyze (2013). Namely they are: sector of households consists of households (S.14) and non-profit institutions serving households (S.15), then sector of non-financial corporations (S.11) and finally the sector general government sector (S.13). It could be worth it to remind that a sum of debts of S.14, S.15 and S.11 is the private debt.

Therefore, up to 3 ratios of sector debt to total debt are included into the analysis. From nature of the regression analysis, it is not favourable to use all the ratios in one estimate. For example, if one ratio has positive impact and other two have negative, it is not possible to conclude to rise the one with positive parameter because such a change would directly lead to changes in other two ratios. For that reason, as Murín (2016) says, variable should be omitted. The ratio of debt *k* is the ratio which is included into the analysis. The ratio of debt *m* is the ratio omitted from the regression. Aftermath of such procedure is the estimated parameter φ of ratio *k* can be described by the following expression:

$$\varphi_k = (\gamma_k - \gamma_m), \tag{4}$$

which means that parameter φ is obtained as a result of the change in ratio *k*, which is allowed by the opposite direction change in omitted ratio *m*. The effect of specific ratio is expressed as γ. From equation 3 stems that there are *K* debt ratios and only 1 is omitted. Furthermore, including *Total_debt* into the set of control variable allows adjusting estimates of the effect of debt development; therefore, φ_k can be understood as effect of internal change in structure of debt which goes from omitted ratio to the ratio included into the regression.

The set of control variables consist of standard used measures within the literature of the economic growth empirics. All variables used in this contribution are retrieved from OECD (2017) database and they are described in table 1.

Table 1 Description of variables

Dependent variable	
GDPpc	Real GDP per capita (USD)
Growth	Year over year growth rate of *GDPpc* (%)
Control variables	
Invest	Real gross fixed capital formation per capita (USD)
Hours	Annual hours worked per worker
Tech	Number of patents per million persons, region by inventor
Open	Sum of export and import to GDP (%)
Gov	General government expenditure to GDP (%)
Total_debt	Sum of gross debts of S.13, S.14, S.15 and S.11 to GDP (%)
Variables of research interest	
Public_d	Gross public debt, general government, share to *Total_debt* (%)
Private_d	Sum of *House_d* and *Nonfin_d* (%)
House_d	Gross debt of households and non-profit institutions, share to *Total_debt* (%)
Nonfin_d	Gross debt of non-financial corporations, share to *Total_debt* (%)

Source: Czech Statistical Office (2010)

Table 1 shows transparently that there are 3 types of variables as mentioned above. The set of control variables **X** consists of variables in respect of present empirical contributions, for instance Afonso and Alves (2015), Chen et al. (2017), Murín, (2018), etc. Variable *Invest* is an approximation for the effect of investment into the physical capital. *Hours* reflects the effective labour utilization. There are

signs that higher the advance is the less hours are needed to work due to its non-linear impact on productivity (Pencavel, 2015). Variable *Tech* is a proxy of technological progress, or to be more precise, it is a proxy of the intensity of the technological progress, which could play a significant role in the sustainable long-term economic growth, see Romer (1990). Variable marked as *Open* is to control the economic growth for the effect of economy to be part of an international trade. The idea behind is that the more open economy the faster growth rates due to the benefits of the international trade. Effect of different size of the public sector o the economic growth is controlled by *Gov*. It is possible the Wagner law to be present, hence the negative sign could be expected, for instance see Murín (2016). The purpose of incorporating *Total_debt* into the set of control variables was already mentioned. For deeper discussion see Murín (2018).

Hence, more general equation 3 can be re-written into estimated model using proper variable names from table 1:

$$Growth_{it} = \beta_0 + \beta_1 Invest_{it} + \beta_2 Hours_{it} + \beta_3 Tech_{it} + \beta_4 Open_{it} + \beta_5 Gov_{it} + \beta_6 Total\_Debt_{it} + \sum_{k=1}^{K-1} \varphi_k \, DEBT\_ratio_{kit} + \mu_i + u_{it} \quad (5)$$

To estimate regressions of equation 5 the within fixed effects model is employed. The cross-section time invariant effects are capturing. This estimation technique is used by Afonso and Alves (2015) or Cecchetti et al. (2011) even with the dynamic specification of panel regression. Murín (2016) employs slightly different method comparing with the one presented here. Hence, the method within this paper is the one-way fixed effects model using robust HAC estimator. The robust HAC estimator is the improvement in comparison with the estimation technique employed by Murín (2016). This estimator allows for the heteroskedasticity and autocorrelation

