# Chapter 7

## Structural Analysis of the Speed Years for Convergence in Equilibrium by Country: Six Hyperbolas with Each Simulation

Background of ***the speed years***:
With R. A. Musgrave's comment on Ryuzo Sato (1963)

Musgrave celebrates Sato's seventies birthday and talks on Sep 9, 2000. Let the author here allow to cite Musgrave's one phrase related to Sato's (16-23, 1963) first use of *the speed years*: 'At that time, neoclassical perfection had just triumphed over Keynesian rigidities and we were both concerned with how long it takes for the growth rate to respond to changes in policy.' Its background is interpreted: Neo-classical models conquered Keynesians' disequilibrium by proving complete substitution between capital and labor.

The author measures the level of equilibrium by country and sector using *the speed years* and replaces the literature's exogenous *speed years* by author's endogenous *speed years*. *The speed years* support Monograph. Further, this Chapter reveals its structure.

### 7.1 Introduction

The purpose of this chapter is first to structurally clarify the dynamics of *the speed years* for convergence in equilibrium by country and, second to empirically show how to use simulations for *the speed years*. The author has theoretically explained *the speed years* for convergence in equilibrium by country (hereunder, *the speed years*) in related chapters, connecting *the speed years* with a few aspects. The level of endogenous-equilibrium is straight measured by *the speed years*. What conditions determine the differences of the endogenous-equilibrium? There are an optimum equilibrium, a modest equilibrium, a close-to-disequilibrium, and disequilibrium. An optimum equilibrium is a moderate equilibrium that satisfies the condition of a maximized rate of return under a minimized net investment to output, and by sector. The author proves the optimum equilibrium empirically using hyperbola by country (see Chapters 6, 11, 15).

This chapter processes the cases not only at the total economy but also at two sectors, the government and private sectors, using twelve countries; the US, Japan, China, France, Germany, Greece, Ireland, Spain, Sweden, the UK, Turkey, and Singapore. These cases are, in the same way, extended to the two sectors, government and private, using endogenous data by sector.

The conditions for a moderate range of the endogenous-equilibrium are structurally determined by three items, the capital-output ratios, $\Omega^* = K/Y$, the quantitative net investment coefficient, $\beta^*$, and the diminishing returns to capital coefficient, $\delta_0$. Three items constitute the structural combinations of the three items (hereunder, the structure of *the speed years*). This structure includes all the parameters to determine *the speed year* equations by sector, $1/\lambda^*$, $1/\lambda^*{}_G$, $1/\lambda^*{}_{PRI}$. *The speed years* of the total economy is shown by $\lambda^* = (1-\alpha)n + (1-\delta_0)g_A^*$. The capital-output ratio is a driver that manipulates and calibrates *the speed years* by carefully watching $\beta^*$ and $\delta_0$. A reason why the conditions leading to a moderate equilibrium is difficult comes from structural combinations of the three items.

For example, $\delta_0 = 1 + \frac{LN(\Omega^*)}{LN(B^*)}$ exists and $B^* = (1-\beta^*)/\beta^*$ is used for the denominator of $\delta_0$. A good example: If $\beta^*$=0.5, then $1-\beta^*$ is 0.5 and as a result, $B^* = 1.0$ holds. This case is arithmetically a moment case. A bad example is the case of $\beta^*$=1.0; it results in $B^* =$ impossible, and accordingly, *the speed years* fall into impossible. Actually, in this bad case, the rate of technological progress, $g_A^* = i(1-\beta^*)$, is zero and no growth is guaranteed. When a sign of #NUM! appears, policy-makers must discriminate each contents; whether a mere arithmetical result or a serious symptom closer to disequilibrium. A moment shock comes from purely arithmetic calculation. An aggravating shock comes from serious real-asset unbalances by year.

Chapter 8 will clarify the mechanics of the capital-output ratio thoroughly, after widely spreading the essence of *the speed years* for convergence in this chapter. This chapter is speed years-oriented and implicitly suggests what differences lying between *the endogenous speed years* and *the speed years* in the literature through the structural analysis of *the speed years*.

## 7.2 Background of Endogenous Equilibrium and *the Speed Years*

This section broadly summarizes a version of the structure of *the speed years* to sustainable robustness and economic stages by country. There are ‘economic indicators’ such as estimated by the World Bank, whose data are actually taken from *International Financial Statistics Yearbook*, IMF. Economic Indicators in the literature are statistics-oriented and, not endogenously related to real, fiscal, financial, and market policies. Policy-makers need to have theoretical data consistently with all other data by year. Statistics data are given exogenously and used independently under the market principle.

For example, there exists an equation for *the speed years* for convergence in the literature yet, this equation is independent of empirical results. For empirical analysis, panel data in statistics are solely exogenously used. The results differ by data and, the causes at the real assets are not clarified at the same time. In the case of the endogenous system, *the speed years* for convergence are endogenously measured without using panel data in statistics. *The speed years* by country and by sector is inevitably related to the endogenous-equilibrium, where no panel data of certain countries by year are required for measurement, differently from *the speed years* in the literature.

*The speed years* in the endogenous-equilibrium are measured by the inverse number of an endogenous speed coefficient of $\lambda^* = (1-\alpha)n_E + (1-\delta_0)g_A^*$. The endogenous speed coefficient is measured differently using such nine parameters as are required for the endogenous system; $\alpha, \beta^*, \delta_0, \Omega, \lambda^*$, and $i, i_G, n_E, n_{E(G)}$. The endogenous speed coefficient, $\lambda^*$, does not include the ratio of net investment to output in equilibrium, $i = I/Y$, but the rate of change in population in equilibrium, $n_E$. The endogenous equilibrium is determined by adjusting $i = I/Y$ with the change in *the speed years* in equilibrium.

Policy-oriented core parameters are the relative share of capital, $\alpha$, the capital-output ratio, $\Omega^*$, and the rate of return, $r^*$,each in equilibrium and these three constitute $\alpha = \Omega^* \cdot r^*$. The inverse of the endogenous speed coefficient, $1/\lambda^*$, determines *the speed years* for convergence in equilibrium by country (i.e., *the speed years*). The three items of $\beta^*, \delta_0, \Omega$ constitute the structure of *the speed years*. This chapter focuses the structure of *the speed years* to answer related unsolved problems between causes and effects in the literature. Four items of $i, i_G, n_E, n_{E(G)}$ constitute independent variables by sector when endogenous equations are each reduced to hyperbolas. There are several related hyperbolas such as, $speed(i)$, $speed(n_E)$ $\Omega^*(i)$, $\Omega^*(n_E)$, $r^*(i)$, and $r^*(n_E)$. Note, $r^*(n_E)$ is reduces to linear, where gradient and intercept each are still expressed by some of nine endogenous parameters. Each hyperbola has its attributes such as the vertical asymptote (VA) and/or the horizontal asymptote (HA), the Width, the Shape, and the Curvature (for each definition and its equation, see Appendix at the end of this monograph). These attributes in each hyperbola are all expressed using some of nine endogenous parameters. These attributes widely constitute the 'mechanics' in equilibrium using hyperbolas implicitly and explicitly.

Back to the structure of *the speed years*, the structure holds not at a closed but an open economy, and, by country and by sector. There is an assumption, behind of the structure of *the speed years*, that the actual balance of payments equals the endogenous balance of payments and that the actual budget deficit equals the endogenous budget deficit. This assumption is useful to guarantee an equation of

$(S_{ENDOG} - S_{ACTUAL}) = -(I_{ENDOG} - I_{ACTUAL})$ as firm as a rock at the real assets. Suppose that endogenous net investment equals actual net investment. Then, the difference between the current situation and the endogenous situation disappears. Suppose that this equation holds within an optimum range of equilibrium, e.g., between 0.25Width and 0.5Width. Then, the current situation shows that policy-makers well acted to reach the optimum range. On the other hand, suppose that a country fell into disequilibrium. The difference between the current situation and the endogenous situation never disappears. The final manoeuvre is to decrease the rate of change in population in equilibrium, as intentionally shown at KEWT 5.10, 1990-2009. It implies that unemployment in equilibrium occurs. The length of the Width measured by $i = I/Y$ at the speed year hyperbola of $i = I/Y$ is in proportion to the robustness of sustainable economy: the longer the Width the more robust an economy is in equilibrium.

From the viewpoint of economic stages, the rate of return hyperbola of $i = I/Y$controls the transition from developing to developed stage; $r^*(i)$. The lower the $i = I/Y$ the higher the rate of return in equilibrium is. $r^*(i)$ is simultaneously related to the above speed year hyperbola of $i = I/Y$; $speed(i)$. Nevertheless, developing countries want to maintain a high rate of output, where a high $i = I/Y$ is attractive, assuming that $\beta^*$ or $\widetilde{\beta^*} = 1 - \beta^*$ is fixed. As a result, the developing country soon reaches a developed country, with an unexpected decline of robustness. This is because the capital-output ratio soon hits its upper limit, e.g., 2.0 to 2.5. It is possible for policy-makers to maintain sustainable robustness and economic stage to some extent, not to decreasing the growth rate of output too much. This is to promote technology and increase $\widetilde{\beta^*} = 1 - \beta^*$ by shifting quantitative to qualitative net investment through ecological and environmental R&D and education, with intentional reduction of $i = I/Y$ in equilibrium. This action leads to a minimized rate of return to a minimized net investment to output at an optimum point of $i = I/Y$.

Preferable combinations for the structure of *the speed years* are (1) $speed(i)$ and $speed(n_E)$, (2) $\Omega^*(i)$ and $\Omega^*(i)$, and (3) $r^*(i)$ and $r^*(n_E)$. It is interesting that $speed(i)$ and $speed(n_E)$ each have the VA and $r^*(i)$ has the HA, while $\Omega^*(i)$ and $\Omega^*(n_E)$ each have the VA and the HA For reverse calculation to serve policy-makers, $i(speed)$, $n_E(speed)$ $i(\Omega^*)$, $n_E(\Omega^*)$, $i(r^*)$, and $n_E(r^*)$ need to be formulated (for comparison, see Appendix of this monograph).

In short, it is the mission of policy-makers to control sustainable robustness and economic stages in order to maintain a moderate growth rate of output in the long run by year. For this purpose, it is necessary for policy-makers to perceive the structure of *the speed years*, adjusting nine endogenous parameters by year. The characteristics of the structure of *the speed years* are clarified by establishing the framework of simulations.

### 7.3 Empirical Results and Implications by Country

This section discusses empirical results using KEWT 5.11 and summarizes implications by country. First, highlighted using BOX 7-1, 7-2, and 7-3 in the text each based on Tables S-1 to S-4 for simulations. Second, very shortly, Tables C1 and C2 for differences of economic stages; Tables A1 and A2 for the structure of *the speed years*; Tables E1 to E4 for endogenous elasticity values of parameters and variables each w.r.t. $\alpha$ and $\beta^*$; Tables F1 and F3 for frequencies to total numbers that falls into disequilibrium and close-to-disequilibrium. Third, very shortly, Figures P1 to P7, are presented widely for the mechanics in equilibrium.

