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Portugal in the EU: the Perspective of Convergence

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FIRST PART

What About Convergence

1. Introduction

The purpose of the beginning of this first part is to present the convergence hypothesis according to its particular concepts, measures and implications, dealing for that with the tests of β-convergence and σ-convergence before differentiating the convergence using panel data, convergence of series' distribution over time and convergence of chronological series, a theoretical presentation that builds the path for the following estimations with econometric manipulation of panel data, dealing with the variable of current GDP per capita.

Thus, the first natural question is: what's convergence all about? The convergence hypothesis results from a study of two or more economies are compared according to their average differences evolution and their dispersion evolution, in such a way that, according to Quah (1996), convergence is no more than a basic empirical subject, that in other things shows income distribution, polarization and inequalities.

In this same reasoning, Sorenson distinguish situations with absolute from relative growth differentials. According to this author, with initial spatial differences in the relative variable (for example, differences in the GDP per capita), we can speak of convergence if the initial distribution becomes more even (when the per capita income differences become smaller). So, convergence deals with polarization (more even, closest initial spatial distribution) or dispersion (more uneven) of the economic activity, whether or not the absolute (de) concentration of one variable (ex: product per capita) is faster or slower than the (de) concentration of the other variable (ex: population).

The neoclassic model and models of endogenous growth have been shown different over the years through presentations concerning the convergence hypothesis. For example, Romer and Rebelo (1991) said that in the case of no proved convergence across economies contradicted the neoclassic model and marked points in favour of the endogenous model.

The question is that converge has been studied knowing that the existence of convergence didn't necessarily authorized the empirical results of the exogenous models since they could also be verified in endogenous models. Why? Because there are common considerations among these two models. So, what does differentiate them? The main difference between endogenous models and exogenous ones are the returns to scale of the accumulating factor. Exogenous models with decreasing returns deal with convergence of productivity growth rates across countries as time goes by. Endogenous models with constant or increasing returns usually show persevering or extended growth rates. In exogenous models, long run is reached with the help of exogenous technological progress. It's with endogenous models that the long-term growth rates can be analysed after the impact of variables that also influence the research and development (R&D). And if governmental policies are definitely considered inefficient in the exogenous models, under the endogenous perspective they can be quite useful, which determines the perspective that the State should have about convergence, a more inactive or active government intervention.

Convergence can also be seen under a Macroeconomics or Microeconomics perspective, if we're considering as principal agents the countries or the firms and industries. This first part privileges the first point of view. Consequently, the countries are to be seen here as the central players and the GDP per capita as the main indicator. The nature of convergence is made through economic growth and the countries are considered to converge when there is capital mobility and cooperation among countries. The main characteristics of the Macro convergence is the conditional convergence, the values of the structural variables are identical between countries, being those variables the savings rates, the demographic rates and the technological progress rates. This Macro convergence leads to closer living standards.

Convergence is, as seen, a very large matter concerning the study of returns to scale, accumulating factors, productivity growth rates, long run analysis, governmental policies, technological differences across countries or within a regional block, realizing if the distribution of income changes over time, if poverty tends to persist among the countries that were poor before, if the interregional differences in income levels tend to grow (if the differences between countries tend to perpetuate), or diminish which would imply less aid programs like, for instance, the Regional and Cohesion Fund Policies given by the EU.

Given that convergence is a delicate and complex subject. This paper is forced to limit the field of its study, but not in a way that won't measure carefully and in detail the idea of convergence particularly interested in the Portuguese performance from the seventies until the late nineties and in the confrontation of that performance with the one of the other state-members of the European Regional Block.

2. Measuring and Testing Convergence – Models Presentation

2.1 Measuring Convergence

How can we measure convergence? How will we begin? Knowing that the convergence hypothesis results from a study of two economies comparing their differences and dispersion over time, it's possible to measure convergence based on Fuss (1999) in the following way:

1) There is convergence between countries X and W, when under the period [u, n], being $0<u<n$, series' difference and dispersion is null, so countries end with a same level of GNP per capita, for example;

2) There is convergence at a constant between countries X and W when, under the period [u, n] being 0<u<n, the dispersion that separates them decreases over time; this means that, according to a strict notion, series diverge - since differences don't tend to zero, but that according to a larger concept, series converge because of dispersion's reduction. Example: the criteria of the Stability Pact for European Monetary Integration (as long as the constant at which convergence evolutes doesn't go beyond the criteria's predefined value).