This estimation technique is based on classical asymptotic theory and it requires all variables to be stationary, see Baltagi (2013). Therefore, variables from table 1 were tested for the presence of a unit root. Only variable *Growth* is stationary at levels, all others are stationary in the first differences. Therefore, the first differences are calculated of every variable except for *Growth*. Result table 2 marks the first different using "*d_*" in front of name of the variable and the equation 5 could be re-written as follows:

$$Growth_{it} = \beta_0 + \beta_1 d\_Invest_{it} + \beta_2 d\_Hours_{it} + \beta_3 d\_Tech_{it} + \beta_4 d\_Open_{it} + \beta_5 d\_Gov_{it} + \beta_6 d\_Total\_Debt_{it} + \sum_{k=1}^{K-1} \varphi_k \, d\_DEBT\_ratio_{k,i,t-1} + \mu_i + u_{it} \quad (6)$$

From the econometrical point of view, debt variables tend to be corelated with the economic growth bidirectional, especially if the public debt is taking into analysis; see e.g. Panizza and Presbitero (2014). In this paper we follow Cecchetti et al. (2011) or Murín (2016) approach and all debt variables are 1 year lagged to lowering potentiality of an endogeneity and this can be seen in equation 6 too.

IV. Empirical results

The results of the described method are presented in table 2, where one can see 6 different model specifications which are stemming from equation 6. The model specifications are done by omitting the different ratio of sector debt, expect for the model 1.

Model 1 is the result of the benchmark estimate. Here are all sector debt ratios omitted. From this specification it can be seen that control variables *Invest*, *Tech*, *Open* and *Gov* have statistically significant impacts on the economic growth of OECD countries. Furthermore, the sign of the parameters of all four variables is in line with the theoretical expectations, which were described within the previous section. Only variables *Hours* and *Total_debt* are not statistically significant. The results of *Hours* mean that while hours worked per worker could be negatively corelated with the level of income, their impact on the growth rate of real GDP is not important see Pencavel (2015).

The estimated impact of *Total_debt* among all other model specifications is more interesting. No significance effect of total debt on the economic growth could mean that debt does not affect the economic growth of advanced economies. However, this conclusion must be perceived by the real caution and the results of other cited studies within this paper should be take into the consideration before one makes any suggestion for the relevant authorities.

Table 2 Fixed-effects estimates, dependent variable: Growth

Model specification	(1)	(2)	(3)	(4)	(5)	(6)
	1.335***	1.312***	1.312***	1.192***	1.192***	1.192***
	(0.065)	(0.079)	(0.079)	(0.109)	(0.109)	(0.131)
d_Invest	0.002***	0.002**	0.002**	0.002***	0.002***	0.002***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)
d_Hours	0.011	0.012	0.012	0.011	0.011	0.011*
	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.006)
d_Tech	0.011**	0.010**	0.010**	0.009**	0.009**	0.009
	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)	(0.006)
d_Open	0.090**	0.096***	0.096***	0.098***	0.098***	0.098***
	(0.032)	(0.032)	(0.032)	(0.033)	(0.033)	(0.018)
d_Gov	-0.325***	-0.346***	-0.346***	-0.347***	-0.347***	-0.347***
	(0.061)	(0.060)	(0.060)	(0.061)	(0.061)	(0.045)
d_Total_debt	-0.000	0.005	0.005	0.009	0.009	0.009
	(0.011)	(0.012)	(0.012)	(0.012)	(0.012)	(0.009)
d_Public_d		-0.299***			-0.439**	-0.181***
		(8.470)			(12.028)	(6.946)
d_Private_d			0.299***			
			(8.470)			
d_House_d				0.439***		0.259***
				(12.028)		(7.643)
d_Nonfin_d				0.181**	-0.259***	
				(7.735)	(10.975)	
N	455	455	455	455	455	455
Adj. R^2	0.492	0.519	0.519	0.532	0.532	0.532

Source: the author´s calculation
*Notes: Robust HAC standard errors in parentheses; *, **, and *** indicate significance at the 10, 5 and 1 percent level respectively*