First, **Tables S1** to **S4** show selected frameworks in simulation, with processes and results by aspect, and compare each other in detail. There are two manoeuvres for simulations; (i) what hyperbolas should be preferably combined and (ii), what endogenous parameters should be selected as basic poles of simulations. For (i) combinations, the author sets two combinations: Combination 1; $\Omega^*(i)$ and $r^*(i)$, and Combination 2; $speed(i)$ and $speed(n_E)$. Combination 1 determines economic stages based on the upper limit of the HA of $\Omega^*(i)$. The lower the difference between the HA of $\Omega^*(i)$ and the current capital-output ratio, the more risky a country becomes. This is the stage risk. A high level of capital-output ratio inevitably decreases the growth rate of output. Combination 2 determines the relationship between equilibrium and unemployment, integrating optimum range of *the speed years* with the non-accelerating-inflation rate of unemployment (endogenous NAIRU). Combination 2 shows final results of policies by country. Combination 2, in other words, clarifies the entrance and exit of essential policies by country simultaneously, where the entrance is the level of endogenous equilibrium and the exit is full-employment with a low rate of inflation. The HA of $r^*(i)$ shows the endogenous rate of inflation. Therefore, the HA of $r^*(i)$ is a tie to connect Combination 1 with Combination 2.

For (ii) simulations, the author selects two parameters each as a basic pole of simulations: relative share, $1-\alpha$; and technology, $1-\beta^*$. When each pole is used, the author assumes that $i = I/Y$ and $n_E$ are fixed in simulation. Relative share, $1-\alpha$, directly works for balancing sustainable robustness and economic stages while technology, $1-\beta^*$, works for promoting technological progress as a base for the dynamic balance between robustness and stages. The two poles, $1-\alpha$ and $1-\beta^*$, do not match always so that policy-makers must design their own directions and extents. Philosophy underlying determines the directions and extents of the dynamic balance. Suppose that the two poles each change the six hyperbolas towards a good or bad same direction. In this case, it is not needed for an operator to simulate two times of $1-\alpha$ and $1-\beta^*$. And, the relationship between philosophy and results are simply clarified.

However, in simulations, results examined by pole differ significantly. In particular, the increase in relative share, $1-\alpha$, results in a linear decrease of *the speed years*. On the contrary, the increase in technology, $1-\beta^*$, results in a convex curve of *the speed years* from upwards to downwards after reaching maximum point. As a result, optimum range of *the speed years* similarly changes, as measured by the vertical asymptote of the speed, $i_{VA(speed)}$, and the Width, $i_{Width(speed)}$. This implies that it is essential to maintain robustness by continuously improving technology. Also, when technology improves with a low $i=I/Y$, economic stage never becomes matured or developed in a hurry. For economic stages, the capital-output ratio hyperbola to $i=I/Y, \Omega^*(i)$, and its horizontal asymptote, ${\Omega^*}_{HA(i)}$, are the targets.

As a result, Combination 1, $\Omega^*(i)$ and $r^*(i)$, and Combination 2, $speed(i)$ and $speed(n_E)$, are simulated, each by using two poles, $1-\alpha$ and $1-\beta^*$separately. For Combination 1, the author examines the changes in the following items: $\Omega^*$, $i_{VA(\Omega^*)}$, $\Omega^*_{HA(i)}$, $r^*$, $r^*_{HA(i)}$, $g^*_Y$, $\alpha/i\cdot\beta^*$ that shows the relationship between $r^*$and $g^*_Y$, $Curvature_{\Omega^*(i)}$, and $\Omega^*_{HA(i)}/r^*_{HA(i)}$. These items constitute a half part of the mechanics in equilibrium. For Combination 2, the author examines the changes in the following items: $\delta_0$, $speed=1/\lambda^*$, $i_{VA(speed)}$, $i_{Width(speed)}$, sum of $i_{VA(speed)}+i_{Width(speed)}$, $n_{VA(speed)}$, $n_{Width(speed)}$, $r^*_{HA(i)}$, and $\Omega^*_{HA(i)}/r^*_{HA(i)}$. These items also constitute a remaining part of the mechanics in equilibrium. The simulation results of the mechanics in equilibrium clarify the characteristics of related hyperbolas. The structure of *the speed years* of $\alpha=\Omega^*\cdot r^*$ seems to be rather complicated when the author explains simulation processes step by step. The simulation results by country show common characteristics among country and thus, are useful to policy-makers.

Let us illustrate the essence of each simulation. **BOX 7-1, 7-2**, and **7-3** each highlight the results of simulations, using symbols drawn by trend.

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**BOX 7-1** Results of simulations 1-1, 1-2, 2-1, 2-2, 3-1, 3-2, 4-1, and 4-2 in equilibrium: by changing $\alpha$ & $\beta^*$, with changes in $n$ and $i = I/Y$

| | Movements between Cases 1 &2 and Cases 3 & 4 | | | | | | | | | differs | | differs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **equilibriur** | $i$ | $n$ | $\alpha$ | $\Omega^*$ | $\beta^*$ | $i_{VA(\Omega)}$ | $\Omega^*_{HA(i)}$ | $i_{Width(\Omega)}$ | Curvat.(Ω* | $i_{VA(\Omega)}+i_{Wid(\Omega}$ | $r^*_{HA(i)}$ | $i_{Width(r^*)}$ | $\Omega^*_{HA(i)}/r^*_{HA}$ |
| Case 1-1 | | | **rises** | | | ↗ | ↘ | ↘ | ↗ | ↘ | ↑ | ↑ | ↓ |
| Case 1-2 | | | | | **rises** | ↓ | ↑ | ↑ | ↓ | ↑ | ↓ | ↘ | ↑ |
| Case 2-1 | | **rises** | **rises** | | | ↗ | ↘ | ↘ | ↗ | ↘ | ↑ | ↑ | ↓ |
| Case 2-2 | | **rises** | | | **rises** | ↓ | ↑ | ↑ | ↓ | ↑ | ↓ | ↘ | ↑ |
| **equilibriur** | $i$ | $n$ | $\alpha$ | $\Omega^*$ | $\beta^*$ | $i_{VA(\Omega)}$ | $\Omega^*_{HA(i)}$ | $i_{Width(\Omega)}$ | Curvat.(Ω* | $i_{VA(\Omega)}+i_{Wid(\Omega}$ | $r^*_{HA(i)}$ | $i_{Width(r^*)}$ | $\Omega^*_{HA(i)}/r^*_{HA}$ |
| Case 3-1 | **falls** | | **rises** | | | ↗ | ↘ | ↘ | ↗ | ↘ | ↑ | ↑ | ↓ |
| Case 3-2 | **falls** | | | | **rises** | ↓ | ↑ | ↑ | ↓ | ↓ | ↓ | ↘ | ↑ |
| Case 4-1 | **rises** | | **rises** | | | ↗ | ↘ | ↘ | ↗ | ↘ | ↑ | ↗ | ↓ |
| Case 4-2 | **rises** | | | | **rises** | ↓ | ↑ | ↑ | ↓ | ↑ | ↓ | ↘ | ↑ |

| | differs | | differs | Movements between Cases 1 &2 and Cases 3 & 4 | | | | differs | differs | differs | | differs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **equilibriur** | **$delta_0$** | $r^*$ | $r_{REAL}=r^*-r^*_H$ | $\alpha/i\cdot\beta^*$ | $g_Y^*$ | $g_A^*$ | $1/\lambda^*$ | $\delta_0-\alpha$ | $(\delta_0-\alpha)/\alpha$ | $i_{VA(speed)}$ | $i_{Width(speed)}$ | $n_{VA(speed)}$ | $n_{Width(speed)}$ |
| Case 1-1 | ↑ | ↑ | ↑ | ↑ | ↗ | → | ↗ | ↘ | ↘ | ↗ | ↗ | ↘ | ↗ |
| Case 1-2 | ↘ | ↓ | ↘ | ↘ | ↓ | ↓ | ⌣↗ | ↘ | ↘ | ⌣↗ | ⌣↗ | ↘ | → |
| Case 2-1 | ↗ | ↑ | ↑ | ↑ | ↗ | → | ↗ | ↓ | ↓ | ↘ | ↗ | ↘ | ↗ |
| Case 2-2 | ↗ | ↓ | ↘ | ↘ | ↓ | ↓ | ⌣↗ | ⌣↗ | ⌣↗ | ⌢↘ | ⌣↗ | ⌣↗ | → |
| **equilibriur** | **$delta_0$** | $r^*$ | $r_{REAL}=r^*-r^*_H$ | $\alpha/i\cdot\beta^*$ | $g_Y^*$ | $g_A^*$ | $1/\lambda^*$ | $\delta_0-\alpha$ | $(\delta_0-\alpha)/\alpha$ | $i_{VA(speed)}$ | $i_{Width(speed)}$ | $n_{VA(speed)}$ | $n_{Width(speed)}$ |
| Case 3-1 | ↗ | ↑ | ↑ | ↑ | ↗ | → | ↗ | ↘ | ↓ | ↘ | ↗ | ↗ | ↗ |
| Case 3-2 | ↘ | ↓ | ↘ | ↘ | ↓ | ↓ | ⌣↗ | ⌣↗ | ⌣↗ | ↓ | ⌣↗ | ⌣↗ | → |
| Case 4-1 | ↗ | ↑ | ↗ | ↑ | ↗ | → | ↗ | ↘ | ⌣↗ | ↗ | ↗ | ↘ | ↗ |
| Case 4-2 | ↗ | ↓ | ↘ | ↘ | ↓ | ↓ | ⌣↗ | ↘ | ⌣↗ | ⌢↘ | ⌣↗ | ⌣↗ | → |

**BOX 7-2** Results of simulations for capital-output ratio and related ratios in equilibrium: by changing $\alpha$ & $\beta^*$, with changes in $n$ and $i = I/Y$

| | Movements between Cases 1 &2 and Cases 3 & 4 | | | | | | | | | differs | | differs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **equilibriur** | $i$ | $n$ | $\alpha$ | $\Omega^*$ | $\beta^*$ | $i_{VA(\Omega)}$ | $\Omega^*_{HA(i)}$ | $i_{Width(\Omega)}$ | Curvat.(Ω* | $i_{VA(\Omega)}+i_{Wid(\Omega}$ | $r^*_{HA(i)}$ | $i_{Width(r^*)}$ | $\Omega^*_{HA(i)}/r^*_{HA}$ |
| Case 1-1 | | | **rises** | | | ↗ | ↘ | ↘ | ↗ | ↘ | ↑ | ↑ | ↓ |
| Case 1-2 | | | | | **rises** | ↓ | ↑ | ↑ | ↓ | ↑ | ↓ | ↘ | ↑ |
| Case 2-1 | | **rises** | **rises** | | | ↗ | ↘ | ↘ | ↗ | ↘ | ↑ | ↑ | ↓ |
| Case 2-2 | | **rises** | | | **rises** | ↓ | ↑ | ↑ | ↓ | ↑ | ↓ | ↘ | ↑ |
| **equilibriur** | $i$ | $n$ | $\alpha$ | $\Omega^*$ | $\beta^*$ | $i_{VA(\Omega)}$ | $\Omega^*_{HA(i)}$ | $i_{Width(\Omega)}$ | Curvat.(Ω* | $i_{VA(\Omega)}+i_{Wid(\Omega}$ | $r^*_{HA(i)}$ | $i_{Width(r^*)}$ | $\Omega^*_{HA(i)}/r^*_{HA}$ |
| Case 3-1 | **falls** | | **rises** | | | ↗ | ↘ | ↘ | ↗ | ↘ | ↑ | ↑ | ↓ |
| Case 3-2 | **falls** | | | | **rises** | ↓ | ↑ | ↑ | ↓ | ↓ | ↓ | ↘ | ↑ |
| Case 4-1 | **rises** | | **rises** | | | ↗ | ↘ | ↘ | ↗ | ↘ | ↑ | ↗ | ↓ |
| Case 4-2 | **rises** | | | | **rises** | ↓ | ↑ | ↑ | ↓ | ↑ | ↓ | ↘ | ↑ |

