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Decomposing US Regional Inequality from 1969 to 2009

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Abstract

This paper analyses changes in levels and composition of income inequality among US counties from 1969 to 2009. It also decomposes inequality using the Theil coefficient into between-state and within-state inequality. The paper finds that income inequality has increased in the period studied with between-State inequality decreasing and within-State inequality increasing. We subsequently decompose income inequality into the proportion arising from differences in productivity and employment-population ratios across counties. The results suggest that inequality arising from differentials in labour productivity have fallen over the period studied while those arising from employment-population ratio differences have increased.

Keywords: Regional convergence, Inequality, Decomposition, Theil
JEL Codes: R12

Introduction

The presence and persistence of regional economic convergence or divergence arises from the assumptions underpinning alternative models of economic growth (Doran and Jordan 2013). The Solow (1956) model predicts regional economic convergence, through the flow of capital from rich to poor regions in pursuit of higher returns. The predictions of endogenous growth theory (Romer 1986) and new economic geography (NEG) models (Fujita, Krugman, and Venables 1999) are that regional economic disparities can persist and, in fact, regions may diverge based on initial advantages in knowledge and technology or, for NEG, the concentration of industries in core regions.

In general, the evidence from studies at state level in the US suggests that there has been a pattern of convergence over the last 8 decades or so (see, for example (Christopoulos and Tsionas 2007, Carlino and Mills 1993, Yu and Lee 2012). This view has been somewhat challenged by Johnson and Takeyama (2001) who, rather than a general convergence experience, find evidence of the presence of convergence clubs. Also, Breuer, Hauk Jr, and McDermott (2014) find evidence of absolute convergence between US states from the end of the great depression until the late 1970s and again from the early 1990s following a decade of divergence. There is also evidence of economic convergence at metropolitan and county level in the US (Crihfield and Panggabean 1995, Young, Higgins, and Levy 2008). In this paper we not are not only interested in whether inequality has increased/decreased but also how inequality has evolved within and between states and two factors which may explain this evolution; productivity and employment-population ratio differentials.

Regional (and national) growth, and therefore the potential for convergence or divergence, are functions of productivity, employment growth and population growth. Harmonization of productivity levels, through the promotion of innovation and technology, is a key mechanism through which convergence can be achieved. However, convergence may also be driven by employment levels. Lower living standards overall will occur if employment growth falls behind population growth and, therefore, the employment-population ratio is viewed as the second major mechanism through which income convergence can be achieved. (Alexiadis, Eleftheriou, and Nijkamp 2014).

We employ a Theil coefficient to estimate the evolution of total income inequality in over 3,000 US counties. An advantage of the Theil coefficient is that it allows for the identification of the proportion of inequality that exists between different states and within these states (Doran and Jordan 2013). In decomposing inequality into between-state and within-state components this paper provides an insight into the underlying structure of inequality in the US from 1969 to 2009 and how this has changed over time. Another advantage of the Theil coefficient is that it can subsequently be used to analyse the drivers of inequality and to determine the contribution of productivity and employment-population ratio differentials to total income inequality.

Data and Method

The data utilized for this analysis is derived from the Bureau of Economic Analysis' Regional Economic Accounts. We obtain data on more than 3,100 US counties across all 50 US states and the District of Colombia for the time period 1969 to 2009. Data is acquired on personal income, population and number of people employed in each US County.

We utilize the Theil coefficient to analyse the evolution of income inequality in US counties between 1969 and 2009. The advantage of the Theil coefficient is that it allows decomposition of inequality into various composite components, providing insights into the factors determining the overall level of inequality observed across US counties. The overall Theil coefficient can be calculated as:

$$T = \sum_c y_c \log\left(y_c / x_c\right) = T_{bs} + T_{ws} \tag{1}$$

$$T_{bs} = \sum_s Y_s \log\left(Y_s / X_s\right) \tag{2}$$

$$T_{ws} = \sum_s Y_s \left[\sum_c \left(y_c / Y_s\right) \log\left(y_c / Y_s / x_c / X_s\right) \right] \tag{3}$$

Where T denotes total inequality as measured by the Theil coefficient, T_{bs} between State inequality and T_{ws} within State inequality. y_c and x_c are county shares of national income and population respectively and Y_s and X_s are the same shares for States. Two alternative specifications of the Theil coefficient may be applied in the context of equation (1). These are to weight regions by income or by population. In equation (1), and all subsequent Theil equations, this paper weights each region by its income. Since income inequality is the subject of this analysis, it is logical to weight these regions by their economic, as opposed to demographic, strength (Terrasi, 1999).

