



Analysis

(De)growth and welfare in an equilibrium model with heterogeneous consumers



T. Heikkinen

University of Helsinki, Finland

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ABSTRACT

This paper studies equilibrium growth and voluntary degrowth, allowing for heterogeneous and time-varying preferences. The approach is based on applying a dynamic equilibrium model with externalities in production, consumption, and leisure. Preference heterogeneity regarding status competition is modeled by asymmetric consumption externality parameters whereas heterogeneity regarding voluntary simplicity is incorporated by allowing for agent-specific restrictions on maximum consumption. Equilibrium is studied in terms of a balanced growth path (BGP). Numerical examples suggest that degrowth triggered by voluntary simplicity by a subset of consumers less affected by status competition has a positive effect on the aggregate welfare under externalities in consumption and leisure. A reduction in status competition increases the aggregate welfare and reduces the equilibrium growth rate. Simulations suggest that a time-varying equilibrium in the heterogeneous preference model with two consumer classes is well approximated by a constant BGP.

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1. Introduction

Degrowth has been defined as the downscaling of the economy to make it consistent with the biophysical boundaries (Kallis, 2013; Latouche, 2009). The purpose of this paper is to study the prerequisites and the welfare-consequences of voluntary degrowth. For voluntary degrowth to take place, it needs to be initiated by the households themselves.¹ Transitions with degrowth from an equilibrium to optimum are studied by Bilancini and D'Alessandro (2012) assuming the society can command or induce the transitions. To formally study pathways towards voluntary degrowth, this paper introduces heterogeneous and time-varying preferences² into a dynamic equilibrium model.

Heterogeneous preferences regarding both voluntary simplicity and status competition will be allowed. Voluntary simplicity (VS) has been defined as the choice out of free will to limit expenditures on consumer goods and services (Etzioni, 1988) (see also Leonard-Barton (1981), (Brown and Kasser (2005))). Heterogeneous preferences for status competition are modeled by assuming household-specific consumption externality parameters. VS is modeled by voluntary household-specific

constraints on consumption, violating the insatiability axiom in mainstream economics. The insatiability axiom has been questioned in ecological economics (Gowdy and Mayumi, 2001); however, voluntary simplicity appears to have been omitted in equilibrium models. According to Brown and Kasser (2005), VS is adhered to by 10–15% of the American population. Why some consumers may choose VS (and reduce status competition) has been partly answered in previous work (Brown and Kasser, 2005; Leonard-Barton, 1981; Elgin and Mitchell, 1977; Etzioni, 1988; Alexander and Ussher, 2012) characterizing the VS phenomenon.³ The assumptions of insatiability and status competition lie at the root of the growth imperative (Jackson et al., 2004); relaxations of both assumptions will be formally addressed in a dynamic equilibrium model.

Economic growth models are typically based on a representative consumer model with negative consumption externalities, assuming a negative relation between the utility of a representative household and the average material consumption (status competition or Veblen effect (Veblen, 1899)). A number of experimental studies confirm the role of consumption externalities in explaining the paradox in Easterlin (1974): a higher income does not necessarily increase happiness (Cooper et al., 2001; Wendner, 2014). Consumption externalities have been studied in a growth model in (Bilancini and D'Alessandro (2012), Liu and Turnovsky (2005) and Cooper et al. (2001)). Both Liu

E-mail address: tiina.m.heikkinen@elisanet.fi.

¹ Transitions with degrowth from an equilibrium to optimum are studied by Bilancini and D'Alessandro (2012) assuming the society can command or induce the transitions.

² Standard consumer theory assumes constant preferences. Proposing a theory of wants, Witt (2001) argues that wants and consumption patterns may change over time through learning.