**BOX 7-3** Results of simulations for *the speed years* and related ratios in equilibrium: by changing $\alpha$ & $\beta^*$, with changes in $n$ and $i = I/Y$

| | differs | | differs | Movements between Cases 1 &2 and Cases 3 & 4 | | | | differs | differs | differs | | differs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **equilibrium** | **$delta_0$** | r* | $r_{REAL}=r^*-r^*_H$ | $\alpha/i\cdot\beta^*$ | $g_Y^*$ | $g_A^*$ | $1/\lambda^*$ | $\delta_0-\alpha$ | $(\delta_0-\alpha)/\alpha$ | $i_{VA(speed)}$ | $i_{Width(speed)}$ | $n_{VA(speed)}$ | $n_{Width(speed)}$ |
| Case 1-1 | ↑ | ↑ | ↑ | ↑ | ↗ | → | ↗ | ↘ | ↘ | ↗ | ↗ | ↘ | ↗ |
| Case 1-2 | ↘ | ↓ | ↘ | ↘ | ↓ | ↓ | ◡↗ | ↘ | ↘ | ◡↗ | ◡↗ | ↘ | → |
| Case 2-1 | ↗ | ↑ | ↑ | ↑ | ↗ | → | ↗ | ↓ | ↓ | ↘ | ↗ | ↘ | ↗ |
| Case 2-2 | ↗ | ↓ | ↘ | ↘ | ↓ | ↓ | ◡↗ | ◡↗ | ◡↗ | ⌒↘ | ◡↗ | ◡↗ | → |
| | | | | | | | | | | | | | |
| **equilibrium** | **$delta_0$** | r* | $r_{REAL}=r^*-r^*_H$ | $\alpha/i\cdot\beta^*$ | $g_Y^*$ | $g_A^*$ | $1/\lambda^*$ | $\delta_0-\alpha$ | $(\delta_0-\alpha)/\alpha$ | $i_{VA(speed)}$ | $i_{Width(speed)}$ | $n_{VA(speed)}$ | $n_{Width(speed)}$ |
| Case 3-1 | ↗ | ↑ | ↑ | ↑ | ↗ | → | ↗ | ↘ | ↓ | ↘ | ↗ | ↗ | ↗ |
| Case 3-2 | ↘ | ↓ | ↘ | ↘ | ↓ | ↓ | ◡↗ | ◡↗ | ◡↗ | ↓ | ◡↗ | ◡↗ | → |
| Case 4-1 | ↗ | ↑ | ↗ | ↑ | ↗ | → | ↗ | ↘ | ◡↗ | ↗ | ↗ | ↘ | ↗ |
| Case 4-2 | ↗ | ↓ | ↘ | ↘ | ↓ | ↓ | ◡↗ | ↘ | ◡↗ | ⌒↘ | ◡↗ | ◡↗ | → |

**Notes:**
At Case 1-1, rise; at Case 1-2, $\beta^*$ rises.
At Case 2-1, α rises with a rise of *n*; and at Case 2-2, $\beta^*$ rises with the same rise of *n*.
At Case 3-1, α rises; at Case 3-2, $\beta^*$ rises, each with a fall of $i = I/Y$.
At Case 4-1, α rises and at Case 4-2, $\beta^*$ rise, each with a rise of $i = I/Y$. Simulation of each case has nine levels, increasing and/or decreasing.

Next, **Tables C1** and **C2** show the differences of economic stages using the structure of *the speed years*, where economic stages are divided into five cases including extreme deficit case. **Tables A1** and **A2** each show results of the structure of *the speed years,* by country and by sub-area in Europe and Asia. **Tables E1** to **E4** show endogenous elasticity values of parameters and variables each w.r.t. $\alpha$ and $\beta^*$, in the discrete time, where the elasticity of substitution is 1.0, as proved (2009). **Tables F1** and **F2** show frequency to total numbers that falls into 'disequilibrium' and frequency to total numbers that falls into 'close-to-disequilibrium,' by country for the 1990-2008, where disequilibrium is measured by *the speed years*<0 and close-to-disequilibrium is measured by 0<*the speed years*<5. **Table F3** shows endogenous real rate of return and endogenous inflation/deflation rate for the NAIRU by country in 2008. This is another expression of disequilibrium since the adjustments by $n_E$ is the last manoeuvre to equilibrium.

Finally, **Figures P1** to **P7** each show the mechanics in equilibrium for three Europe sub-areas in Europe. 'Mechanics' in these figures broadly means the characteristics shown by using some specific ratios in endogenous equations and related hyperbolas.

## 7.4 Conclusions

This chapter aims at clarifying a version of the structure of *the speed years* empirically using endogenous equations. One specific point in this chapter is the use of KEWT 5.11 data-sets. This is because KEWT 5.11 data-sets each leave an endogenous rate of unemployment as a final adjustment for maintaining a moderate range of endogenous equilibrium. The structure of *the speed years* locates at the centre of the endogenous-equilibrium and the endogenous system; made of two attributes, the capital-output ratio and the quantitative net investment coefficient, $\beta^*$. And, this chapter connects endogenous equations with each hyperbola. A hyperbola is a reduced form of an endogenous equation and reinforces the endogenous system by measuring vertical and/or horizontal asymptotes.

The policy-oriented core parameters, i.e., relative share of capital, the capita-output ratio, and the rate of return, or $\alpha = \Omega^* \cdot r^*$ are overlapped in the structure of *the speed years*. Related hyperbolas are a few times explained at other chapters from different viewpoints of sustainability so that readers may be relaxed in this chapter.

The other specific point of this chapter is the use of ‘the origin’ of each related hyperbola. The origin of a hyperbola is visibly shown at the centre of the four quadrants and determines accurate spots of parameters and variables. The optimum point of $i = I/Y$ of the rate of return hyperbola to $i = I/Y$ is, even though, difficult to find the maximum rate of return corresponding to the minimum $i = I/Y$ since this spot is not obtained by point but by a narrow range.

The author recalls a story of genius pianist, Tsujii Nobuyuki broadcasted on 19 May 2012 at TV Asahi. Tsujii won the highest pianist record in the world and today keeps “the youngest winner” by the age of twenty years, despite of the blind. A judge raised: He played piano with mind and spirit or his spirit played his piano.

The simulations based on related hyperbolas are visible and accordingly testable. Yet in a sense, it is important for an operator/policy-maker to work spiritually rather than to stick to mechanical method and its results. The parabolic maximization is replaced by an optimum range of the endogenous-equilibrium to satisfy the maximum rate of return under the minimum$i = I/Y$. The origin of a hyperbola overlaps one corner of the right rectangular that helps to draw hyperbolic curve. By imaging the rectangular, the optimum point by hyperbola will be confirmed, not intuitively but accurately. Two dimensional rectangular reinforces the hyperbola and, empirically determines the original point and a range of the maximum and minimum spot. The origin and the vertical and horizontal asymptotes constitute each body of the endogenous system and related hyperbolas. Not one corner of a right rectangular but a whole of the rectangle determines the optimization by hyperbola. This image is similar to human body and further human mind and body (see Chapter 10).

**Structural Analysis of the Speed Years for Convergence in Equilibrium by Country: Six Hyperbolas with Each Simulation**

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For readers' convenience: contents of Tables and Figures hereunder

**Table S1** Simulations 1-1, 1-2, 2-1, and 2-2 (1) in equilibrium: by changing $\alpha$ & $\beta^*$, with changes in $n$ and $i = I/Y$

