The Journal of Economic Asymmetries xxx (2017) 1–15

Contents lists available at ScienceDirect

The Journal of Economic Asymmetries

journal homepage: www.elsevier.com/locate/jeca

On the value of the dollar and income inequality: Asymmetric evidence from state level data in the U.S.

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ARTICLE INFO

JEL Classification:
F31
O16

Keywords:
Income distribution
Economic growth
Asymmetry
State level data
United State

ABSTRACT

On the assumption that wages do not adjust fully to inflationary effects of currency depreciation, a depreciation could shift income from workers to producers which could worsen income inequality. When we tested this hypothesis using a standard linear ARDL model, we found no long-run support for the hypothesis in any of the 51 states of the U.S. However, when we applied recent advances in formulating nonlinearity and introduced nonlinear adjustment of the real effective exchange rate of the dollar, we found significant short-run and long-run asymmetric effects in almost half of the 51 states. In most states, dollar depreciation was found to have un-equalizing effects on income inequality, consistent with theory.

1. Introduction

Currency depreciation is said to affect every sector of an economy or every macro variable and income distribution is no exception. In search of an intuitive explanation for the link between exchange rate changes and income distribution, we come across Alexander (1952) who alluded us to the link between the two variables by arguing that if wages do not adjust fully to inflationary effects of a depreciation, producers will gain at the expense of workers. Since income has shifted from workers with high MPC to producers with low MPC, aggregate consumption and eventually output could decline, implying that a depreciation could be contractionary. Although Alexander (1952) was trying to explain why a devaluation or a depreciation could be contractionary, we can try to empirically verify if a depreciation shifts income from workers (low income group) to producers (high income group) or if a depreciation worsens income inequality.[1]

A few studies in the literature have considered the effects of exchange rate changes on a measure of income distribution. While Bahmani-Oskooee (1997) used a cross-sectional model and data from 28 countries to confirm the fact that devaluations could have worsening effects on income distribution, the same was confirmed by Bahmani-Oskooee, Goswami, and Mebratu (2006) when they included the black market premium in their cross-sectional model. As time-series data became available, experience of individual countries were considered. The U.S. annual data over the period 1952–2002 were considered by Bahmani-Oskooee and Gelan (2008) who used error-correction modeling approach to show that, indeed, dollar depreciation has un-equalizing effects on a measure of GINI in the U.S. in the short-run. However, in the long-run, although there was evidence of cointegration, the impact was negligible. We wonder if this long-run negligible effects suffer from aggregation bias. Do all states in the U.S. respond to a change in the value of the dollar in the

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[1] For a review article on contractionary devaluation see Bahmani-Oskooee and Miteza (2003).

http://dx.doi.org/10.1016/j.jeca.2017.08.001
Received 29 April 2017; Received in revised form 2 August 2017; Accepted 3 August 2017
Available online xxxx
1703-4949/

same manner? Put differently, could dollar depreciation worsen income distribution in one state and improve it in another state?

Thus, the main purpose of this paper is to assess the impact of changes in the value of the dollar on a measure of income distribution in each state of the United States, a practice that has never been considered by previous studies. Additionally, we add a new flavor to our analysis by showing that changes in the value of the dollar could have asymmetric effects on income distribution. After all, as discussed above since effects of a depreciation on income distribution works through inflationary effects of depreciation and since prices react to exchange rate changes in an asymmetric manner (Delatte & Lopez-Villavicencio, 2012), we would expect the measure of income distribution also to react in an asymmetric manner to exchange rate changes. The remaining of the paper is organized as follows. In Section 2 we outline the models and methodologies. The results for each state of the United States are then presented and discussed in Section 3. Finally, while a summary is provided in Section 4, data definition and sources are outlined in the Appendix.

2. The models and methods

In addition to assessing the asymmetric effects of exchange rate changes on income inequality, we also try to determine if exchange rate changes Granger cause income inequality. To that end, we need to employ a bivariate model between the two variables as outlined by equation (1):

$$\ln GINI_t = \alpha + \beta \ln REX + \varepsilon_t \tag{1}$$

where GINI is a measure of income inequality in each state and by way of construction, an increase reflects increased inequality. REX is the real effective value of the dollar and by way of construction, a decline signifies a real depreciation of the dollar. If a depreciation is to worsen income distribution we expect an estimate of γ to be negative.

