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From necessities to imaginary worlds: Structural change, product quality and economic development

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ABSTRACT

In this paper we explore how innovation and structural change affected economic development in the long run, by which we mean a period such as the one between the industrial revolution and the present. We separate the period since the industrial revolution into two sub periods, which we call 'necessities' and 'imaginary worlds' and focus on three trajectories, increasing productive efficiency, increasing output variety, and increasing output quality and differentiation. In the paper we show how a combination of the three trajectories gave rise to the transition between 'necessities' and 'imaginary worlds' and propose a mechanism of economic development which could have given rise to the type of economic system which we can observe today. To create growing output quality and differentiation higher competencies were required. These higher competencies required higher levels of education and demanded higher wages, which contributed to raise consumers' purchasing power. These phenomena, combined with the income effect of the creation of new sectors, generated the disposable income with which consumers could purchase the new, higher quality, non necessities, goods and services generated by innovation. In the paper we study the impact of several model parameters on the stability of the virtuous circle previously described.

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1. Introduction

The main objective of this paper is to compare the roles of output variety and of product quality in economic development. In particular, we wish to explain why product quality started increasing only a considerable time after the beginning of the industrial revolution and was preceded by an economic development driven almost exclusively by sectoral differentiation. Thus, we separate the period since the industrial revolution into two sub periods, which we call *necessities* and *imaginary worlds*. In the first period most people could afford only necessities while in the second one a growing percentage

of the population of industrialized countries started to be able to afford goods and services which were not necessities, but what some authors have called higher goods services [24]. In this paper we use the concept of trajectory and focus on three trajectories, increasing productive efficiency, increasing output variety, and increasing output quality which includes also product differentiation. Among the variables which we expect to have the greatest impact on output variety and on product quality we have selected wages, rates of population growth and education.

In the paper we will use a model of economic development by the creation of new sectors, called TEVECON, which we have previously created. In the paper we will describe TEVECON in greater detail, but some of its features deserve to be anticipated here. Thus, innovation and structural change play a central role in it. Furthermore, TEVECON is intended to be a long run model of economic development, an objective

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which is here interpreted as potentially focusing on the period starting from the beginning of the industrial revolution. TEVECON is a systemic model, in which the interactions between the components of the model are of crucial importance. For example, search activities and demand co-evolve. A distinctive feature of our approach is that we take into account both demand and supply factors by studying the co-evolution of demand and innovation.

2. Conceptual background

2.1. Structural change

We can start our study with the observation that a very large number of new sectors have been created since the industrial revolution. Examples of these sectors are those producing cars, aircraft, computers, radios, television, refrigerators, plastics, etc. The emergence of these and of other sectors needs to be explained. No theory or model of economic development can escape the question: How and why did these sectors emerge? Given that the composition of the economic system changed and that this change in composition is a clear example of structural change, the central question to be raised here is whether structural change is involved in economic development and, if so, how. Furthermore, given that structural change and growth are related but not identical, the related question of whether structural change contributes to growth arises. Structural change is a much broader phenomenon for which many definitions are possible [46]. In principle the structure of a system is constituted by its components and by their interactions. Components can be defined at several levels of aggregation varying from individuals to organizations and industrial sectors. In past literature on the subject structural change has been most often studied as the changing weight of sectors defined at levels of aggregation varying from primary, manufacturing and services to the different subsectors of each of the previous three (see for example [3,6,11,12,19,22,30,31,32,34,25,47]). The type of structural change in which we are interested occurs at a level of aggregation lower than the tripartite representation based on agriculture, manufacturing and services. In this as in our previous papers we are interested in the mechanisms which drive the creation and the subsequent evolution of sectors and in the inter-sector interactions which give rise to the emergence of new sectors. Thus, we focus both on the emergence of new sectors and on the changing share of output and of employment which occurs during their subsequent evolution. Our sectors do not provide a specific representation of the features of those of a real economic system but include elements of sectoral dynamics which can be considered common to most sectors. The definition of sectors we use is compatible with them being either manufacturing or services. The only sector which is different from all the other ones is the first sector, which we consider the one producing necessities.

The question which then arises is whether structural change is a determinant or just a consequence of growth. Our starting point will be the observation that economic development has been very uneven (refs above). Observed rates of growth differed markedly for different sectors at a given time and for the same sector in the course of time. Furthermore, the timing of the emergence of new sectors differed among

countries or economic systems depending on their levels of economic development. To pursue our analysis we start by comparing the two concepts of proportional and non-proportional growth (see [19,30]). Proportional growth occurs when all sectors have the same rate of growth of productivity and of demand and when the rate of growth of productivity equals the rate of growth of demand within each sector. In this situation the composition of the economic system, as represented by the output and employment share of different sectors, would remain constant in the course of time. In other words, if proportional growth occurred there would be no structural change.

We situate our paper within evolutionary economics. In this sense TEVECON has a number of similarities with recent evolutionary models such as those by Dosi et al. [9] or by Ciarli et al. [4,5]. While we share some basic assumptions with these models, such as the absence of optimization or of general equilibrium, our model has some specificities. Our emphasis on structural change is shared by Ciarli et al. but not by Dosi et al. On the other hand Ciarli et al. placed greater stress on the behavioral foundations of their model. However, TEVECON's emphasis on the endogenous change in composition of the economic system, and in particular the tendency towards a growing differentiation, or on the balance between growing output variety and growing sectoral quality and differentiation, are strong TEVECON specificities.

If compared with the rest of the literature TEVECON is an endogenous growth model both in the sense that one of the main factors leading to growth is constituted by search activities, a general analog of R&D [28] that these search activities use resources created in the process of economic development and in the above mentioned sense that the composition of the economic system endogenously changes. With some endogenous growth models it shares the neo-Schumpeterian inspiration in the roles of entrepreneurs and of competition. However, with respect to endogenous growth models TEVECON differs for a) combining output variety and sectoral output quality and differentiation while Aghion and colleagues [2,33] use only one of these. Grossman and Helpman [18] place a considerable emphasis on product quality, but do not combine it with the creation of new sectors. Furthermore, and even more importantly, while most endogenous growth models are exclusively supply based TEVECON models the co-evolution of innovation and demand.

Another strand of literature with which TEVECON in general and this paper in particular has some similarities is the so called unified growth theory [16,17]. Here the similarity consists of the emphasis on the long run, although unified growth theory aims for a much longer time horizon extending back to the beginning of human history. As already pointed out, our intended time horizon is the period since the industrial revolution to the present, which would be the third period of unified growth theory. Thus, while aiming for the long run our run is less long. However, we think that the endogenously generated structural change in TEVECON is a mechanism which either did not exist or played a negligible role before the industrial revolution. Thus, it would not be possible to extend TEVECON back in time without introducing additional mechanisms.

In the emphasis we place on structural change we rely not only on evolutionary economics but on a number of

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