Reply to the Referee's *Comments on "The endogeneity of the natural rate of growth: an alternative approach"*

We appreciate the referee for bringing up some concerns regarding the contents of the manuscript. Below, we address in detail all the concerns of the referee:

The bold and blue explanations belong to the authors. The rest are the original comments of the referee.

This paper attempts to estimate a BOP consistent growth rate and to test "the endogeneity of the natural rate of growth". The paper also aims to test "the Thirlwall's law for the US economy".
According to the "Thirlwall Law", under certain conditions including the validity of Marshall-Lerner condition and purchasing power parity hypothesis, the ratio of export growth to the income elasticity of import demand may be defined as long-run growth rate consistent with the BOP equilibrium (y). Accordingly, the performance of y in explaining "long-run" or actual growth rate has often been taken as a test for the validity of the Thirlwall postulation. Given that, the income elasticity is a constant number, the Thirlwall postulation, indeed asserts that y can be represented by a scaled export growth variable. A cointegration of actual growth rate and the estimated constrained growth rate with a unitary coefficient is often taken as evidence supporting the Thirlwall postulation.
The paper, first of all, needs completely re-written as it contains numerous English errors: A typical example is given below:
"The first method involves estimating the elasticity of the income of demand for imports that would make the growth of the income consistent with the balance-of-payments equilibrium (which is equal to the actual rate of growth). Then the elasticity of the income of demand for imports which is compared with the estimated elasticity of imports with respect to the income from the time series regression analysis of the import demand function".

The paper introduces some misleading notations such as "Δ%U" (Change % U!),

This is a common notation in the related literature. Please see, for example, Thirlwall (2002: 89).

"long-term elasticity" and many more.

It is not clear to us what the referee meant with this statement. However, we think that the referee refers to the title of Table 2 and the coefficients given in Table 2 and Table 3 that show the long-run parameter estimates. We used "long-term elasticity" since there is a cointegration (long-run levels relations as in expressed by Pesaran, Shin and Smith, 2001) relationship among the variables of the real import equation in which the variables entered the regressions by their logarithmic values.

Also, there is no notational consistency between the uses of y, gb, gn etc. along with natural, BOP consistent/constrained, hypothetical growth rates.

We have reviewed our study carefully. According to us there is no notational inconsistency for natural rate of growth; it is g_n. However, we can correct our possible mistakes if the referee gives an exact page and paragraph about using of g_n. We used g_b for BPCRG and it is same with y and hypothetical rate of growth. Indeed, we had

The paper (and often the referred literature) uses some concepts such as natural rate of growth etc. ignoring (and thus not referring to) the basic macroeconomic findings including Okun's law, NAIRU, Phillips Curve.

The paper provides estimates of real import equations employing ARDL and FM-OLS procedures. The income elasticities are quite high which is indeed consistent with the bulk of the recent literature including the "price elasticity pessimism". Unfortunately, this finding is not interpreted in the context of the growing related literature.

The paper incorrectly interprets the results of the bounds tests as an indication of weak exogeneity. The authors may be suggested to the use of alternative procedures including Johansen and Juselius for such an inference.

The paper, takes an income elasticity estimate by the FM-OLS (2.159) and presents this value as the ratio of an undefined variable to another undefined variable (p. 16). The insignificance of the divergence of the estimated income elasticities of import demand equations from this value are interpreted in assessing the Thirlwall postulation. This is indeed not a valid procedure both theoretically and empirically.

Table 4 of the paper "finds" that the relationship between two stationary variables, one of which is (hypothetical?, natural? y* or something else) is stationary. Table 4 provides no valid inference for any hypothesis. Not surprisingly, the relationship between two stationary variables is found to be stationary. But this may not be representing a long-run relationship.

It is well-known from this original definition, cointegration refers to the variables that are integrated of the same order and implicitly d must be greater than zero. Therefore, two variables that are I(0), cannot be cointegrated since when $d = 0$, there is no way to find a b given $d - b = 0$. That is if $d = 0$, b must be 0 in order to have cointegration. This also breaks the restriction that is $b > 0$.

Pesaran, Shin and Smith (2001) explicitly say that the bounds testing procedure can be used when (a) all variables are I(1) and co-integrated, (b) all variables are I(1) but not co-integrated, and (c) all variables are I(0). Based on this, we checked the long-level relation between these two growth rates. The results confirmed the existence of a stable long-term relationship between the hypothetical and actual growth rates. We also showed the existence of a significant relationship between actual growth and predicted growth [hypothetical] with a constant term close to zero and a slope coefficient close to unity which is a test of Thirlwall's law (Alonso, 1999; Britto and McCombie, 2009 and Thirlwall, 2011).

The IV results are all completely invalid and the authors may be expected to provide an understanding of the basic concepts including simultaneity bias, exogeneity, Sargan and Wu-Hausmann tests.

First of all, we would like to remind that we reported the results obtained by OLS not IV in Table 5. We reported which results we obtained when we used the lagged values of the fitted values of $\Delta\%U$ as an instrumental variable in the text. We also followed Davidson and McKinnon (1993) procedure for testing endogeneity of $\Delta\%U$ in order to check statistical significance of the fitted values of $\Delta\%U$ in the auxiliary regressions (p. 17-18). We did not estimate the fitted values of $\Delta\%U$ statistically significant; confirming that the $\Delta\%U$ variable is empirically not endogenous. We also followed León-Ledesma and Thirlwall (2002). These authors also used the lagged values of $\Delta\%U$ as an instrument in order to see whether the values obtained for the intercept term are biased or not.

The final part of the paper, which indeed attempts to test "the endogeneity of natural rate …" is seriously misleading. An insignificance of a dummy variable, may be interpreted in the context of a shift, but not as an evidence of endogeneity.

Our paper has a theoretical background. This background is mainly based on León-Ledesma and Thirlwall (2002). Therefore, on *this* basis, our results point out endogeneity. We summarized the testing procedure below.

We first estimate the natural rate of growth using Equation (1) in the paper.

$$g = \gamma - \lambda(\Delta\%U) \tag{1}$$

The growth rate of real output (g) is a function of the change in the percentage level of unemployment ($\Delta\%U$). If $\Delta\%U = 0$, then γ equals to the natural rate of growth. After measuring the natural rate of growth, the endogeneity is tested using a dummy variable

(D). In this case *D* takes the value of 1 for the years whose actual rate of growth exceeds the natural rate of growth and 0 for the rest of the years.

$$g = \theta + \phi D - \psi (\Delta\%U) \tag{2}$$

When $\Delta\%U = 0$ and if the parameter ϕ is statistically significant, the natural rate of growth equals to $\theta + \phi$. Furthermore, if the sum of $\theta + \phi$ is greater than γ (i.e., $\theta + \phi > \gamma$) this will indicate that the natural rate of growth increases during boom periods, suggesting endogeneity.

For your convenience the references cited in this report are given below.

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