Estimate of (1) by any method only yields the long-run effects of the exchange rate on GINI. In order to also assess its short-run effects, we turn (1) into an error-correction specification. Since it is possible for one variable to be stationary or I(0) and the other one to be first-differenced stationary or I(1), the approach we follow is that of Pesaran, Hashem, Shin, and Smith (2001) as outlined by error-correction model (2):

$$\Delta \ln GINI_t = a + \sum_{j=1}^{n1} b_j \Delta \ln GINI_{t-j} + \sum_{j=0}^{n2} c_j \Delta \ln REX_{t-j} + \lambda_1 \ln GINI_{t-1} + \lambda_2 \ln REX_{t-1} + \nu_t \tag{2}$$

In (2) the short-run effects of the exchange rate are inferred by the estimates of c_j and its long-run effects by the estimate of λ_2 normalized on λ_1. However, for the long-run effects to be valid, cointegration between the two variables must be established by applying the F test for which Pesaran et al. (2001) tabulate new critical values. Since critical values do account for integrating properties of variables, there is no need for pre-unit root testing and variables could be combination of I(0) and I(1).[2] Within specification (2), Bahmani-Oskooee and Oyolola (2007) have argued and demonstrated that if $\sum \widehat{c}_j \neq 0$, that will be an indication of exchange rate Granger causing GINI.

In specification (2) the main assumption is that changes in the exchange rate have symmetric effects on GINI. However, as mentioned in the introductory section, the effects could be asymmetric. In order to assess the possibility of asymmetric effects, we follow Shin et al. (2014) and modify specification (2) to estimate asymmetric effects of exchange rate changes on GINI. The modification amounts to separating exchange rate appreciations from depreciations. This is done by first forming $\Delta LnREX_t$ as a new time series variable which includes positive changes (appreciations) and negative changes (depreciations). We then use the concept of partial sum approach to form two new series where one reflects only appreciations (POS_t) and the other one reflects only depreciations (NEG_t). These two partial sum series are constructed as:

$$POS_t = \sum_{j=1}^{t} \Delta \ln REX_j^+ = \sum_{j=1}^{t} \max(\Delta \ln REX_j, 0), NEG_t = \sum_{j=1}^{t} \Delta \ln REX_j^- = \sum_{j=1}^{t} \min(\Delta \ln REX_j, 0) \tag{3}$$

In (3) the POS variable is constructed as partial sum of positive changes and the NEG variable as partial sum of negative changes. We then go back to (2) and replace $LnREX_t$ by POS and NEG variables to arrive at:

$$\begin{aligned} \Delta \ln GINI_t = a + \sum_{j=1}^{n1} b_j \Delta \ln GINI_{t-j} + \sum_{j=0}^{n2} d_j^+ \Delta POS_{t-j} + \sum_{j=0}^{n3} d_j^- \Delta NEG_{t-j} \\ + \lambda_1 \ln GINI_{t-1} + \lambda_2^+ POS_{t-1} + \lambda_2^- NEG_{t-1} + \zeta_t \end{aligned} \tag{4}$$

Due to nature of constructing the two partial sum variables, (4) is usually named as a nonlinear ARDL specification whereas (2) is a linear ARDL model. Shin et al. (2014) demonstrate that Pesaran et al. (2001) F test for cointegration is also applicable to (4). They even argue that critical values of the F test should stay the same for both models (2) and (4), even though (4) has one more variable. This is due to dependency between partial sum variables.[3]

Once we estimate the nonlinear model (4), we can test a few asymmetry hypothesis. First, short-run asymmetry effects could be established if coefficient estimates at each lag associated with ΔPOS variable are different than estimates at the same lag associated with

[2] Note that Pesaran et al. (2001), p. 300 critical values are for large samples. Narayan (2005) provides these critical values for small samples such as ours.
[3] See Shin et al. (2014), p. 291.