Energy Economics 65 (2017) 98–104

Contents lists available at ScienceDirect

Energy Economics

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

Can an oil-rich economy reduce its income inequality? Empirical evidence from Alaska's Permanent Fund Dividend

Kate Kozminski, Jungho Baek *

Department of Economics, School of Management, University of Alaska Fairbanks, United States

ARTICLE INFO

Article history:
Received 13 January 2015
Received in revised form 17 April 2017
Accepted 28 April 2017
Available online 3 May 2017

JEL classification:
C22
C31
D63
Q48

Keywords:
Alaska
ARDL
Income
Inequality
Oil
Permanent Fund Dividend

ABSTRACT

The main focus of this paper is to empirically examine the effect of the Permanent Fund Dividend (PFD) payouts on Alaska's income inequality by taking into account the roles of income and population. To that end, an autoregressive distributed lag (ARDL) approach to cointegration and the Johansen cointegration approach are applied to annual time series data from 1963 to 2012. We find that the PFD payouts tend to worsen income inequality in Alaska in both the short- and long-run. We also provide evidence to support the existence of Kuznets' hypothesis for Alaska – growth deteriorates income inequality initially and improves it later. Finally, population is found to reduce Alaska's income inequality in the short- and long-run.

1. Introduction

While Alaska is not the largest producer of oil in the United States, it is the state most reliant on oil revenue with no foreseeable change in this reliance. In fact, the Alaska Department of Revenue forecasts that 2014 through 2023 oil production will be contributing 82%–89% of the general fund unrestricted revenue in Alaska.[1] While that is a decline from more recent 90%+ levels, it is still a significant reliance on oil revenue for the state (Alaska Department of Revenue, 2014). One of the results of the state's financial windfall tied to the oil industry in the 1970's was the establishment of the Alaska Permanent Fund (APF), which receives a percentage of Alaska's revenue from oil production as an investment that is set aside from government spending. Each year, 10.5% of the APF's past five fiscal years' realized net income is withdrawn for the Permanent Fund Dividend (PFD). The PFD is then divided between and paid out to each permanent Alaska resident in the form of an individual PFD payment (Widerquist and Howard, 2012).

Though it was designed to be a sort of profit-sharing mechanism, the fact that Alaska's PFD is paid annually to all state citizens, regardless of income or age, has caused some researchers to conclude that this equal payout may be reducing the state's income inequality. The theory behind the PFD's ability to decrease income inequality is explained in *Escaping the Resource Curse*, as the PFD acts as "a uniform transfer to all citizens [that] acts like a progressive tax… and produces a decline in the rich to poor income ratio and in this way reduces the level of vertical inequality" (Humphreys et al., 2007, p. 243). In Widerquist and Howard's book *Alaska's Permanent Fund Dividend: Examining its Suitability as a Model*, Scott Goldsmith contributes the possibility that "because the dividend provides a greater percentage increase to low-income households, it reduces inequality in the income distribution" (Widerquist and Howard, 2012, p. 53). The real struggle underlying these assertions, however, is the lack of empirical research done on the PFD's relationship to Alaska's income inequality.

The main focus of this paper is, therefore, to quantify the impact the PFD has on the state of Alaska's income inequality in the Kuznets curve framework. In doing so, three different measures of income inequality – that is, the Gini Coefficient, Relative Mean Deviation (RMD) and the

* Corresponding author.
E-mail addresses: swtappen@alaska.edu (K. Kozminski), jbaek3@alaska.edu (J. Baek).

[1] General fund unrestricted revenue is not restricted by the Alaska Constitution, state or federal law, trust or debt restrictions, or customary practice (Alaska Department of Revenue, 2015). In 2015, for example, the state received $2.3 billion in revenue from unrestricted sources, about $1.7 billion of which came from petroleum-related activities such as production tax, royalties, corporate income tax and petroleum property tax.

http://dx.doi.org/10.1016/j.eneco.2017.04.021
0140-9883/

Thiel's Entropy Index – are regressed on a measure of income that follows a polynomial of second degree and population in addition to a dummy variable capturing the PFD impacts. To that end, an autoregressive distributed lag (ARDL) approach to cointegration is applied to annual data over the 1963–2012 period. It should be emphasized at the onset that the current research is motivated by the following two reasons. First, it would be the most fundamental topic for a social welfare policy. If it is established that the PFD has a beneficial effect on reducing income inequality, then the PFD could be used as a model for other oil-rich regions to improve their income disparities as well. This line of research is also interesting because, although the Kuznets hypothesis has long been a popular area of empirical research, the answer is not settled. Indeed, the growth impact on income inequality empirically varies according to circumstances such as individual countries/states and different economic development.

This paper proceeds as follows: Section 2 presents the relevant literature; in Section 3, the empirical model and the ARDL modeling are discussed; Section 4 presents the data; in Section 5, the main empirical findings are reported and discussed; finally, Section 6 makes some concluding remarks.

2. Literature review

As noted above, since we test the PFD impact in conjunction with the Kuznets curve hypothesis, our paper is part of a larger literature that has examined the hypothesis. The Kuznets curve is an inverted U-shaped relationship between growth and certain measures of income inequality, first brought into academic attention by the seminal work of Simon Kuznets (1955). Economic growth worsens income inequality in the initial stage of industrialization, but improves it later after reaching a peak (turning point). Thus, the effect of growth on income inequality shows a parabolic shape.

