This paper develops a dynamic general equilibrium model with two sectors (goods producing sector and education sector), multi-dimensional heterogeneity (consumers differ in both physical and human capital holdings), and joint determination of growth and inequality. We use this framework to analyze the growth-inequality relationship both along the balanced growth path when fundamentals change and along the transitional trajectory as the economy converges to the balanced growth path.


Early theoretical models on this matter, for example, Alesina and Rodrik (1994, *QJE*), Persson and Tabellini (1994, *AER*), take the initial inequality as given and focus on how inequality exerts a negative impact on rate of growth. Later papers start to build a framework where growth and inequality
are both endogenous and subject to common forces, so they are jointly determined. Bertola (1993, *AER*) shows how policies that increase growth affect inequality with labor supply being assumed to be fixed. García-Penalosa and Turnovsky (2006, *ET*) and Viane and Zilcha (2003) generate growth-inequality relationship with endogenous labor supply. Most recently, Jin and Zeng (2006) and Jin (2006) combine two types of heterogeneity but human capital difference is assumed to be exogenous.

Our paper differs from the existing theoretical models in the following important aspects. First, we present a two-sector model where both types of heterogeneity are endogenous. The individual income share is a convex combination of her physical and human capital shares, with coefficients varying with endogenous sectoral allocations of labor. Furthermore, the two types of heterogeneity play opposite roles in the variation of the income inequality. Second, existing models focus on the balanced growth path. With a two-sector framework, sectoral technology difference (here it refers to different capital intensities) allows for transitional dynamics. This enables us to compare the growth-inequality relationship along the transitional trajectory with the one along the balanced growth path.

We summarize our results here. With two types of heterogeneity, the income share becomes a convex combination of physical and human capital shares, contrast to models with one-dimension heterogeneity where the income share is linear in either the physical or human capital share. Fundamental changes affect the income inequality through sectoral labor allocations with the aggregate labor supply being fixed. Physical and human capital heterogeneity play opposite roles in the growth-inequality relationship induced by fundamental changes. When the physical capital heterogeneity dominates, changes in productivity and capital intensity cause a positive growth-inequality relationship while changes in the discount rate or the intertemporal elasticity of substitution cause a negative growth-inequality relationship along the balanced growth path. These results are consistent with what García-Peñalosa and Turnovsky obtain in their model. However, when
the human capital heterogeneity dominates, all results are reversed. We also show that the growth-inequality relationship along the transitional trajectory may be different from the one along the balanced growth path. In particular, consider the case when physical capital heterogeneity dominates. If we consider the growth rate of full output, then a deviation of the capital stock ratio from its steady state level induces a positive growth-inequality relationship. But if growth is in terms of measured GDP, then the growth-inequality relationship depends on whether the physical-human capital stock ratio is higher or lower than its steady state value. This dependence of the growth measure is caused by the difference of the transitional dynamics for full output and measure GDP: full output monotonically decreases as the capital stock ratio increases while the dynamics of the measured GDP exhibit a U-shape. Once again when the human capital heterogeneity dominates, all results are reversed.

In short, the conclusion is that ambiguity of empirical evidence on growth-inequality relationship should not be too surprising. Our theoretical results provide important implications for empirical studies on the growth-inequality relationship. An unambiguous growth-inequality relationship can only be obtained when it is conditioned on the relative magnitude of physical and human capital heterogeneity. Countries with relatively more physical capital may exhibit different growth-inequality relationship than countries with relatively more human capital. We should also distinguish developed and developing countries since former ones are likely to be along the balanced growth path while latter ones are more likely to be long transitions.

This paper considers how fundamental changes affect growth and income inequality. The framework developed here provides a convenient starting point for various extensions. Future work may include studying growth-inequality relationship in response to macroeconomic policies such as tax and monetary policies.