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The effect of growth volatility on income inequality ☆

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ABSTRACT

This paper assesses the long-run effect of growth volatility on income inequality using a comprehensive panel of annual U.S. state-level data during the 1945 to 2004 period. Using the pooled mean group (PMG) estimator, we find evidence supporting the hypothesis that larger growth volatility positively and significantly associates with higher income inequality. Our key finding is robust to alternative lag structures, conditioning variables, inequality measures, volatility indicators, time periods, and panel estimators. Our key finding does change for asymmetric effects, where larger growth volatility positively and significantly associates with higher income inequality only for positive economic growth. The volatility effect proves positive, but insignificant, for negative economic growth.

1. Introduction

The interrelationships among economic growth, growth volatility, and income distribution (inequality) have generated separate strands in the existing growth literature. One broad strand assesses the effect of growth volatility on economic growth. While conventional wisdom suggests a standard dichotomy in that business cycle volatility and growth are unrelated (Lucas, 1987), other theoretical models predict that growth volatility negatively affects growth (Aizenman and Marion, 1993; Bernanke, 1983; Pindyck, 1991) or positively affects it (Black, 1987; Mirman, 1971). The negative effect can occur because higher volatility increases the option value of waiting on investment, lowering growth, whereas the positive effect can occur because households want to consume more today to hedge against the higher volatility (uncertainty) of the future, raising growth. In an influential empirical paper, Ramey and Ramey (1995) use two panels of countries and conclude that economies with higher volatility experience lower growth. Hnatkovska and Loayza (2005) confirm that volatility negatively affects growth and that the negative link largely depends on the country's structural characteristics. Kose et al. (2006) find that the negative relationship between volatility and growth becomes weaker in the 1990s because of trade and financial integration. Imbs (2007) shows that, while volatility negatively affects growth across countries, it positively affects growth across sectors. More recently, Fang and Miller (2014) find a positive volatility effect on growth, using a long sample of U.S. (United States) real gross national product.

Another broad strand of research explores the effect of income inequality on growth. Galor and Zeira (1993), Alesina and Rodrik (1994), and Persson and Tabellini (1994) argue theoretically that income inequality harms growth through fiscal redistribution and distortion, sociopolitical instability, or imperfect financial markets mechanisms; while Kaldor (1957), Saint-Paul and Verdier (1993) and Galor and Tsiddon (1997a, 1997b) assert that income inequality exerts a positive effect on growth through incentive, saving rate, or investment indivisibility channels. A similar divide exists at the empirical level: Alesina and Rodrik (1994), Persson and Tabellini (1994), Wan et al. (2006), Sukiassyan (2007), and Woo (2011) provide strong evidence that income inequality negatively influences growth; Partridge (1997, 2005), Li and Zou (1998), Forbes (2000), Lundberg and Squire (2003), and Frank (2009) show that income inequality positively affects growth, however. Barro (2000) uncovers a nonlinear inequality-growth nexus, with inequality encouraging growth in rich economies but slowing it in poor countries. Similarly, Lin et al. (2009) determine that an increase in inequality accelerates growth in high-income countries but hinders growth in low-income ones.

Rather than examining the volatility-growth or the inequality-growth linkages, a recent strand of literature considers a third possible

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connection between the level of growth volatility and the extent of income inequality. Current theories reveal at least three channels that can explain how growth volatility affects the distribution of income. First, Caroli and García-Peñalosa (2002) consider an economy where random shocks affect output. Therefore, laborers' marginal products and their wages fluctuate over time. As such, risk-averse laborers willingly accept a decrease in their average earnings in exchange for a constant wage, offered by risk-neutral entrepreneurs. Thus, the more volatile the output, the greater the risk premium the laborers willingly forego, and the larger the share of income seized by the entrepreneurs. As a result, more volatile economies probably associate with worsened income distribution. This is called the wage setting mechanism.

Second, Checchi and García-Peñalosa (2004) extend the seminal work of Galor and Zeira (1993) by considering the influence of risk on the accumulation of human capital. Assuming decreasing absolute risk aversion, they show that non-labor (inherited) wealth performs as an insurance mechanism, and only individuals with sufficiently high inheritance will pursue risky human capital investment. Thus, riskier economies (i.e., larger output volatility) require higher non-labor wealth to accumulate human capital. Consequently, a more volatile economy will exhibit fewer average years of education and a greater degree of educational inequality and, hence, a higher level of income inequality. This is called the human capital investment mechanism.

Third, García-Peñalosa and Turnovsky (2005) propose a stochastic endogenous growth model to explore the relationship between the volatility of growth and the distribution of factor income. In their model, the employment level is endogenously determined and the production structure allows for non-constant labor shares. Under realistic values of the degree of risk aversion, greater output volatility increases saving and promotes growth, thereby raising (future) wages and the supply of labor. As a result, the return to capital rises and that to labor falls. Since capital endowments exhibit more unequal distribution than labor time, the change in relative factor prices will raise income inequality. This is called the labor supply decision mechanism.