³ Leonard-Barton (1981) studies the sociodemographic characteristics of people following a lifestyle of VS. Elgin and Mitchell (1977) study who the VS people are and list reasons, including energy shortages, to expecting a growing trend in VS.

and Turnovsky (2005) and Bilancini and D'Alessandro (2012) apply a representative consumer model. The analysis in this paper is based on extending the model in Bilancini and D'Alessandro (2012) to heterogeneous preferences and VS. The preference for status competition is measured in terms of the sign and the degree of an agent-specific consumption externality effect. A different approach is applied by Cooper et al. (2001) where like in Hirsch (1977) status competition is modeled via positional goods (also in an endogenous growth model). The utility of each consumer depends on the consumption of positional goods by their reference group defined as a subset of the population. Consumption externalities due to the reference consumption level directly affect the utility of the individual household. A similar utility model is applied by Garcia-Penalosa and Turnovsky (2008), studying dynamic equilibrium under consumption externalities with two forms of heterogeneity across agents: different initial wealth endowments and different reference consumption levels. In both Cooper et al. (2001) and Garcia-Penalosa and Turnovsky (2008) different consumers may have different reference groups; however, the utility parameters are symmetric across agents.

Previously, it has been shown that status competition leads to overconsumption (Dupor and Liu, 2003). Also, it has been shown that status competition may result in a lower aggregate utility as resources for innovation are transferred to a status-good sector (Cooper et al., 2001). Thus, it is not surprising that voluntary simplicity and a reduction in status competition appear to be elements of welfare-increasing degrowth. The contribution that this paper makes beyond (Cooper et al., 2001; Dupor and Liu, 2003) is the introduction of asymmetric and time-varying preferences, enabling the study of preference changes by subsets of consumers. As long as it is even uncertain what degrowth means to welfare, it is unlikely that the preferences of a whole population will change in favor of degrowth.

Abstracting from the variability of the individual labor supplies, the heterogeneous preference model yields a constant balanced growth path (BGP) that corresponds to the BGP in a representative consumer model in Bilancini and D'Alessandro (2012). Along the BGP the average capital and consumption grow at equal rates. A constant BGP can be solved for a constant equilibrium labor, simplifying the analysis. Assuming asymmetric externalities the individual consumption paths differ, implying a time-varying equilibrium. However, simulations (discussed in Section 5) suggest that a constant BGP is a good approximation of a time-varying equilibrium in the heterogeneous preference model with $N = 2$ consumer classes. The main results from the welfare analysis of the proposed heterogeneous preference model with externalities in consumption and leisure can be summarized as follows:

- The weakening of status consumption increases the aggregate welfare while reducing the equilibrium growth rate;
- A degrowth transition triggered by VS by a subset of consumers less affected by status competition has a positive welfare effect even if the model omits the effects of the economic activity on the environment.

Countries with longer working hours consume more resources and emit more carbon (Knigh et al., 2013). This makes reduced working hours (along with VS) a key element in degrowth (Kallis, 2011). The degrowth proposal in Kallis (2013) emphasizes that reduced working hours in the paid sector will need to be substituted by increased work in the self-employed or unpaid sectors as the energy becomes scarcer. For simplicity, only work in the paid sector is formally considered in the equilibrium model. Following Bilancini and D'Alessandro (2012) the model incorporates leisure externalities through relational activities that may affect the utility only; establishing a link between leisure and nonmarket production is left for future work.

The organization of the paper is as follows. Section 2 introduces a dynamic equilibrium model with asymmetric externalities in consumption, and with symmetric externalities in leisure and production.

Section 3 studies the dynamics of the heterogeneous dynamic model with N classes of consumers. Section 4 studies long-run equilibrium and optimum under preference heterogeneity. Section 5 presents numerical examples of dynamic equilibria and optima. Concluding comments are summarized in Section 6.

