PRODUCTION INSTITUTIONAL FUNCTIONS IN ANALYSIS OF FISCAL POLICY OF THE REPUBLIC OF BELARUS

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Abstract

The present paper is devoted to analysis of fiscal policy of the Republic of Belarus by means of production institutional functions.

The aim of this paper is the using of production institutional functions (PIF) for analysis of fiscal policy of the Republic of Belarus. PIF were introduced by Balatskiy in [1] in which institutional variables are used together with traditional factors, such as output, labor and capital. Balatskiy proposed to use tax burden (tax share in GDP) as institutional factor. Also the relation between output and tax burden is supposed to be nonlinear. That type of model allows analyzing the role of the fiscal climate in getting economic growth of the country.

The output is defined by the next PIF:

$$Y = \gamma e^{\alpha t} K^{(a+bq)q} L^{(n+mq)q}, \tag{1}$$

where Y is output (Gross Domestic Product); K is capital (fixed assets); L is labor (number of employed in economy); q is tax burden (the share of tax revenues T in GDP, $q = T/Y$); γ, a, b, n and m are parameters we have to estimate.

The production curve is specified by (1). It defines output depending on tax burden. Then fiscal curve describes relation between tax revenues and tax burden and is determined by the next function:

$$T = \gamma q e^{\alpha t} K^{(a+bq)q} L^{(n+mq)q}. \tag{2}$$

The main idea of fiscal analysis based on PIF is defining of mutual position of Laffer points of the first and the second type and real tax burden. These fiscal indicators allow describing enough full picture of fiscal climate and his role in dynamic of economic growth of the country.

Let path on to logarithms of (1) and (2) :

$$lnY = ln\gamma + \alpha t + (a + bq)qlnK + (n + mq)qlnL, \tag{3}$$

$$lnT = ln\gamma + lnq + \alpha t + (a + bq)qlnK + (n + mq)qlnL. \tag{4}$$

Under [1] Laffer point of the first type (q^*) is the point of maximum of the function (3). The requirement for Laffer point of the first type is

$$\partial lnY/\partial q = 0,$$

i.e.

$$2q(blnK + mlnL) + (alnK + nlnL) = 0.$$

Thus the Laffer point of the first type (q^*) of the function(3) is defined by:

$$q^* = -\frac{1}{2}\frac{nlnL + alnK}{mlnL + blnK}. \tag{5}$$

Similarly Laffer point of the second type (q^{**})is the point of maximum of the function (4), when it satisfied the condition

$$\partial lnT/\partial q = 0,$$

i.e.

$$2q^2(blnK + mlnL) + q(alnK + nlnL) + 1 = 0.$$

This gives:

$$q^{**} = \frac{1}{4}\frac{\pm\sqrt{(nlnL + alnK)^2 - 8(mlnL + blnK)} - nlnL - alnK}{mlnL + blnK}. \tag{6}$$

The PIF (1), (2) were estimated in [1] using statistical data of Russia, USA, Sweden, Great Britain.

In the paper we use annual statistical data on GDP (Y_t), fixed assets of the economy (K_t), average annual number of employed in national economy (L_t), taxes on production and import (T_t) of the Republic of Belarus for the time period 1990-2005.

For all the time series there were conducted unit root tests: Augmented Dickey-Fuller test (ADF-test), Phillips-Perron test (PP-test), Kwiatkowski-Phillips-Schmidt-Shin test (KPSS-test) [2]. The result of this tests indicates that all the time series are I(1). Thus the Engle-Granger method is used to reveal long-run relationship [3].

We have got the next PIF on Belarusian statistical data for the time period 1990-2005:

$$\begin{aligned} lnY_t = &-\underset{(0.000)}{0.065}t + (-\underset{(0.000)}{2.13} + \underset{(0.000)}{0.094}q_t)q_t lnK_t + \\ &+ (\underset{(0.000)}{0.062} - \underset{(0.000)}{0.002}q_t)q_t lnL_t + \underset{(0.000)}{0.121}DT(1995)_t, \end{aligned} \tag{7}$$

$$\begin{aligned} lnT_t = &\underset{(0.000)}{0.061}t - \underset{(0.000)}{17.515}q_t + (-\underset{(0.017)}{2.213} + \underset{(0.015)}{0.097}q_t)q_t lnK_t + \\ &+ (\underset{(0.000)}{0.229} - \underset{(0.000)}{0.005}q_t)q_t lnL_t + \underset{(0.002)}{21.898}. \end{aligned} \tag{8}$$

The dummy variable $DT(1995)_t$ describes the decreasing of GDP until 1995 and its rising from this period.