| i | n | α | $\Omega^*$ | $\beta^*$ | $i_{VA(\Omega)}$ | $\Omega^*_{HA(i)}$ | $i_{Width(\Omega)}$ | Curvat.($\Omega^*$ | $i_{VA(\Omega)}+i_{Wid(\Omega}$ | $r^*_{HA(i)}$ | $i_{Width(r^*)}$ | $\Omega^*_{HA(i)}/r^*_{H}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Simu 1-1: changing *alpha*** | | | | | | | | | | | | |
| 0.2 | 0.005 | **0.05** | 3.926 | 0.825 | (0.0270) | 4.456 | 0.3469 | 2.038 | 0.3199 | 0.0112 | 0.0174 | 397.17 |
| 0.2 | 0.005 | **0.1** | 3.743 | 0.825 | (0.0256) | 4.222 | 0.3287 | 2.151 | 0.3031 | 0.0237 | 0.0246 | 178.23 |
| 0.2 | 0.005 | **0.15** | 3.557 | 0.825 | (0.0242) | 3.987 | 0.3104 | 2.278 | 0.2862 | 0.0376 | 0.0302 | 105.99 |
| 0.2 | 0.005 | **0.2** | 3.369 | 0.825 | (0.0227) | 3.753 | 0.2921 | 2.420 | 0.2694 | 0.0533 | 0.0348 | 70.41 |
| 0.2 | 0.005 | **0.25** | 3.179 | 0.825 | (0.0213) | 3.518 | 0.2739 | 2.582 | 0.2526 | 0.0711 | 0.0389 | 49.51 |
| 0.2 | 0.005 | **0.3** | 2.986 | 0.825 | (0.0199) | 3.284 | 0.2556 | 2.766 | 0.2357 | 0.0914 | 0.0426 | 35.94 |
| 0.2 | 0.005 | **0.35** | 2.791 | 0.825 | (0.0185) | 3.049 | 0.2374 | 2.979 | 0.2189 | 0.1148 | 0.0461 | 26.56 |
| 0.2 | 0.005 | **0.4** | 2.593 | 0.825 | (0.0171) | 2.814 | 0.2191 | 3.227 | 0.2021 | 0.1421 | 0.0492 | 19.80 |
| 0.2 | 0.005 | **0.45** | 2.393 | 0.825 | (0.0156) | 2.580 | 0.2008 | 3.521 | 0.1852 | 0.1744 | 0.0522 | 14.79 |
| **Simu 1-2 changing *beta*** * | | | | | | | | | | | | |
| 0.2 | 0.005 | 0.25 | 1.070 | **0.6** | (0.0093) | 1.119 | 0.1022 | 6.920 | 0.0929 | 0.2233 | 0.0456 | 5.01 |
| 0.2 | 0.005 | 0.25 | 1.316 | **0.65** | (0.0107) | 1.386 | 0.1216 | 5.817 | 0.1109 | 0.1804 | 0.0439 | 7.68 |
| 0.2 | 0.005 | 0.25 | 1.639 | **0.7** | (0.0124) | 1.741 | 0.1472 | 4.805 | 0.1347 | 0.1436 | 0.0423 | 12.13 |
| 0.2 | 0.005 | 0.25 | 2.083 | **0.75** | (0.0149) | 2.239 | 0.1828 | 3.868 | 0.1679 | 0.1117 | 0.0408 | 20.05 |
| 0.2 | 0.005 | 0.25 | 2.730 | **0.8** | (0.0187) | 2.985 | 0.2360 | 2.996 | 0.2173 | 0.0838 | 0.0395 | 35.64 |
| 0.2 | 0.005 | 0.25 | 3.761 | **0.85** | (0.0249) | 4.229 | 0.3243 | 2.180 | 0.2995 | 0.0591 | 0.0383 | 71.53 |
| 0.2 | 0.005 | 0.25 | 5.660 | **0.9** | (0.0373) | 6.716 | 0.5006 | 1.412 | 0.4633 | 0.0372 | 0.0373 | 180.44 |
| 0.2 | 0.005 | 0.25 | 10.326 | **0.95** | (0.0746) | 14.179 | 1.0287 | 0.687 | 0.9540 | 0.0176 | 0.0363 | 804.19 |
| 0.2 | 0.005 | 0.25 | 25.781 | **0.99** | (0.3731) | 73.881 | 5.2505 | 0.135 | 4.8773 | 0.0034 | 0.0355 | 21833 |
| **Simu 2-1: changing *alpha*** | | | | | | | | | | | | |
| 0.2 | **0.010** | **0.05** | 3.495 | 0.825 | (0.0537) | 4.434 | 0.4882 | 1.448 | 0.4344 | 0.0113 | 0.0246 | 393.25 |
| 0.2 | **0.010** | **0.1** | 3.348 | 0.825 | (0.0509) | 4.201 | 0.4625 | 1.529 | 0.4116 | 0.0238 | 0.0348 | 176.47 |
| 0.2 | **0.010** | **0.15** | 3.198 | 0.825 | (0.0481) | 3.967 | 0.4368 | 1.619 | 0.3887 | 0.0378 | 0.0426 | 104.94 |
| 0.2 | **0.010** | **0.2** | 3.045 | 0.825 | (0.0453) | 3.734 | 0.4111 | 1.720 | 0.3658 | 0.0536 | 0.0492 | 69.72 |
| 0.2 | **0.010** | **0.25** | 2.888 | 0.825 | (0.0424) | 3.501 | 0.3854 | 1.835 | 0.3430 | 0.0714 | 0.0550 | 49.02 |
| 0.2 | **0.010** | **0.3** | 2.727 | 0.825 | (0.0396) | 3.267 | 0.3597 | 1.966 | 0.3201 | 0.0918 | 0.0603 | 35.58 |
| 0.2 | **0.010** | **0.35** | 2.563 | 0.825 | (0.0368) | 3.034 | 0.3340 | 2.117 | 0.2973 | 0.1154 | 0.0651 | 26.30 |
| 0.2 | **0.010** | **0.4** | 2.394 | 0.825 | (0.0339) | 2.801 | 0.3083 | 2.293 | 0.2744 | 0.1428 | 0.0696 | 19.61 |
| 0.2 | **0.010** | **0.45** | 2.222 | 0.825 | (0.0311) | 2.567 | 0.2826 | 2.502 | 0.2515 | 0.1753 | 0.0739 | 14.65 |
| **Simu 2-2 changing *beta*** * | | | | | | | | | | | | |
| 0.2 | **0.010** | 0.25 | 1.019 | **0.6** | (0.0186) | 1.114 | 0.1438 | 4.917 | 0.1252 | 0.2244 | 0.0645 | 4.96 |
| 0.2 | **0.010** | 0.25 | 1.247 | **0.65** | (0.0212) | 1.379 | 0.1711 | 4.134 | 0.1498 | 0.1813 | 0.0620 | 7.61 |
| 0.2 | **0.010** | 0.25 | 1.542 | **0.7** | (0.0248) | 1.733 | 0.2071 | 3.414 | 0.1823 | 0.1443 | 0.0598 | 12.01 |
| 0.2 | **0.010** | 0.25 | 1.940 | **0.75** | (0.0297) | 2.228 | 0.2572 | 2.749 | 0.2275 | 0.1122 | 0.0577 | 19.85 |
| 0.2 | **0.010** | 0.25 | 2.505 | **0.8** | (0.0371) | 2.970 | 0.3321 | 2.129 | 0.2950 | 0.0842 | 0.0559 | 35.29 |
| 0.2 | **0.010** | 0.25 | 3.373 | **0.85** | (0.0495) | 4.208 | 0.4564 | 1.549 | 0.4069 | 0.0594 | 0.0542 | 70.83 |
| 0.2 | **0.010** | 0.25 | 4.874 | **0.9** | (0.0743) | 6.683 | 0.7045 | 1.004 | 0.6302 | 0.0374 | 0.0527 | 178.66 |
| 0.2 | **0.010** | 0.25 | 8.097 | **0.95** | (0.1485) | 14.109 | 1.4475 | 0.488 | 1.2990 | 0.0177 | 0.0513 | 796.25 |
| 0.2 | **0.010** | 0.25 | 15.599 | **0.99** | (0.7426) | 73.515 | 7.3885 | 0.096 | 6.6459 | 0.0034 | 0.0503 | 21618 |

**Table S2** Simulations 1-1, 1-2, 2-1, and 2-2 (2) in equilibrium: by changing $\alpha$ & $\beta^{*}$, with changes in $n$ and $i = I/Y$

| $delta_0$ | $r^{*}$ | $r_{REAL}=r^{*}-r^{*}_{H}$ | $\alpha/r\beta^{*}$ | $g^{*}_{Y}$ | $g^{*}_{A}$ | $1/\lambda^{*}$ | $\delta_0-\alpha$ | $(\delta_0-\alpha)/\alpha$ | $i_{VA(speed)}$ | $i_{Width(speed)}$ | $n_{VA(speed)}$ | $n_{Width(speed)}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Simu 1-1: changing *alpha*** | | | | | | | | | | | | |
| 0.1180 | 0.0127 | 0.0015 | 0.3030 | 0.0420 | 0.0350 | 28.07 | 0.0680 | 1.3597 | (0.0308) | 0.0255 | (0.0325) | 0.0103 |
| 0.1488 | 0.0267 | 0.0030 | 0.6061 | 0.0441 | 0.0350 | 29.16 | 0.0488 | 0.4880 | (0.0302) | 0.0259 | (0.0331) | 0.0105 |
| 0.1816 | 0.0422 | 0.0045 | 0.9091 | 0.0464 | 0.0350 | 30.40 | 0.0316 | 0.2106 | (0.0297) | 0.0264 | (0.0337) | 0.0108 |
| 0.2166 | 0.0594 | 0.0061 | 1.2121 | 0.0490 | 0.0350 | 31.83 | 0.0166 | 0.0829 | (0.0292) | 0.0270 | (0.0343) | 0.0112 |
| 0.2541 | 0.0786 | 0.0076 | 1.5152 | 0.0519 | 0.0350 | 33.49 | 0.0041 | 0.0163 | (0.0287) | 0.0277 | (0.0348) | 0.0115 |
| 0.2944 | 0.1005 | 0.0091 | 1.8182 | 0.0553 | 0.0350 | 35.47 | (0.0056) | (0.0186) | (0.0283) | 0.0285 | (0.0353) | 0.0120 |
| 0.3380 | 0.1254 | 0.0106 | 2.1212 | 0.0591 | 0.0350 | 37.85 | (0.0120) | (0.0342) | (0.0281) | 0.0294 | (0.0356) | 0.0124 |
| 0.3854 | 0.1542 | 0.0121 | 2.4242 | 0.0636 | 0.0350 | 40.80 | (0.0146) | (0.0364) | (0.0279) | 0.0305 | (0.0358) | 0.0129 |
| 0.4373 | 0.1881 | 0.0136 | 2.7273 | 0.0690 | 0.0350 | 44.56 | (0.0127) | (0.0282) | (0.0279) | 0.0319 | (0.0358) | 0.0135 |
| **Simu 1-2 changing *beta**** | | | | | | | | | | | | |
| 0.8342 | 0.2338 | 0.0104 | 2.0833 | 0.1122 | 0.0800 | 58.79 | 0.5842 | 2.3370 | (0.0566) | 0.0388 | (0.0177) | 0.0115 |
| 0.5567 | 0.1900 | 0.0096 | 1.9231 | 0.0988 | 0.0700 | 28.75 | 0.3067 | 1.2267 | (0.0242) | 0.0254 | (0.0414) | 0.0115 |
| 0.4166 | 0.1525 | 0.0089 | 1.7857 | 0.0854 | 0.0600 | 25.80 | 0.1666 | 0.6665 | (0.0214) | 0.0239 | (0.0467) | 0.0115 |
| 0.3319 | 0.1200 | 0.0083 | 1.6667 | 0.0720 | 0.0500 | 26.91 | 0.0819 | 0.3276 | (0.0225) | 0.0245 | (0.0445) | 0.0115 |
| 0.2755 | 0.0916 | 0.0078 | 1.5625 | 0.0586 | 0.0400 | 30.55 | 0.0255 | 0.1018 | (0.0259) | 0.0263 | (0.0386) | 0.0115 |
| 0.2363 | 0.0665 | 0.0074 | 1.4706 | 0.0452 | 0.0300 | 37.51 | (0.0137) | (0.0548) | (0.0327) | 0.0295 | (0.0305) | 0.0115 |
| 0.2111 | 0.0442 | 0.0069 | 1.3889 | 0.0318 | 0.0200 | 51.21 | (0.0389) | (0.1558) | (0.0475) | 0.0356 | (0.0210) | 0.0115 |
| 0.2071 | 0.0242 | 0.0066 | 1.3158 | 0.0184 | 0.0100 | 85.62 | (0.0429) | (0.1716) | (0.0946) | 0.0502 | (0.0106) | 0.0115 |
| 0.2928 | 0.0097 | 0.0063 | 1.2626 | 0.0077 | 0.0020 | 193.63 | 0.0428 | 0.1712 | (0.5303) | 0.1189 | (0.0019) | 0.0115 |
| **Simu 2-1: changing *alpha*** | | | | | | | | | | | | |
| 0.1930 | 0.0143 | 0.0030 | 0.3030 | 0.0472 | 0.0350 | 26.49 | 0.1430 | 2.8600 | (0.0673) | 0.0266 | (0.0297) | 0.0103 |
| 0.2206 | 0.0299 | 0.0061 | 0.6061 | 0.0493 | 0.0350 | 27.57 | 0.1206 | 1.2064 | (0.0660) | 0.0271 | (0.0303) | 0.0105 |
| 0.2502 | 0.0469 | 0.0091 | 0.9091 | 0.0516 | 0.0350 | 28.78 | 0.1002 | 0.6679 | (0.0648) | 0.0276 | (0.0309) | 0.0108 |
| 0.2819 | 0.0657 | 0.0121 | 1.2121 | 0.0542 | 0.0350 | 30.18 | 0.0819 | 0.4095 | (0.0637) | 0.0282 | (0.0314) | 0.0112 |
| 0.3160 | 0.0866 | 0.0152 | 1.5152 | 0.0571 | 0.0350 | 31.81 | 0.0660 | 0.2641 | (0.0627) | 0.0289 | (0.0319) | 0.0115 |
| 0.3530 | 0.1100 | 0.0182 | 1.8182 | 0.0605 | 0.0350 | 33.73 | 0.0530 | 0.1765 | (0.0618) | 0.0297 | (0.0324) | 0.0120 |
| 0.3931 | 0.1366 | 0.0212 | 2.1212 | 0.0644 | 0.0350 | 36.05 | 0.0431 | 0.1231 | (0.0612) | 0.0307 | (0.0327) | 0.0124 |
| 0.4370 | 0.1671 | 0.0242 | 2.4242 | 0.0689 | 0.0350 | 38.90 | 0.0370 | 0.0924 | (0.0609) | 0.0319 | (0.0328) | 0.0129 |
| 0.4852 | 0.2026 | 0.0273 | 2.7273 | 0.0743 | 0.0350 | 42.52 | 0.0352 | 0.0783 | (0.0611) | 0.0333 | (0.0328) | 0.0135 |
| **Simu 2-2 changing *beta**** | | | | | | | | | | | | |
| 0.9530 | 0.2453 | 0.0208 | 2.0833 | 0.1177 | 0.0800 | 88.79 | 0.7030 | 2.8119 | (0.3987) | 0.0729 | (0.0050) | 0.0115 |
| 0.6437 | 0.2005 | 0.0192 | 1.9231 | 0.1043 | 0.0700 | 30.82 | 0.3937 | 1.5747 | (0.0601) | 0.0283 | (0.0333) | 0.0115 |
| 0.4890 | 0.1621 | 0.0179 | 1.7857 | 0.0908 | 0.0600 | 26.20 | 0.2390 | 0.9559 | (0.0489) | 0.0255 | (0.0409) | 0.0115 |
| 0.3970 | 0.1289 | 0.0167 | 1.6667 | 0.0773 | 0.0500 | 26.56 | 0.1470 | 0.5878 | (0.0497) | 0.0258 | (0.0402) | 0.0115 |
| 0.3375 | 0.0998 | 0.0156 | 1.5625 | 0.0639 | 0.0400 | 29.41 | 0.0875 | 0.3501 | (0.0566) | 0.0275 | (0.0353) | 0.0115 |
| 0.2991 | 0.0741 | 0.0147 | 1.4706 | 0.0504 | 0.0300 | 35.05 | 0.0491 | 0.1963 | (0.0713) | 0.0308 | (0.0280) | 0.0115 |
| 0.2792 | 0.0513 | 0.0139 | 1.3889 | 0.0369 | 0.0200 | 45.63 | 0.0292 | 0.1166 | (0.1040) | 0.0372 | (0.0192) | 0.0115 |
| 0.2897 | 0.0309 | 0.0132 | 1.3158 | 0.0235 | 0.0100 | 68.48 | 0.0397 | 0.1588 | (0.2112) | 0.0531 | (0.0095) | 0.0115 |
| 0.4022 | 0.0160 | 0.0126 | 1.2626 | 0.0127 | 0.0020 | 115.00 | 0.1522 | 0.6086 | (1.2545) | 0.1293 | (0.0016) | 0.0115 |