3) There is divergence between countries X and W when, under the period [u, n] being 0<u<n, difference and dispersion that separate them never tends to zero or even diminishes; or when X's series have simultaneously stronger fluctuations than W's series and increasingly stronger as time goes by;

From this, a remark arises: the convergence hypothesis deals with two complementary perspectives, since convergence in function of its average difference evolution is one thing and convergence in terms of its dispersion evolution is a non-equivalent other thing. The first has the inconvenient of dealing with an average, covering the possible big differences between series; the second shows series volatility. Both perspectives face problems when X and W's series feel uncertain shocks that diverge from the not lasting effects and that influence them differently.

So, dealing with Robertson and Wickens (1993), in which n is time, we reach that two series y_n, y_n^* of GDP per capita may:

⇒ Converge point by point if their difference tends to a constant

$$\lim_{n\to\infty}(y_n - y_n^*) = constant \quad \text{(A.1)}$$

⇒ Expected converge, if the expected value of the difference of the series tends to a constant

$$\lim_{n\to\infty} E(y_n - y_n^*) = constant \quad \text{(A.2)}$$

⇒ Converge in probability, if the expected value of the difference of series also tends to a constant and if the variance of their difference tends to zero

$$\lim_{n\to\infty} E(y_n - y_n^*) = constant \quad \text{(A.3)}$$

$$\lim_{n\to\infty} \operatorname{var}(y_n - y_n^*) = 0 \quad \text{(A.4)}$$

There's an inconvenient on convergence in probability, is that needs dispersion of series towards zero, which is a too big constraint in the case of temporary shocks (because they don't last the enough).

Because of this, Catherine Fuss (1999) advises an alternative method:

⇒ Two series y_n, y_n^* converge if the expected value of the difference of series also tends to a constant but if the variance of their difference tends to a constant:

$$\lim_{n\to\infty} E(y_n - y_n^*) = constant \quad \text{(A.5)}$$

$$\lim_{n\to\infty} \operatorname{var}(y_n - y_n^*) = \sigma^2 \quad \text{(A.6)}$$

This is seen as a better method because both the expected value and the variance tend to a constant. The tendency of the variance to a constant is very important for non stationary series, when their average or their variance or their covariance depend of the variable time and are represented by a Gaussian white noise process: $\varepsilon \sim N(0,\sigma^2)$.

An example for two countries y_n, y_n^*, knowing that the previous constant was equal to α, then we have:

$$y_n^* = \alpha^* + y_{n-1}^* + \varepsilon_n^* \quad \text{with} \quad E(\varepsilon_n^*) = 0 \text{ and } \operatorname{var}(\varepsilon_n^*) = \sigma^2 \qquad \text{(A.7)}$$

$$y_n = \alpha + y_{n-1} + \varepsilon_n \quad \text{with} \quad E(\varepsilon_n) = 0 \text{ and } \operatorname{var}(\varepsilon_n) = \sigma^2 \qquad \text{(A.8)}$$

Then, by recursive induction, the formulas get the following form:

$$y_n^* = \alpha^* n + y_0^* + \sum_{k=1}^{n} \varepsilon_k^* \qquad \text{(A.9)}$$

$$y_n = \alpha\, n + y_0 + \sum_{k=1}^{n} \varepsilon_k \qquad \text{(A.10)}$$

To reach the expected value and the variance of the difference, we need first to get that difference:

$$y_n^* - y_n = (\alpha^* - \alpha)n + (y_0^* - y_0) + (\sum_{k=1}^{n} \varepsilon_k^* - \sum_{k=1}^{n} \varepsilon_k) \qquad \text{(A.11)}$$

Once with the difference it's possible to reach its expected value and the its variance:

$$E(y_n^* - y_n) = (\alpha^* - \alpha)n + (y_0^* - y_0) \qquad \text{(A.12)}$$

$$\operatorname{var}(y_n^* - y_n) = \operatorname{var}(\sum_{k=1}^{n} \varepsilon_k^* - \sum_{k=1}^{n} \varepsilon_k) \qquad \text{(A.13)}$$

Obviously, if $y_0^* > y_0$ series face Expected Converge as long as $\alpha^* < \alpha$; they also converge when $\alpha^* = \alpha$; in which case the expected value of the difference is a constant. This tends to demand cointegrated series or towards cointegration because the difference has constant variance, so fluctuates in constant borders.