Statistical characteristics of the models (7)and(8) are given in the table 1.

Testing the forecasting ability of the models, out-of-sample forecasts were produced for the period 2004 to 2005 and compared with the actual values of the endogenous variables. Overall the represented models proved to be a good fit and have satisfactory forecasting ability.

Table 1: Statistical characteristics of the models (7)-(8)

Equation	R^2	R^2_{adj}	SER	DW	MAPE
(7)	0.965	0.946	0.038	2.573	1.61%
(8)	0.986	0.975	0.039	1.428	1.99%

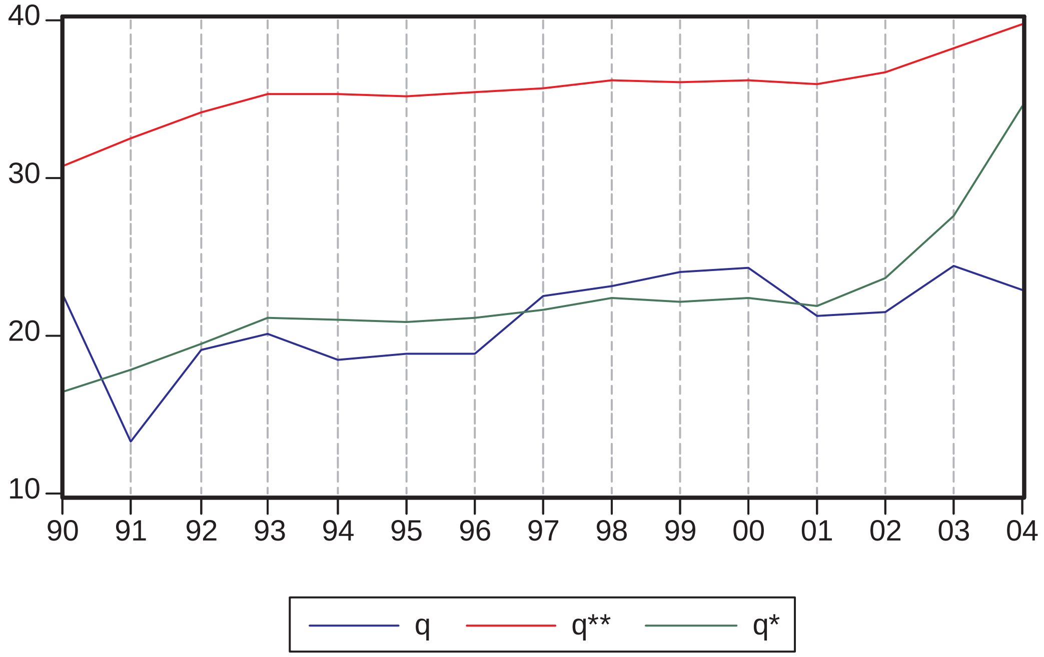

Figure 1: Real tax burden and Laffer points of the first and the second type for the Republic of Belarus

Using the estimated coefficients of the models (7) and (8) we calculated Laffer points of the first (q^*) and the second (q^{**}) type. Laffer point of the first type defines the limit of tax burden increasing with no setback in production. Laffer point of the second type shows the highest possible value of tax burden. Exceeding this value makes impossible the increasing of tax revenues in budget.

The figure 1 describes estimated results.

Mean value of Laffer point of the first type come to 22.3% and of the second type - 35.5%.On figure 1 it is shown that real tax burden was lower then Laffer points of the first type with the exception of the time periods 1990, 1997-2000. It means that the tax burden was not very high and can't provoke to setback in production. Excess the real tax burden over q^* in 1990, 1997-2000 is evidence of excessiveness of tax burden on national producers in this time period.

Laffer points of the second type were greatly higher then q^* during the all analyzing period. It indicate about possibility of tax burden increasing to the q^{**} level. It will result in reduction of economic growth rate, although budget revenues will rise.

References

[1] Balatskiy E.V. (2003). Analysis of influence of tax burden on economic growth using production institutional functions. *Problems of forecasting*. N. **2**, pp. 88-105.

[2] Maddala G.S., Kim I.-M. (1998). *Unit roots, cointegration, and structural change*. Cambridge University Press, Cambridge.

[3] Granger C.W.J. (1981).Properties of Time Series Data and Their Use in Econometric Model Specification. *Journal of Econometrics*. Vol. **16**, pp. 121-130.