2. A Dynamic Equilibrium Model with Heterogeneous Consumers

Consider a heterogeneous preference model with N classes of consumers. The fraction p_j of the consumers (agents) is associated with consumption externalities parameterized by $\gamma_j, j = 1, \dots, N$. Each consumer of type j is endowed with one unit of time that can be allocated either to leisure, l_j , or to work $1 - l_j$. The utility of a representative household in class j then takes the following form (omitting for simplicity the consumer indices within consumer classes):

$$u_j(c_j, \bar{c}, l_j, V) = \begin{cases} \frac{(c_j \bar{c}^{\gamma_j} l_j^\phi V^\mu)^{1-\theta}}{1-\theta}, & j = 1, \dots, N, \quad \text{if } c_j \leq c_{j,max}, \\ \frac{(c_{j,max} \bar{c}^{\gamma_j} l_j^\phi V^\mu)^{1-\theta}}{1-\theta}, & j = 1, \dots, N, \quad \text{if } c_j > c_{j,max}, \end{cases} \quad (1)$$

where c_j is the consumption of a household of type j , \bar{c} is the average consumption of N households, V is the stock of social capital, where $\phi, \mu > 0$ are utility parameters associated with leisure and social capital like in Bilancini and D'Alessandro (2012), $\theta > 1$ is the inverse of the intertemporal elasticity of substitution, and where $c_{j,max}$ denotes an upper bound of the consumption of the consumers in class j (discussed below). Both the leisure and the consumption of relational goods positively affect utility. In Eq. (1) the parameters $\gamma_j, j = 1, \dots, N$, are unrestricted in sign, capturing different preferences regarding status competition. Previous literature is based on assuming $\gamma_j = \gamma, j = 1, \dots, N$. Bilancini and D'Alessandro (2012), abstracting from voluntary constraints c_{max} , follow the predominant Veblen tradition by assuming a symmetric consumption externality parameter $-1 < \gamma < 0$. Allowing for heterogeneous preferences, if $\gamma_j < 0$, the consumers of type j derive disutility from an increase in the average consumption, reducing the relative consumption c_j/\bar{c} (indicating status). If $\gamma_j > 0$ the utility of the consumers of type j is increasing in the level of average consumption, corresponding to altruism. The stock of social capital V in Eq. (1) is defined as $V = B\bar{l}$ where $\bar{l} = \sum_j p_j l_j$ is the average leisure and where $B > 0$ measures the contribution of average leisure to the social capital.⁴

Mainstream economics imposes the axiom of (local) non-satiation (based on e.g. a free disposal of goods), implying $c_{j,max} = \infty \forall j$ in Eq. (1). The insatiability axiom has been criticized by ecological economists "because many if not most of the environmental services provided by ecosystems (water, food, oxygen, etc.) have a saturation region" (Gowdy and Mayumi, 2001). The formulation of the utility in Eq. (1) allows the households to determine themselves whether they are satiated at some level of consumption $c_{j,max} < \infty$. Voluntary simplicity refers to the choice out of free will to limit consumption (Etzioni, 1988). Accordingly, if for some consumer class j , $c_{j,max}$ in Eq. (1) satisfies $c_{j,max} < \infty$, the consumers in class j would voluntarily restrict their consumption. Ecological awareness is a key element of VS (Leonard-Barton, 1981); the consumers restricting their consumption can be motivated e.g. by their willingness to limit their CO2 impact or ecological footprint.

Questioning the invariability of consumer preferences, Witt (2001) applies the notion of wants based on older economic literature. According to Witt (2001) a structure of subjective wants is formed through

⁴ In Bilancini and D'Alessandro (2012) the social capital V is associated with the dynamics $\dot{V} = B\bar{l} - \delta_v V$, where $B > 0$ measures the significance of \bar{l} to social capital formation and where δ_v measures the depreciation of the stock of social ties. The evolution of V can then be stated as $V(t) = B\bar{l}/\delta_v (1 - e^{-\delta_v t})$ (using $V(0) = 0$) which is asymptotically equal to $V = B\bar{l}$ letting $B = B'/\delta_v$. Along a constant BGP the growth rate of $V(t)$ is zero. A constant equilibrium BGP can be obtained using the asymptotic value of $V(t)$.

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