2.2 Testing Convergence

2.2.1 β-Convergence and σ-Convergence

First of all convergence is a long-term process and its concept is regularly subdivided in two. We find β-Convergence in Barro (1984, 1991), Baumol (1986), De long (1988), Barro and Sala-i-Martin (1991, 1992), focusing the need that poor countries have for a stronger growth to recuperate its backwardness from the rich countries. We study σ-Convergence in Easterlin (1960), Borts and Stein (1964), Streissler (1979), Barro (1984), Baumol (1986), Dowrick and Nguyen (1989), Barro and Sala-i-Martin (1991,1992), in which convergence is reached if dispersion diminishes over time. But there were used very general terms. What are these two tests really all about?

2.2.1.1 β-Convergence

β-Convergence absolute results from comparing growth and real product per capita under the initial period. As before, with y_{in} as the GDP per capita, i as the country, n as time and ε_{in} as the factor error, the regression of the series growth rate over the initial level of the series is the following:

$$(\ln(y_{in}) - \ln(y_{i0}))/n = \alpha - \beta.\ln(y_{i0}) + \varepsilon_{in} \qquad \text{(B.1)}$$

Exists convergence if the initial level β is negative. The bigger β, stronger the convergence process will be; and that rapidity, θ, can be reached from $\beta = (1 - e^{-\theta n})/n$.

So if two countries have the same structural specifications in terms of technology, saving rates and demographic growth they will verify equal GDP per capita if growth is at the steady state.

From this we realize that the β-Convergence test focuses on the rhythm at which GNP per capita of particular economy evolutes relatively to the average of GNP per capita of the rest of the world. Doesn't consider but the evolution towards a regular long-term growth.

If more apart from the steady state, bigger the importance of capital per capita growth, this is the conditional β-convergence, conditioned by the values characteristics, which can be different according to states.

If a rich country has a higher saving rate than a poor economy, then the rich country may be further away from its steady-state; could've had predicted a faster per capita growth, so β convergence absolute didn't hold; if β is positive then the log (yit) tending to diminish.

A negative bias in the least-squares estimation of the convergence coefficient can be produced through the measurement error of the initial level of revenue, for instance the value of the real revenue, obliging the regressions to exaggerate the estimated convergence coefficient β.

Several critics were made to the β-convergence test, expressed by Quah (1993,94,96), Bernard and Durlauf (1991), Mankiw and al. (1992).

Quah is a heavy critic of the β-convergence method for not giving information about the evolution of the dispersion's distribution. The interpretation of results isn't considered very reliable since poor countries going beyond the rich ones is as possible as convergence towards a same level or convergence at a constant. Variables like product per capita, possibly non-stationary, end with a biased β towards zero. And there's the Galton's error, one that results from a paradox that shows how we should expect a tendency towards average and, consequently, convergence to one same level, at the same time as the distribution of dispersion doesn't diminish over time; in other terms, how an initially negative income coexists with a constant or even increasing dispersion's distribution.

Quah's analysis (1992) estimated the probabilities of going from an interval of GNP per capita to another before estimating all the ergotic distribution process. The problem is that even according to the convergence model that didn't prove regular growth for each country, reason why Quah considered convergence as a transition process in which the chain of Markov played a determinant role.

Quah (1993) showed how a negative relationship between initial income and growth might be compatible with a stable cross-sectional variance in output levels. Bernard and Durlauf follow this idea, defending that this holds because shocks for country-specific growth rates counterbalance this negative coefficient's effect. Yet, for them, the chain of Markov has inconveniences. First because focus the relevance of anticipations in the development process; second, because realizes how initial conditions are determinant. Bernard and Durlauf even focus a considered big fault, the tests inefficiency in the case of non-stationary income series, again because the use of an annual and average growth rate of income implies a constant growth rate, which doesn't happen in a non-determinant (stochastic) process.

Mankiw and al. (1995) focus incompatibility of product and capital's data with the regular convergence rate of 2%, all this because there is a lack of variables in the model, as human capital, for example. So, countries end with different stationary states, diverging from each other. Against this point of view, as well as against Barro and Sala-i-Martin (1992) and Sala-i-Martin (1996)'s, arguments in favour of a stable proportionate rate at which regions and countries constraints the gap between their respective steady-states, but Temple (1999) say that returns to human and physical capital may not diminish slowly as the previous authors proclaim. Why? Never forgetting how hard it is to get exact conclusions in a convergence context, Temple says that the estimation of the 2% is based in unreliable cross-section regressions and fixed consequences are usually neglected a priori; that the probability of heterogeneity obliquity or isolation isn't taken in consideration and there's no deficit of accompanying econometric problems; and that the sensitivity of error's measurement isn't much clear and more sophisticated panel data or time series may upset the first calculations showing the 2%. The author also agrees that conditional convergence needs a reversion of the mean and that exists a tied link between testing for unit roots and studding convergence.