The aim of this paper is to investigate the effect of structural changes of total gross debt on economic growth. The methodological approach used within this paper allows accomplishing this aim. In table 2 model specifications from 2 to 6 are directly in line with the purpose of this contribution. From the results stem that all structural shifts of total debt are statistically significant. Model 2 is obtained as the result of omitting private debt, *Private_d*. The parameter of *Public_d* suggests that if the ratio of

the debt goes from private debt to the public debt the impact on the economic growth is negative. This statement is confirmed by the model 3. Model 3 presents the opposite analysis, which means that the private debt is incorporated into the regression, while public debt is omitted. It can be seen that the distances from zero of the parameter *Public_d* in model 2 and the parameter *Private_d* are exact same. However, these two parameters are of opposite signs. This fact is in absolute conformity with the methodological proposition described within the section III.

By model 4 is done an extension of the analysis by model 3. The more detailed decomposition of the private debt is made. The results suggest that both shifts, towards the debt of households and debt of non-financial corporation, are positive correlated with the higher economic growth. Furthermore, the shift from public debt to the debt of households seems to be the most positive one among all other structural changes. This is in contradiction with Batini et al. (2016). They consider the debt of households to be the most harmful. Like it was said, the effect of the shift from public debt to debt of non-financial corporation is positive too, but the parameter is almost 2.5 times lower than the shift toward the debt of household.

Further analysis, which consists of model 5 and 6, is dealing with the omitting particular private debt category. Model 5 in table 2 shows the results of estimate of equation 6 with the debt of household excluded from the regression. It could be seen that all two debt ratios left in estimate have negative and statistical significant parameter. It means that shifts from debt of households to other debt categories are detrimental to the economic growth. These results confirm the idea of the debt of household to be the most expedient. Therefore, every increase in fraction of debt which goes from debt of households is negatively correlated with the economic growth. Model 6 confirms the interdependency between the debt of households and debt of non-financial corporations from the model 5 and between the public debt and debt of non-financial corporations from the model 4.

V. Conclusions

World development since the Great Recession has put light on many economic challenges. One of them is the real effect of debt on the economies. The sovereign debt crisis led to an enlargement of discussion on the public debt impact on long-term economic growth. Based on several studies, which are dealing with the advanced economies, there can be a “too-much-debt" phenomena within the public finance. However, there are signs that the private debt could behave similarly. It means that “too-much-debt” is an issue even for the private sectors of the economy. Although, there are severe problems linked with an endogeneity. Rather on the levels, this contribution focuses on the ratios of particular sector debt to the total debt. Therefore, the aim of this paper was to investigate the effects of structural changes of total gross debt on economic growth in OECD countries during period from 1996 to 2016. To be able to conduct such analysis the approach of Acosta-Ormaechea and Yoo (2018) is modified in line with the purpose of this article. The panel data fixed-effects model using robust HAC errors is employed to estimate results.

The findings suggest that while total gross debt does not affect the economic growth of advanced economies change in structure of total debt could play significant role. The shift from public debt to private debt is correlated with the higher economic growth. The most positive impact of all debt ratios is obtained where the structural change goes from public debt toward debt of households. It seems that the more individual is the decision-making process about the debt creating the more positive is its impact. This, on the other hand, is in direct contradiction with the recent studies, which considers the households debt to be more harmful than debts of other two sectors (e.g. Batini, et al., 2016 or Lombardi et al., 2017).

This contribution represents an enter analysis and its output should take into the considered with some level of caution. There could be a problem of the causality of the nexus between change of debt structure and economic growth, as Izák (2015) proposes. He notes that during the bad times the spill-over between private and public debt is more likely. The possibility that private debt could develop under a moral hazard is present. Subsequently, this all means that during crisis many governments

tend to take over the private liabilities and doing so to increase the ratio of public debt to total debt. Aftermath of this, we could observe the negative correlation of shifts from public debt to all two private sectors. At this point, the further analysis is needed and for that reason it is responsible to make no detailed recommendations for the economic policy makers.

If the results were right the governments should not take over the private liabilities even in bad times, because it would lead to debt structure changes which are detrimental to the economic growth. Especially, if any financial problems befall households it seems that the economy is able to conduct best by itself. Nevertheless, there are no doubts about the social implication of such measure. On the other hand, if both the private and public debt rise, it is important the public debt to rise slower than private debt.

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