Endogenous Growth and General Purpose Technologies

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ABSTRACT

I consider a growth model based on GPT -general purpose techonolgy-, by following Helpmann and Trajetenberg approach.

The growth path of the model depends on the introduction of GPT and the development of compatible components. The framework is the following: there is a period in which a GPT becomes avalaible, however the old one is used to manifacturate the final output while R&D is financed in order to develop compatible components for the new GPT. After the development of enough compatible components, the new GPT substitutes the old one and the development continues.

The paper is devoted to analyze two different growth paths.

The first one is based on the assumption that the productivity of GPT is given, according the Helpmann and Trajetenberg framework.

In the second one I specify the nature of the productivity by distinguishing between two elements: the technology itself and the expertise accumulated in that technology, by adopting Parente approach. Then I endogenize the last component.

The dynamics of the model changes according to the nature of the productivity.

Under the assumption that the productivity of GPT is given, during the development of the compatible components with the new GPT, the number of components of the old GPT remains constan and the GDP falls.

When “enough” components for the new GPT have been developed, the real GDP increases. In this second phase an actual growth appears, thank to the development of enough compatible components for the new GPT.

On the other hand, under the assumption that the level of output depends on the technology itself and the expertise accumulated in that technology, the time to have an actual growth can decrease.

In the Helpman and Trajtenberg model, there is a parameter that measures the productivity of a GPT, without difference between produtivity of GPT in itself and productivity of human capital due to expertise.

In Parente there is the distiction between them, however they are supposed to be fixed.

This is the building-block of the model:

there is a production function Q with l^i productivity level of GPT i and an assembly of a continuum of components $x_i(j)$ that must be compatible with the *current* GPT.

1. $Q_i = l^i D^i$
2. $D^i = \left[\int_0^{n_i} x_i(j)^a \, dj\right]^{1/a}$

where $1/(1-a) > 1$ is the elasticity of substitution.

I would specify the nature of λ:

$l = m.s$ where m represents the productivity of GPT in itself, and s the expertise in technology in terms of human capital. By defining $g = \frac{\dot{a}}{a}$ as the ratio between the new GPT and the old one, S as the the expertise accumulated in technology a at the instant of the switch from the old GPT to the new one, k the fixed amount of expertise that is relevant only for the current technology, it can be written

$s = S - k$

where s represents the amount of expertise that the firm uses for the new GPT.

I would analyze how the model changes if the value of l increases and k decreases, by comparing the outcomes of the model with different values of k (and indirectly of l).