## Chapter 7

**Table S3** Simulations 3-1, 3-2, 4-1, and 4-2 (1) in equilibrium: by changing $\alpha$ & $\beta^*$, with changes in $n$ and $i = I/Y$

| i | n | α | $\Omega^*$ | $\beta^*$ | $i_{VA(\Omega)}$ | $\Omega^*_{HA(i)}$ | $i_{Width(\Omega)}$ | Curvat.(Ω* | $i_{VA(\Omega)}+i_{Wid(\Omega}$ | $r^*_{HA(i)}$ | $i_{Width(r^*)}$ | $\Omega^*_{HA(i)}/r^*_{H}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Simu 3-1: changing *alpha*** | | | | | | | | | | | | |
| ***0.075*** | 0.005 | **0.05** | 3.276 | 0.825 | (0.0270) | 4.456 | 0.3469 | 2.038 | 0.3199 | 0.0112 | 0.0174 | 397.17 |
| ***0.075*** | 0.005 | **0.1** | 3.148 | 0.825 | (0.0256) | 4.222 | 0.3287 | 2.151 | 0.3031 | 0.0237 | 0.0246 | 178.23 |
| ***0.075*** | 0.005 | **0.15** | 3.016 | 0.825 | (0.0242) | 3.987 | 0.3104 | 2.278 | 0.2862 | 0.0376 | 0.0302 | 105.99 |
| ***0.075*** | 0.005 | **0.2** | 2.879 | 0.825 | (0.0227) | 3.753 | 0.2921 | 2.420 | 0.2694 | 0.0533 | 0.0348 | 70.41 |
| ***0.075*** | 0.005 | **0.25** | 2.739 | 0.825 | (0.0213) | 3.518 | 0.2739 | 2.582 | 0.2526 | 0.0711 | 0.0389 | 49.51 |
| ***0.075*** | 0.005 | **0.3** | 2.595 | 0.825 | (0.0199) | 3.284 | 0.2556 | 2.766 | 0.2357 | 0.0914 | 0.0426 | 35.94 |
| ***0.075*** | 0.005 | **0.35** | 2.446 | 0.825 | (0.0185) | 3.049 | 0.2374 | 2.979 | 0.2189 | 0.1148 | 0.0461 | 26.56 |
| ***0.075*** | 0.005 | **0.4** | 2.293 | 0.825 | (0.0171) | 2.814 | 0.2191 | 3.227 | 0.2021 | 0.1421 | 0.0492 | 19.80 |
| ***0.075*** | 0.005 | **0.45** | 2.135 | 0.825 | (0.0156) | 2.580 | 0.2008 | 3.521 | 0.1852 | 0.1744 | 0.0522 | 14.79 |
| **Simu 3-2 changing *beta* *** | | | | | | | | | | | | |
| ***0.075*** | 0.005 | 0.25 | 0.996 | **0.6** | (0.0093) | 1.119 | 0.1022 | 6.920 | 0.0929 | 0.2233 | 0.0456 | 5.01 |
| ***0.075*** | 0.005 | 0.25 | 1.213 | **0.65** | (0.0107) | 1.386 | 0.1216 | 5.817 | 0.1109 | 0.1804 | 0.0439 | 7.68 |
| ***0.075*** | 0.005 | 0.25 | 1.494 | **0.7** | (0.0124) | 1.741 | 0.1472 | 4.805 | 0.1347 | 0.1436 | 0.0423 | 12.13 |
| ***0.075*** | 0.005 | 0.25 | 1.867 | **0.75** | (0.0149) | 2.239 | 0.1828 | 3.868 | 0.1679 | 0.1117 | 0.0408 | 20.05 |
| ***0.075*** | 0.005 | 0.25 | 2.390 | **0.8** | (0.0187) | 2.985 | 0.2360 | 2.996 | 0.2173 | 0.0838 | 0.0395 | 35.64 |
| ***0.075*** | 0.005 | 0.25 | 3.176 | **0.85** | (0.0249) | 4.229 | 0.3243 | 2.180 | 0.2995 | 0.0591 | 0.0383 | 71.53 |
| ***0.075*** | 0.005 | 0.25 | 4.485 | **0.9** | (0.0373) | 6.716 | 0.5006 | 1.412 | 0.4633 | 0.0372 | 0.0373 | 180.44 |
| ***0.075*** | 0.005 | 0.25 | 7.107 | **0.95** | (0.0746) | 14.179 | 1.0287 | 0.687 | 0.9540 | 0.0176 | 0.0363 | 804.19 |
| ***0.075*** | 0.005 | 0.25 | 12.365 | **0.99** | (0.3731) | 73.881 | 5.2505 | 0.135 | 4.8773 | 0.0034 | 0.0355 | 21833 |
| **Simu 4-1: changing *alpha*** | | | | | | | | | | | | |
| ***0.4*** | 0.005 | **0.05** | 4.174 | 0.825 | (0.0270) | 4.456 | 0.3469 | 2.038 | 0.3199 | 0.0112 | 0.0174 | 397.17 |
| ***0.4*** | 0.005 | **0.1** | 3.968 | 0.825 | (0.0256) | 4.222 | 0.3287 | 2.151 | 0.3031 | 0.0237 | 0.0246 | 178.23 |
| ***0.4*** | 0.005 | **0.15** | 3.760 | 0.825 | (0.0242) | 3.987 | 0.3104 | 2.278 | 0.2862 | 0.0376 | 0.0302 | 105.99 |
| ***0.4*** | 0.005 | **0.2** | 3.551 | 0.825 | (0.0227) | 3.753 | 0.2921 | 2.420 | 0.2694 | 0.0533 | 0.0348 | 70.41 |
| ***0.4*** | 0.005 | **0.25** | 3.340 | 0.825 | (0.0213) | 3.518 | 0.2739 | 2.582 | 0.2526 | 0.0711 | 0.0389 | 49.51 |
| ***0.4*** | 0.005 | **0.3** | 3.128 | 0.825 | (0.0199) | 3.284 | 0.2556 | 2.766 | 0.2357 | 0.0914 | 0.0426 | 35.94 |
| ***0.4*** | 0.005 | **0.35** | 2.914 | 0.825 | (0.0185) | 3.049 | 0.2374 | 2.979 | 0.2189 | 0.1148 | 0.0461 | 26.56 |
| ***0.4*** | 0.005 | **0.4** | 2.699 | 0.825 | (0.0171) | 2.814 | 0.2191 | 3.227 | 0.2021 | 0.1421 | 0.0492 | 19.80 |
| ***0.4*** | 0.005 | **0.45** | 2.483 | 0.825 | (0.0156) | 2.580 | 0.2008 | 3.521 | 0.1852 | 0.1744 | 0.0522 | 14.79 |
| **Simu 4-2 changing *beta* *** | | | | | | | | | | | | |
| ***0.4*** | 0.005 | 0.25 | 1.094 | **0.6** | (0.0093) | 1.119 | 0.1022 | 6.920 | 0.0929 | 0.2233 | 0.0456 | 5.01 |
| ***0.4*** | 0.005 | 0.25 | 1.350 | **0.65** | (0.0107) | 1.386 | 0.1216 | 5.817 | 0.1109 | 0.1804 | 0.0439 | 7.68 |
| ***0.4*** | 0.005 | 0.25 | 1.689 | **0.7** | (0.0124) | 1.741 | 0.1472 | 4.805 | 0.1347 | 0.1436 | 0.0423 | 12.13 |
| ***0.4*** | 0.005 | 0.25 | 2.158 | **0.75** | (0.0149) | 2.239 | 0.1828 | 3.868 | 0.1679 | 0.1117 | 0.0408 | 20.05 |
| ***0.4*** | 0.005 | 0.25 | 2.852 | **0.8** | (0.0187) | 2.985 | 0.2360 | 2.996 | 0.2173 | 0.0838 | 0.0395 | 35.64 |
| ***0.4*** | 0.005 | 0.25 | 3.981 | **0.85** | (0.0249) | 4.229 | 0.3243 | 2.180 | 0.2995 | 0.0591 | 0.0383 | 71.53 |
| ***0.4*** | 0.005 | 0.25 | 6.143 | **0.9** | (0.0373) | 6.716 | 0.5006 | 1.412 | 0.4633 | 0.0372 | 0.0373 | 180.44 |
| ***0.4*** | 0.005 | 0.25 | 11.950 | **0.95** | (0.0746) | 14.179 | 1.0287 | 0.687 | 0.9540 | 0.0176 | 0.0363 | 804.19 |
| ***0.4*** | 0.005 | 0.25 | 38.224 | **0.99** | (0.3731) | 73.881 | 5.2505 | 0.135 | 4.8773 | 0.0034 | 0.0355 | 21833 |