A plethora of studies have sought to examine the Kuznets hypothesis. Given the use of econometric methods, previous studies roughly can be categorized into two groups. The first group typically uses cross-sectional or panel data of a group of countries to examine the Kuznets hypothesis. Examples include, but are not limited to, Ahluwalia (1976), Papanek and Kyn (1987), Campano and Salvatore (1988), Randolph and Lott (1993), Anand and Kanbur (1993), Jha (1996), Dawson (1997), Mbaku (1997) Eusufzai (1997), Deininger and Squire (1998), Thornton (2001), and Gelan and Price (2003). These studies provide mixed conclusions. For example, Anand and Kanbur (1993) find that the Kuznets hypothesis does not exist for 60 developing and developed countries. Dawson (1997), on the other hand, supports the hypothesis for 36 less developed countries (LDCs).

The second group argues that given different economic development (inequality) trajectory in individual countries, a cross-country comparison is likely to provide misleading results. This group adopts individual country specific data and time series approach in testing the hypothesis. Examples include Hsing and Smyth (1994), Khasru and Jalil (2004), Angeles-Castro (2005), Frazer (2006), Bahmani-Oskooee and Gelan (2008), German-Soto and Cantu (2015). The results from these studies are generally supportive of the Kuznets hypothesis. With time-series data from the U.S., for example, Bahmani-Oskooee and Gelan (2008) discover that low levels of income increase income inequality, but high levels improve it.

In this paper, as the second group does, we also employ time-series data from Alaska not only to examine the Kuznets hypothesis, but also to measure the effect of the PFD payouts on income inequality in Alaska. Unlike them, however, we apply parallel application of both ARDL and Johansen's methods to the same dataset in an effort to draw robust conclusions. We hope that these complementary features should lead to more balanced and robust conclusions.

3. Methodology

In an attempt to examine the effect of the individual Permanent Fund Dividend payouts on Alaska's income inequality, the following log-linear model is considered[2]:

$$\ln index_t = \beta_0 + \beta_1 \ln y_t + \beta_2 \ln (y_t)^2 + \beta_3 \ln pop_t + \beta_4 PFD_t + u_t \quad (1)$$

where $index_t$ is one of three measures of income inequality for Alaska; y_t represents the real gross state product (GSP) in Alaska; pop_t denotes the population in Alaska; PFD_t is the dummy variable capturing the PFD impact on Alaska's income inequality – taking on the value unity from 1982 on, when a PFD was distributed; and u_t is the error term. We are interested in the parameter β_4, the ceteris paribus effect of the PFD payouts on the state's income inequality. According to the Kuznets hypothesis, we expect that $\beta_1 > 0$ and $\beta_2 < 0$, respectively, so that the income inequality curve eventually shows an inverted-U shape. Finally, if population growth in Alaska worsens (improves) income inequality, it is expected that $\beta_3 > 0$ ($\beta_3 < 0$).

Since Eq. (1) represents a long-run model, Pesaran et al. (2001) suggest that in order to obtain stable estimates using the ARDL, we should incorporate the short-run dynamic adjustment process in the modeling procedure. Thus, we utilize an error-correction modeling (ECM) format to re-write Eq. (1):

$$\begin{aligned}\Delta \ln index_t = {} & \beta'_0 + \sum_{k=1}^{p} \beta'_1 \Delta \ln index_{t-k} + \sum_{k=0}^{p} \beta'_2 \Delta \ln y_{t-k} \\ & + \sum_{k=0}^{p} \beta'_3 \Delta \ln (y_{t-k})^2 + \sum_{k=0}^{p} \beta'_4 \Delta \ln (pop_{t-k}) \\ & + \beta'_5 PFD_t + \varphi_0 \ln index_{t-1} + \varphi_1 \ln y_{t-1} \\ & + \varphi_2 \ln (y_{t-1})^2 + \varphi_3 \ln pop_{t-1} + \nu_t \end{aligned} \quad (2)$$

Pesaran et al. (2001) demonstrate that the standard F-test can be applied to Eq. (2) in establishing joint significance of lagged level variables as a way of identifying cointegration. In application, it is to test the null hypothesis of no existence of a long-run relationship (no cointegration) – that is, H_0: $\varphi_0 = \varphi_1 = \varphi_2 = \varphi_3 = 0$ – against the alternative of the form as H_1: $\varphi_0 \neq 0, \varphi_1 \neq 0, \varphi_2 \neq 0, \varphi_3 \neq 0$. The problem is, however, that under the null the asymptotic standard normal distribution for the F-statistic does not apply: the standard F-statistic is no longer valid. Thus, two new sets of critical values (upper and lower critical values) for the F-test have been tabulated by Pesaran et al. (2001). For cointegration the computed F-statistic must be higher than the upper critical value. Once cointegration is identified, the long-run effects of each variable are inferred by the estimates of φ_1, φ_2 and φ_3 normalized on φ_0. The short-run dynamics are obtained from the estimates of first-differenced variables. Hence, the main advantage of the ARDL over the standard cointegration analysis (i.e., Johansen, 1988) is that both the short- and long-run effects can be estimated through one step estimation.[3]

[2] It should be noted that in examining factors influencing income inequality, studies typically employ a reduced-form model in which a measure of income inequality is related to income and other factors (i.e., population) (for example, Gelan and Price, 2003; Bahmani-Oskooee and Gelan, 2008). In this paper, we extend the standard model of income inequality to include a quadratic function of income and a dummy variable capturing the PFD impacts.

[3] In addition, the ARDL is generally known to work better for small sample sizes like this study (50 observations) than the standard cointegration analysis. However, since the ARDL is basically a single equation method, it may not be able to correct the potential endogeneity of the explanatory variables in a model, thereby causing the estimates to be biased. However, the literature presented in Section 2 consistently shows that income and population tend to behave exogenously in the income inequality model and justifies the use of the ARDL in estimating Eq. (2).