Hausmann and Gavin (1996) verify empirically that compared with industrial countries (and East-Asian tigers), Latin American economies experience much more unequal income distributions and much more volatile economic growth rates. Laursen and Mahajan (2005) find that output volatility negatively influences the degree of equality of the income distribution as measured by the income share of the bottom quintile. Using data on a cross-section of developing and developed countries, Breen and García-Peñalosa (2005) find that a more volatile growth rate positively associates with higher degrees of income inequality as captured by the Gini coefficient and the income share of the top quintile. Performing panel regressions with fixed country and period effects, Konya and Mouratidis (2006) conclude that growth volatility reduces inequality in countries with low volatility, but it leads to more unequal income distribution in countries with high volatility. Calderón and Yeyati (2009) show that aggregate output volatility, especially adverse extreme output drops such as macroeconomic crises, increases income inequality, measured as the Gini coefficient and as the relative income response across income quintiles.

This paper re-visits the volatility–inequality nexus and contributes to the literature in two respects. First, most studies rely on cross-sectional panel data on developed and developing countries to explore the effect of growth volatility on income inequality. These cross-country studies face the problems of structural, cultural, and other differences between the panel of countries, especially income inequality indicators, and more likely suffer from the problems of limited observations, measurement errors, and incompatibility. For instance, using cross-country panels, Ramey and Ramey (1995) establish that a strong and negative association exists between volatility and growth, Kose et al. (2006), however, show that this negative relationship significantly weakens with both trade and financial integration. Iyigun and Owen (2004) demonstrate that whether greater income inequality associates with more or less volatility in consumption growth depends on the level of economic development. As such, the volatility–inequality relationship probably responds to the level of economic and financial development, the extent of liberalization, the degree of globalization, and so on. We rely on a large annual panel data for 48 states in the continental U.S. The use of the within-country, across-state data may mitigate those difficulties because the data are more consistently measured and, thus, are more homogeneous in nature.[1] In this respect, our paper provides a more clear-cut conclusion on the relationship between volatility and inequality.

Second, we implement a panel error-correction approach instead of the conventional method of time averaging (using cross-sectional data). While averaging obviously loses information, it remains unclear whether averaging over fixed-length intervals effectively eliminates cyclical fluctuations. Moreover, averaging hides the dynamic relationship among important variables and eliminates useful information for estimating a more flexible model. The use of the pooled mean-group (PMG) estimator, introduced by Pesaran et al. (1999), permits not only the control for individual (state-specific) effects that might invalidate the results of cross-sectional analysis, but also the identification of the long-run equilibrium relationship among the variables of interest, whether such variables are stationary or nonstationary.[2]

Our empirical results support a long-run relationship between growth volatility and income inequality with a significantly positive effect. As such, our findings confirm the theoretical prediction that larger growth volatility worsens the distribution of income. This key finding continues to hold when we use alternative lag orders, different conditioning information sets, alternative inequality indicators, different volatility measures, different time periods, and a dynamic fixed-effect panel estimator. When we consider asymmetric responses to volatility, we find that this significant positive effect only holds for positive economic growth. The effect proves positive, but insignificant, for negative economic growth.

The organization of the paper is as follows. Section 2 discusses the empirical model and estimation issues. Section 3 describes the data sources and properties. Section 4 presents our main results as well as a variety of robustness checks. The last section concludes.

2. Empirical strategy

Consider the long-run equilibrium relationship between y and x. In a panel data context, we can specify the model as follows:

$$y_{it} = \theta_{0i} + \theta_i' x_{it} + \epsilon_{it} \quad (1)$$

where y_{it} stands for income inequality, and x_{it} equals a $(k \times 1)$ vector of explanatory variables, including a measure of growth volatility in state i at time t. A significantly positive (negative) estimate of this coefficient indicates that higher income inequality associates with larger (lower) growth volatility.

Pesaran et al. (1999), Catão and Solomou (2005), and Catão and Terrones (2005) argue that Eq. (1) nests itself in an autoregressive distributed lag ARDL (p, q, …, q) model. The dependent and independent

[1] For example, see Section 3. When we divide the national panel-data set into subsamples for the four Census regions — the Midwest, Northeast, South, and West, both the average inequality measures and the volatility measures do not vary much from the national outcomes.

[2] Loayza and Ranciére (2006) argue that the cointegration literature created a false impression about the estimation of long-run relationships, involving two misconceptions — long-run relationships only occur with cointegration and standard inference tests do not hold. To wit, Pesaran in a series of papers (e.g., Pesaran and Smith, 1995, Pesaran et al., 1999, 2001) promotes the autoregressive distributed lag (ARDL) approach to modeling long-run relationships. The ARDL approach demonstrates that long-run relationships can exist between both stationary and nonstationary variables. In addition, the method does not require the pretesting for the order of integration or for the imposition of conformity between the orders of integration of the variables in the ARDL model. Finally, inferences in the ARDL model rely on standard tests.