**Table S4** Simulations 3-1, 3-2, 4-1, and 4-2 (2) in equilibrium: by changing $\alpha$ & $\beta^*$, with changes in $n$ and $i = I/Y$

| $delta_0$ | r* | $r_{REAL}=r^*-r^*_H$ | $\alpha/i{\cdot}\beta^*$ | $g_Y^*$ | $g_A^*$ | $1/\lambda^*$ | $\delta_0-\alpha$ | $(\delta_0-\alpha)/\alpha$ | $i_{VA(speed)}$ | $i_{Width(speed)}$ | $n_{VA(speed)}$ | $n_{Width(speed)}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Simu 3-1: changing *alpha*** | | | | | | | | | | | | |
| 0.2346 | 0.0153 | 0.0040 | 0.8081 | 0.0189 | 0.0131 | 67.59 | 0.1846 | 3.6929 | (0.0355) | 0.0273 | (0.0106) | 0.0103 |
| 0.2605 | 0.0318 | 0.0081 | 1.6162 | 0.0197 | 0.0131 | 70.39 | 0.1605 | 1.6047 | (0.0348) | 0.0278 | (0.0108) | 0.0105 |
| 0.2881 | 0.0497 | 0.0121 | 2.4242 | 0.0205 | 0.0131 | 73.57 | 0.1381 | 0.9210 | (0.0341) | 0.0283 | (0.0110) | 0.0108 |
| 0.3179 | 0.0695 | 0.0162 | 3.2323 | 0.0215 | 0.0131 | 77.21 | 0.1179 | 0.5897 | (0.0335) | 0.0289 | (0.0112) | 0.0112 |
| 0.3501 | 0.0913 | 0.0202 | 4.0404 | 0.0226 | 0.0131 | 81.43 | 0.1001 | 0.4004 | (0.0330) | 0.0297 | (0.0114) | 0.0115 |
| 0.3850 | 0.1156 | 0.0242 | 4.8485 | 0.0238 | 0.0131 | 86.42 | 0.0850 | 0.2834 | (0.0325) | 0.0305 | (0.0115) | 0.0120 |
| 0.4231 | 0.1431 | 0.0283 | 5.6566 | 0.0253 | 0.0131 | 92.40 | 0.0731 | 0.2088 | (0.0322) | 0.0315 | (0.0116) | 0.0124 |
| 0.4648 | 0.1744 | 0.0323 | 6.4646 | 0.0270 | 0.0131 | 99.76 | 0.0648 | 0.1620 | (0.0320) | 0.0327 | (0.0117) | 0.0129 |
| 0.5109 | 0.2108 | 0.0364 | 7.2727 | 0.0290 | 0.0131 | 109.06 | 0.0609 | 0.1353 | (0.0321) | 0.0342 | (0.0117) | 0.0135 |
| **Simu 3-2 changing *beta*** * | | | | | | | | | | | | |
| 1.0109 | 0.2511 | 0.0278 | 5.5556 | 0.0452 | 0.0300 | 292.24 | 0.7609 | 3.0437 | 0.8572 | #NUM! | 0.0004 | 0.0115 |
| 0.6875 | 0.2060 | 0.0256 | 5.1282 | 0.0402 | 0.0263 | 83.66 | 0.4375 | 1.7499 | (0.0343) | 0.0302 | (0.0109) | 0.0115 |
| 0.5265 | 0.1674 | 0.0238 | 4.7619 | 0.0352 | 0.0225 | 69.43 | 0.2765 | 1.1060 | (0.0264) | 0.0265 | (0.0142) | 0.0115 |
| 0.4316 | 0.1339 | 0.0222 | 4.4444 | 0.0301 | 0.0188 | 69.41 | 0.1816 | 0.7264 | (0.0264) | 0.0265 | (0.0142) | 0.0115 |
| 0.3714 | 0.1046 | 0.0208 | 4.1667 | 0.0251 | 0.0150 | 75.88 | 0.1214 | 0.4854 | (0.0298) | 0.0282 | (0.0126) | 0.0115 |
| 0.3339 | 0.0787 | 0.0196 | 3.9216 | 0.0201 | 0.0113 | 88.94 | 0.0839 | 0.3354 | (0.0375) | 0.0316 | (0.0100) | 0.0115 |
| 0.3170 | 0.0557 | 0.0185 | 3.7037 | 0.0151 | 0.0075 | 112.71 | 0.0670 | 0.2679 | (0.0549) | 0.0383 | (0.0068) | 0.0115 |
| 0.3340 | 0.0352 | 0.0175 | 3.5088 | 0.0100 | 0.0038 | 160.06 | 0.0840 | 0.3358 | (0.1126) | 0.0548 | (0.0033) | 0.0115 |
| 0.4527 | 0.0202 | 0.0168 | 3.3670 | 0.0060 | 0.0008 | 240.36 | 0.2027 | 0.8109 | (0.6852) | 0.1352 | (0.0005) | 0.0115 |
| **Simu 4-1: changing *alpha*** | | | | | | | | | | | | |
| 0.0784 | 0.0120 | 0.0008 | 0.1515 | 0.0791 | 0.0700 | 14.44 | 0.0284 | 0.5687 | (0.0295) | 0.0249 | (0.0679) | 0.0103 |
| 0.1112 | 0.0252 | 0.0015 | 0.3030 | 0.0832 | 0.0700 | 14.99 | 0.0112 | 0.1115 | (0.0289) | 0.0254 | (0.0691) | 0.0105 |
| 0.1459 | 0.0399 | 0.0023 | 0.4545 | 0.0878 | 0.0700 | 15.62 | (0.0041) | (0.0276) | (0.0284) | 0.0259 | (0.0703) | 0.0108 |
| 0.1828 | 0.0563 | 0.0030 | 0.6061 | 0.0929 | 0.0700 | 16.34 | (0.0172) | (0.0861) | (0.0280) | 0.0264 | (0.0715) | 0.0112 |
| 0.2222 | 0.0748 | 0.0038 | 0.7576 | 0.0988 | 0.0700 | 17.18 | (0.0278) | (0.1110) | (0.0276) | 0.0271 | (0.0726) | 0.0115 |
| 0.2646 | 0.0959 | 0.0045 | 0.9091 | 0.1055 | 0.0700 | 18.19 | (0.0354) | (0.1182) | (0.0272) | 0.0279 | (0.0735) | 0.0120 |
| 0.3102 | 0.1201 | 0.0053 | 1.0606 | 0.1132 | 0.0700 | 19.40 | (0.0398) | (0.1138) | (0.0269) | 0.0288 | (0.0743) | 0.0124 |
| 0.3596 | 0.1482 | 0.0061 | 1.2121 | 0.1223 | 0.0700 | 20.91 | (0.0404) | (0.1010) | (0.0268) | 0.0299 | (0.0747) | 0.0129 |
| 0.4135 | 0.1812 | 0.0068 | 1.3636 | 0.1329 | 0.0700 | 22.83 | (0.0365) | (0.0811) | (0.0268) | 0.0312 | (0.0746) | 0.0135 |
| **Simu 4-2 changing *beta*** * | | | | | | | | | | | | |
| 0.7787 | 0.2285 | 0.0052 | 1.0417 | 0.2194 | 0.1600 | 25.53 | 0.5287 | 2.1147 | (0.0424) | 0.0336 | (0.0472) | 0.0115 |
| 0.5153 | 0.1852 | 0.0048 | 0.9615 | 0.1926 | 0.1400 | 13.96 | 0.2653 | 1.0611 | (0.0221) | 0.0243 | (0.0905) | 0.0115 |
| 0.3816 | 0.1480 | 0.0045 | 0.8929 | 0.1658 | 0.1200 | 12.83 | 0.1316 | 0.5262 | (0.0202) | 0.0232 | (0.0990) | 0.0115 |
| 0.2997 | 0.1158 | 0.0042 | 0.8333 | 0.1390 | 0.1000 | 13.55 | 0.0497 | 0.1990 | (0.0214) | 0.0239 | (0.0934) | 0.0115 |
| 0.2440 | 0.0877 | 0.0039 | 0.7813 | 0.1122 | 0.0800 | 15.57 | (0.0060) | (0.0240) | (0.0248) | 0.0257 | (0.0806) | 0.0115 |
| 0.2035 | 0.0628 | 0.0037 | 0.7353 | 0.0854 | 0.0600 | 19.40 | (0.0465) | (0.1860) | (0.0314) | 0.0289 | (0.0637) | 0.0115 |
| 0.1738 | 0.0407 | 0.0035 | 0.6944 | 0.0586 | 0.0400 | 27.18 | (0.0762) | (0.3048) | (0.0454) | 0.0348 | (0.0441) | 0.0115 |
| 0.1575 | 0.0209 | 0.0033 | 0.6579 | 0.0318 | 0.0200 | 48.54 | (0.0925) | (0.3700) | (0.0890) | 0.0487 | (0.0225) | 0.0115 |
| 0.2071 | 0.0065 | 0.0032 | 0.6313 | 0.0104 | 0.0040 | 144.48 | (0.0429) | (0.1716) | (0.4729) | 0.1123 | (0.0042) | 0.0115 |

