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## On the Diversity of Growth Patterns with Habit Formation<sup>1</sup>

Zaifu Yang<sup>2</sup> and Rong Zhang<sup>3</sup>

**Abstract:** We study a case in the growth model of Carroll, Overland and Weil with habit formation that has not been examined previously. We show the existence of a continuum of balanced growth paths which exhibit a rich diversity of growth patterns such as catching up, overtaking or lagging behind. Our results are in sharp contrast to their unique balanced growth path.

**Key words:** Multiple balanced growth paths, history dependence, habit.

**JEL classification:** C62, O41, D91, E21.

## 1 Introduction

Studying multiple steady states in economic growth is important for both theoretical and empirical reasons. Lucas (1988) puts forward a conjecture that in his growth model on human capital accumulation through schooling, the economy with higher initial endowments of physical capital and human capital will be permanently richer than the one with lower initial endowments; see also Lucas (1993). Mulligan and Sala-i-Martin (1993), Benhabib and Perli (1994), and Xie (1994) have examined the relevant issues from theoretical viewpoints, while Baumol (1986), and Durlauf and Quah (1999) have offered empirical evidence on multiple development clubs. In the literature multiple balanced growth paths (BGPs) are used to represent diverse growth patterns in the long run, while indeterminacy usually stands for multiple transition paths converging to a single BGP.

In this paper we address the question of whether there are multiple balanced growth paths in an endogenous growth model with habit formation or persistence. To answer the question, we revisit a well-known endogenous one-sector growth model of Carroll, Overland and Weil (1997, 2000) with habit formation.<sup>4</sup> It is worth stressing that *we explore a case in their model which has not been previously investigated by themselves or others*. They (1997, 2000) have demonstrated the existence of a unique balanced growth path and analyzed a

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<sup>1</sup>The authors declare that they have no relevant or material financial interests related to this research.

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<sup>4</sup>There is a large literature on habits in preferences or habit formation or persistence; see e.g., Marshall (1898), Ryder and Heal (1973), and more recently Abel (1990), Constantinides (1990), Detemple and Zapatero (1991), Boldrin et al. (2001), and Augeraud-Veron and Bambi (2015).

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