Following from the decomposition of between- and within-country inequality, this paper analyses the causes of this inequality by decomposing inequality into the proportion caused by differing productivity and employment-population ratios across counties. This is accomplished through the use of equations (4) to (6)

$$T == T_{prod} + T_{emp} \tag{4}$$

$$T_{prod} = \sum_c y_c \log\left(y_c / w_c\right) \tag{5}$$

$$T_{emp} = \sum_c y_c \log\left(w_c / p_c\right) \tag{6}$$

Where T_{prod} represents the Theil coefficient of inequality due to differences in county productivity, T_{emp} is the Theil coefficient of inequality due to differences in county employment-population ratios, w_c is county c's share of the total workforce and all other variables are defined as above.

Results

In this section we discuss the results of our inequality decomposition of US counties and States. We note in Figure 1 that there has been an overall upward trend in inequality among the US counties considered in this analysis since 1969. Starting in the mid 1970s income inequality increased steadily before briefly contracting in the late 1980s. The 1990s were also characterized by increasing inequality while in the 2000s there appears to be much greater variation in the pattern of convergence/divergence. This is consistent with the general observations of studies such as Yu & Lee (2012).

Figure 1: Overall Theil Inequality Coefficient in the US 1969 to 2009

[Figure 1 Here]

While the overall pattern of inequality provides insights into convergence/divergence amongst US counties by disaggregating the contribution of within- and between-State inequality to our overall Theil coefficient, we can gain insights as to whether the pattern of convergence/divergence is driven by State differences. Figure 2 highlights the patterns of between- and within-State inequality. We note that between-State inequality has declined slightly over the period studied. This suggests that US States have experienced convergence in income levels. However, Figure 2 also shows that there has been a substantial increase in within-State inequality. This suggests that the central driver of persistent, and increasing, income inequality is differences in income between counties within States. This may indicate a strong urban/peripheral divide; where more urbanized counties (regardless of the State they are in) experience higher levels of income growth, while more peripheral counties lag behind.

Figure 2: Within- and Between-State Inequality in the US 1969 to 2009

[Figure 2 Here]

Figure 3 shows the contribution of productivity and the employment population ratios to the Theil coefficient. We note that the contribution of productivity to income inequality has fallen over the time period considered while the contribution of differentials in the employment-population ratio has increased. This implies that there has been convergence in productivity levels across US counties since the 1970s but that there is a widening of inequality in employment-population ratios. However, it is worth noting that the contribution of productivity differentials to income inequality, while falling, is still greater than the contribution of employment-population ratio differentials.

Figure 3: Contribution of Productivity and Employment Ratios to Inequality in the US 1969 to 2009

[Figure 3 Here]

Conclusions

In this paper we have analysed the evolution of income inequality amongst US counties for the period 1969 to 2009. Our results suggest income inequality has been increasing in the US and this has been a function of increasing within-State divergence in income levels, while between-State inequality has decreased. We also note that the contribution of productivity differentials across US counties to income inequality has fallen; however, it still remains the main contributor to differences in income inequality. Differences in employment-population ratios across counties has contributed increasingly to rising income inequality.

These results have important implications for regional policy in the US, which is directed at achieving balanced growth. Policies to improve between-State income

equality may only come at the cost of increased inequality at lower levels of spatial activity. The increasing contribution of employment-population ratios to rising income inequality highlights an uneven employment performance between urban/core and rural/peripheral areas. The declining, though persistently important, role of productivity differences suggests that there may be a transfer of more productive resources, including labour, from rural to urban areas. Better employment prospects in urban areas and/or employment in more productive businesses and sectors may attract more qualified and productive workers into those areas, sometimes referred to as 'sorting effects' in the regional literature (Doran and Fingleton 2015). This may be a worthwhile direction for further research based on the results here.

The results in this paper also suggest an important role for State-level regional policies that are place-based and that consider impacts at, at least, county-level. This may include investment in educational, social and physical infrastructures to enhance the attractiveness of rural counties. This may be directed at retaining and complementing productive resources in these counties.

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