**Table C1** Economic stage case study of endogenous parameters and synergy structure of $\Omega^*(i)$ and $r^*(i)$ 2008

| equilibrium | i | n | α | $\Omega^*$ | $\beta^*$ | $i_{VA(\Omega)}$ | $\Omega^*_{HA(i)}$ | $i_{Width(\Omega)}$ | Curvat.(Ω* | $i_{VA(\Omega)}+i_{Wid(\Omega}$ | $r^*_{HA(i)}$ | $i_{Width(r^*)}$ | $\Omega^*_{HA(i)}/r^*_{HA}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Case 1** | 0.1 | (0.0050) | 0.275 | 4.3382 | 0.825 | 0.0208 | 3.4350 | 0.2674 | 2.6442 | 0.2882 | 0.0801 | 0.0408 | 42.91 |
| developed | 0.1 | (0.0025) | 0.275 | 3.8234 | 0.825 | 0.0104 | 3.4264 | 0.1886 | 3.7489 | 0.1990 | 0.0803 | 0.0289 | 42.69 |
| good tech. | 0.1 | 0.0000 | 0.275 | 3.4179 | 0.825 | 0.0000 | 3.4179 | 0.0000 | #DIV/0! | 0.0000 | 0.0805 | 0.0000 | 42.48 |
| | 0.1 | 0.0025 | 0.275 | 3.0901 | 0.825 | (0.0103) | 3.4093 | 0.1877 | 3.7677 | 0.1773 | 0.0807 | 0.0289 | 42.27 |
| | 0.1 | 0.0050 | 0.275 | 2.8197 | 0.825 | (0.0206) | 3.4009 | 0.2648 | 2.6708 | 0.2441 | 0.0809 | 0.0408 | 42.06 |
| | 0.1 | 0.0075 | 0.275 | 2.5928 | 0.825 | (0.0308) | 3.3924 | 0.3235 | 2.1861 | 0.2926 | 0.0811 | 0.0500 | 41.85 |
| | 0.1 | 0.0100 | 0.275 | 2.3997 | 0.825 | (0.0410) | 3.3840 | 0.3726 | 1.8979 | 0.3315 | 0.0813 | 0.0577 | 41.64 |
| | 0.1 | 0.0125 | 0.275 | 2.2334 | 0.825 | (0.0511) | 3.3757 | 0.4155 | 1.7018 | 0.3644 | 0.0815 | 0.0645 | 41.44 |
| | 0.1 | 0.0150 | 0.275 | 2.0886 | 0.825 | (0.0612) | 3.3673 | 0.4541 | 1.5573 | 0.3928 | 0.0817 | 0.0707 | 41.23 |
| **Case 2** | 0.3 | (0.0050) | 0.375 | 2.2692 | 0.775 | 0.0140 | 2.1636 | 0.1738 | 4.0689 | 0.1877 | 0.1733 | 0.0492 | 12.48 |
| **developing** | 0.3 | (0.0025) | 0.375 | 2.2094 | 0.775 | 0.0070 | 2.1582 | 0.1226 | 5.7687 | 0.1295 | 0.1738 | 0.0348 | 12.42 |
| good tech. | 0.3 | 0.0000 | 0.375 | 2.1528 | 0.775 | 0.0000 | 2.1528 | 0.0000 | #DIV/0! | 0.0000 | 0.1742 | 0.0000 | 12.36 |
| | 0.3 | 0.0025 | 0.375 | 2.0989 | 0.775 | (0.0069) | 2.1474 | 0.1220 | 5.7976 | 0.1150 | 0.1746 | 0.0348 | 12.30 |
| | 0.3 | 0.0050 | 0.375 | 2.0477 | 0.775 | (0.0138) | 2.1421 | 0.1721 | 4.1098 | 0.1582 | 0.1751 | 0.0492 | 12.24 |
| | 0.3 | 0.0075 | 0.375 | 1.9990 | 0.775 | (0.0207) | 2.1368 | 0.2102 | 3.3640 | 0.1895 | 0.1755 | 0.0602 | 12.18 |
| | 0.3 | 0.0100 | 0.375 | 1.9525 | 0.775 | (0.0275) | 2.1315 | 0.2421 | 2.9205 | 0.2146 | 0.1759 | 0.0696 | 12.12 |
| | 0.3 | 0.0125 | 0.375 | 1.9081 | 0.775 | (0.0343) | 2.1262 | 0.2700 | 2.6186 | 0.2357 | 0.1764 | 0.0778 | 12.06 |
| | 0.3 | 0.0150 | 0.375 | 1.8657 | 0.775 | (0.0411) | 2.1210 | 0.2951 | 2.3964 | 0.2540 | 0.1768 | 0.0852 | 12.00 |
| **Case 3** | 0.05 | (0.0050) | 0.15 | 11.2451 | 0.85 | 0.0285 | 4.8409 | 0.3713 | 1.9045 | 0.3998 | 0.0310 | 0.0297 | 156.23 |
| **developing** | 0.05 | (0.0025) | 0.15 | 6.7445 | 0.85 | 0.0142 | 4.8287 | 0.2619 | 2.7002 | 0.2761 | 0.0311 | 0.0210 | 155.44 |
| unstable | 0.05 | 0.0000 | 0.15 | 4.8167 | 0.85 | 0.0000 | 4.8167 | 0.0000 | #DIV/0! | 0.0000 | 0.0311 | 0.0000 | 154.67 |
| | 0.05 | 0.0025 | 0.15 | 3.7459 | 0.85 | (0.0141) | 4.8047 | 0.2606 | 2.7137 | 0.2464 | 0.0312 | 0.0210 | 153.90 |
| | 0.05 | 0.0050 | 0.15 | 3.0647 | 0.85 | (0.0282) | 4.7927 | 0.3676 | 1.9237 | 0.3394 | 0.0313 | 0.0297 | 153.13 |
| | 0.05 | 0.0075 | 0.15 | 2.5931 | 0.85 | (0.0422) | 4.7808 | 0.4491 | 1.5746 | 0.4069 | 0.0314 | 0.0364 | 152.37 |
| | 0.05 | 0.0100 | 0.15 | 2.2473 | 0.85 | (0.0561) | 4.7690 | 0.5173 | 1.3670 | 0.4612 | 0.0315 | 0.0420 | 151.62 |
| | 0.05 | 0.0125 | 0.15 | 1.9828 | 0.85 | (0.0700) | 4.7572 | 0.5769 | 1.2257 | 0.5069 | 0.0315 | 0.0470 | 150.87 |
| | 0.05 | 0.0150 | 0.15 | 1.7741 | 0.85 | (0.0837) | 4.7455 | 0.6304 | 1.1217 | 0.5467 | 0.0316 | 0.0514 | 150.13 |
| **Case 4** | 0.05 | (0.0050) | 0.2 | (137.67) | 0.925 | 0.0536 | 9.9162 | 0.7291 | 0.9699 | 0.7827 | 0.0202 | 0.0329 | 491.66 |
| Huge deficit | 0.05 | (0.0025) | 0.2 | 21.26 | 0.925 | 0.0267 | 9.8914 | 0.5142 | 1.3751 | 0.5410 | 0.0202 | 0.0232 | 489.20 |
| | 0.05 | 0.0000 | 0.2 | 9.8667 | 0.925 | 0.0000 | 9.8667 | 0.0000 | #DIV/0! | 0.0000 | 0.0203 | 0.0000 | 486.76 |
| | 0.05 | 0.0025 | 0.2 | 6.4243 | 0.925 | (0.0266) | 9.8421 | 0.5117 | 1.3820 | 0.4851 | 0.0203 | 0.0232 | 484.33 |
| | 0.05 | 0.0050 | 0.2 | 4.7627 | 0.925 | (0.0531) | 9.8176 | 0.7218 | 0.9796 | 0.6687 | 0.0204 | 0.0329 | 481.92 |
| | 0.05 | 0.0075 | 0.2 | 3.7840 | 0.925 | (0.0794) | 9.7932 | 0.8818 | 0.8019 | 0.8024 | 0.0204 | 0.0403 | 479.54 |
| | 0.05 | 0.0100 | 0.2 | 3.1389 | 0.925 | (0.1056) | 9.7690 | 1.0157 | 0.6962 | 0.9101 | 0.0205 | 0.0465 | 477.16 |
| | 0.05 | 0.0125 | 0.2 | 2.6818 | 0.925 | (0.1317) | 9.7449 | 1.1328 | 0.6242 | 1.0011 | 0.0205 | 0.0520 | 474.81 |
| | 0.05 | 0.0150 | 0.2 | 2.3408 | 0.925 | (0.1576) | 9.7209 | 1.2379 | 0.5712 | 1.0802 | 0.0206 | 0.0569 | 472.47 |
| **Case 5** | 0.2 | (0.0050) | 0.3 | 2.6287 | 0.775 | 0.0156 | 2.4232 | 0.1946 | 3.6329 | 0.2103 | 0.1238 | 0.0440 | 19.57 |
| balanced | 0.2 | (0.0025) | 0.3 | 2.5152 | 0.775 | 0.0078 | 2.4172 | 0.1373 | 5.1506 | 0.1451 | 0.1241 | 0.0311 | 19.48 |
| growth and | 0.2 | 0.0000 | 0.3 | 2.4111 | 0.775 | 0.0000 | 2.4111 | 0.0000 | #DIV/0! | 0.0000 | 0.1244 | 0.0000 | 19.38 |
| inequality | 0.2 | 0.0025 | 0.3 | 2.3153 | 0.775 | (0.0078) | 2.4051 | 0.1366 | 5.1765 | 0.1288 | 0.1247 | 0.0311 | 19.28 |
| | 0.2 | 0.0050 | 0.3 | 2.2268 | 0.775 | (0.0155) | 2.3991 | 0.1927 | 3.6694 | 0.1772 | 0.1250 | 0.0440 | 19.19 |
| | 0.2 | 0.0075 | 0.3 | 2.1448 | 0.775 | (0.0232) | 2.3932 | 0.2354 | 3.0035 | 0.2123 | 0.1254 | 0.0539 | 19.09 |
| | 0.2 | 0.0100 | 0.3 | 2.0686 | 0.775 | (0.0308) | 2.3872 | 0.2712 | 2.6076 | 0.2404 | 0.1257 | 0.0622 | 19.00 |
| | 0.2 | 0.0125 | 0.3 | 1.9977 | 0.775 | (0.0384) | 2.3813 | 0.3024 | 2.3381 | 0.2640 | 0.1260 | 0.0696 | 18.90 |
| | 0.2 | 0.0150 | 0.3 | 1.9315 | 0.775 | (0.0460) | 2.3755 | 0.3305 | 2.1396 | 0.2845 | 0.1263 | 0.0762 | 18.81 |
| **equilibrium** | i | n | α | $\Omega^*$ | $\beta^*$ | $i_{VA(\Omega)}$ | $\Omega^*_{HA(i)}$ | $i_{Width(\Omega)}$ | Curvat.(Ω* | $i_{VA(\Omega)}+i_{Wid(\Omega}$ | $r^*_{HA(i)}$ | $i_{Width(r^*)}$ | $\Omega^*_{HA(i)}/r^*_{HA}$ |

**Note:** Shadowed cells each show abnormal results due to close-to-disequilibrium or disequilibrium, far from a moderate range of endogenous equilibrium.

**Table C2** Economic stage case study to $\delta_0$, the speed of convergence, DRC, and variables 2008 (2)

| **equilibriun** | $delta_0$ | r* | $r_{REAL}=r^*-r^*_F$ | $\alpha/i\cdot\beta^*$ | $g_Y^*$ | $g_A^*$ | $1/\lambda^*$ | $\delta_0-\alpha$ | $(\delta_0-\alpha)/\alpha$ | $i_{VA(speed)}$ | $i_{Width(speed)}$ | $n_{VA(speed)}$ | $n_{Width(speed)}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | |
| **Case 1** | 0.0536 | 0.0634 | (0.0167) | 3.3333 | 0.0190 | 0.0175 | 77.30 | (0.2214) | (0.8050) | 0.0219 | 0.0246 | (0.0228) | 0.0117 |
| developed | 0.1351 | 0.0719 | (0.0083) | 3.3333 | 0.0216 | 0.0175 | 75.05 | (0.1399) | (0.5088) | 0.0120 | 0.0257 | (0.0209) | 0.0117 |
| good tech. | 0.2074 | 0.0805 | 0.0000 | 3.3333 | 0.0241 | 0.0175 | 72.09 | (0.0676) | (0.2458) | 0.0000 | 0.0269 | (0.0191) | 0.0117 |
| | 0.2724 | 0.0890 | 0.0083 | 3.3333 | 0.0267 | 0.0175 | 68.75 | (0.0026) | (0.0094) | (0.0142) | 0.0280 | (0.0176) | 0.0117 |
| | 0.3315 | 0.0975 | 0.0167 | 3.3333 | 0.0293 | 0.0175 | 65.26 | 0.0565 | 0.2053 | (0.0310) | 0.0292 | (0.0161) | 0.0117 |
| | 0.3856 | 0.1061 | 0.0250 | 3.3333 | 0.0318 | 0.0175 | 61.77 | 0.1106 | 0.4021 | (0.0506) | 0.0305 | (0.0148) | 0.0117 |
| | 0.4355 | 0.1146 | 0.0333 | 3.3333 | 0.0344 | 0.0175 | 58.38 | 0.1605 | 0.5836 | (0.0734) | 0.0318 | (0.0136) | 0.0117 |
| | 0.4818 | 0.1231 | 0.0417 | 3.3333 | 0.0369 | 0.0175 | 55.15 | 0.2068 | 0.7520 | (0.0999) | 0.0332 | (0.0125) | 0.0117 |
| | 0.5250 | 0.1317 | 0.0500 | 3.3333 | 0.0395 | 0.0175 | 52.12 | 0.2500 | 0.9092 | (0.1308) | 0.0347 | (0.0115) | 0.0117 |
| | | | | | | | | | | | | | |
| **Case 2** | 0.3374 | 0.1653 | (0.0081) | 1.6129 | 0.1025 | 0.0675 | 24.04 | (0.0376) | (0.1001) | 0.0210 | 0.0259 | (0.0716) | 0.0126 |
| **developing** | 0.3590 | 0.1697 | (0.0040) | 1.6129 | 0.1052 | 0.0675 | 23.98 | (0.0160) | (0.0426) | 0.0108 | 0.0263 | (0.0692) | 0.0126 |
| good tech. | 0.3800 | 0.1742 | 0.0000 | 1.6129 | 0.1080 | 0.0675 | 23.90 | 0.0050 | 0.0134 | 0.0000 | 0.0268 | (0.0670) | 0.0126 |
| | 0.4005 | 0.1787 | 0.0040 | 1.6129 | 0.1108 | 0.0675 | 23.79 | 0.0255 | 0.0680 | (0.0116) | 0.0272 | (0.0647) | 0.0126 |
| | 0.4205 | 0.1831 | 0.0081 | 1.6129 | 0.1135 | 0.0675 | 23.67 | 0.0455 | 0.1213 | (0.0240) | 0.0277 | (0.0626) | 0.0126 |
| | 0.4400 | 0.1876 | 0.0121 | 1.6129 | 0.1163 | 0.0675 | 23.54 | 0.0650 | 0.1732 | (0.0372) | 0.0282 | (0.0605) | 0.0126 |
| | 0.4590 | 0.1921 | 0.0161 | 1.6129 | 0.1191 | 0.0675 | 23.38 | 0.0840 | 0.2240 | (0.0513) | 0.0287 | (0.0584) | 0.0126 |
| | 0.4776 | 0.1965 | 0.0202 | 1.6129 | 0.1219 | 0.0675 | 23.22 | 0.1026 | 0.2736 | (0.0665) | 0.0292 | (0.0564) | 0.0126 |
| | 0.4958 | 0.2010 | 0.0242 | 1.6129 | 0.1246 | 0.0675 | 23.04 | 0.1208 | 0.3220 | (0.0826) | 0.0297 | (0.0545) | 0.0126 |
| | | | | | | | | | | | | | |
| **Case 3** | (0.3951) | 0.0133 | (0.0176) | 3.5294 | 0.0038 | 0.0075 | 160.95 | (0.5451) | (3.6340) | 0.0203 | 0.0219 | (0.0123) | 0.0108 |
| **developing** | (0.1004) | 0.0222 | (0.0088) | 3.5294 | 0.0063 | 0.0075 | 163.19 | (0.2504) | (1.6692) | 0.0129 | 0.0246 | (0.0097) | 0.0108 |
| unstable | 0.0937 | 0.0311 | 0.0000 | 3.5294 | 0.0088 | 0.0075 | 147.12 | (0.0563) | (0.3754) | 0.0000 | 0.0271 | (0.0080) | 0.0108 |
| | 0.2386 | 0.0400 | 0.0088 | 3.5294 | 0.0113 | 0.0075 | 127.63 | 0.0886 | 0.5909 | (0.0186) | 0.0296 | (0.0067) | 0.0108 |
| | 0.3543 | 0.0489 | 0.0176 | 3.5294 | 0.0139 | 0.0075 | 109.98 | 0.2043 | 1.3623 | (0.0439) | 0.0321 | (0.0057) | 0.0108 |
| | 0.4507 | 0.0578 | 0.0265 | 3.5294 | 0.0164 | 0.0075 | 95.28 | 0.3007 | 2.0045 | (0.0774) | 0.0348 | (0.0048) | 0.0108 |
| | 0.5332 | 0.0667 | 0.0353 | 3.5294 | 0.0189 | 0.0075 | 83.33 | 0.3832 | 2.5546 | (0.1214) | 0.0378 | (0.0041) | 0.0108 |
| | 0.6054 | 0.0756 | 0.0441 | 3.5294 | 0.0214 | 0.0075 | 73.61 | 0.4554 | 3.0358 | (0.1795) | 0.0411 | (0.0035) | 0.0108 |
| | 0.6695 | 0.0846 | 0.0529 | 3.5294 | 0.0240 | 0.0075 | 65.67 | 0.5195 | 3.4633 | (0.2572) | 0.0449 | (0.0029) | 0.0108 |
| | | | | | | | | | | | | | |
| **Case 4** | #NUM! | (0.0015) | (0.0216) | 4.3243 | (0.0003) | 0.0038 | #NUM! | #NUM! | #NUM! | #NUM! | #NUM! | #NUM! | 0.0112 |
| Huge defici | (0.2167) | 0.0094 | (0.0108) | 4.3243 | 0.0022 | 0.0038 | 390.24 | (0.4167) | (2.0834) | 0.0219 | 0.0331 | (0.0057) | 0.0112 |
| | 0.0888 | 0.0203 | 0.0000 | 4.3243 | 0.0047 | 0.0038 | 292.66 | (0.1112) | (0.5559) | 0.0000 | 0.0383 | (0.0043) | 0.0112 |
| | 0.2596 | 0.0311 | 0.0108 | 4.3243 | 0.0072 | 0.00375 | 209.36 | 0.0596 | 0.2980 | (0.0360) | 0.0424 | (0.0035) | 0.0112 |
| | 0.3787 | 0.0420 | 0.0216 | 4.3243 | 0.0097 | 0.00375 | 157.98 | 0.1787 | 0.8937 | (0.0858) | 0.0463 | (0.0029) | 0.0112 |
| | 0.4703 | 0.0529 | 0.0324 | 4.3243 | 0.0122 | 0.00375 | 125.21 | 0.2703 | 1.3515 | (0.1510) | 0.0502 | (0.0025) | 0.0112 |
| | 0.5447 | 0.0637 | 0.0432 | 4.3243 | 0.0147 | 0.00375 | 103.01 | 0.3447 | 1.7234 | (0.2343) | 0.0541 | (0.0021) | 0.0112 |
| | 0.6073 | 0.0746 | 0.0541 | 4.3243 | 0.0172 | 0.00375 | 87.17 | 0.4073 | 2.0367 | (0.3396) | 0.0583 | (0.0018) | 0.0112 |
| | 0.6615 | 0.0854 | 0.0649 | 4.3243 | 0.0198 | 0.00375 | 75.36 | 0.4615 | 2.3073 | (0.4726) | 0.0628 | (0.0016) | 0.0112 |
| | | | | | | | | | | | | | |
| **Case 5** | 0.2185 | 0.1141 | (0.0097) | 1.9355 | 0.0590 | 0.0450 | 31.58 | (0.0815) | (0.2716) | 0.0199 | 0.0238 | (0.0502) | 0.0120 |
| balanced | 0.2542 | 0.1193 | (0.0048) | 1.9355 | 0.0616 | 0.0450 | 31.44 | (0.0458) | (0.1526) | 0.0104 | 0.0244 | (0.0479) | 0.0120 |
| growth and | 0.2884 | 0.1244 | 0.0000 | 1.9355 | 0.0643 | 0.0450 | 31.23 | (0.0116) | (0.0387) | 0.0000 | 0.0250 | (0.0457) | 0.0120 |
| inequality | 0.3212 | 0.1296 | 0.0048 | 1.9355 | 0.0669 | 0.045 | 30.96 | 0.0212 | 0.0706 | (0.0115) | 0.0256 | (0.0436) | 0.0120 |
| | 0.3527 | 0.1347 | 0.0097 | 1.9355 | 0.0696 | 0.045 | 30.65 | 0.0527 | 0.1757 | (0.0240) | 0.0262 | (0.0416) | 0.0120 |
| | 0.3830 | 0.1399 | 0.0145 | 1.9355 | 0.0723 | 0.045 | 30.29 | 0.0830 | 0.2768 | (0.0378) | 0.0268 | (0.0397) | 0.0120 |
| | 0.4123 | 0.1450 | 0.0194 | 1.9355 | 0.0749 | 0.045 | 29.90 | 0.1123 | 0.3742 | (0.0529) | 0.0275 | (0.0378) | 0.0120 |
| | 0.4405 | 0.1502 | 0.0242 | 1.9355 | 0.0776 | 0.045 | 29.47 | 0.1405 | 0.4683 | (0.0695) | 0.0282 | (0.0360) | 0.0120 |
| | 0.4677 | 0.1553 | 0.0290 | 1.9355 | 0.0803 | 0.045 | 29.03 | 0.1677 | 0.5591 | (0.0877) | 0.0289 | (0.0342) | 0.0120 |
| | | | | | | | | | | | | | |
| **equilibriun** | $delta_0$ | r* | $r_{REAL}=r^*-r^*_F$ | $\alpha/i\cdot\beta^*$ | $g_Y^*$ | $g_A^*$ | $1/\lambda^*$ | $\delta_0-\alpha$ | $(\delta_0-\alpha)/\alpha$ | $i_{VA(speed)}$ | $i_{Width(speed)}$ | $n_{VA(speed)}$ | $n_{Width(speed)}$ |

## Chapter 7

**Table A1** Endogenous parameters and synergy structure of $\Omega^*(i)$ and $r^*(i)$ by country and area 2008

| **equilibrium** | i | n | α | $\Omega^*$ | $\beta^*$ | $i_{VA(\Omega)}$ | $\Omega^*_{HA(i)}$ | $i_{Width(\Omega)}$ | Curvat.($\Omega^*$ | $i_{VA(\Omega)}+i_{Wid(\Omega}$ | $r^*_{HA(i)}$ | $i_{Width(r^*)}$ | $\Omega^*_{HA(i)}/r^*_{HA}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 17 pacific on | 0.1998 | 0.01098 | 0.2595 | 2.2267 | 0.7742 | (0.0356) | 2.5110 | 0.2990 | 2.3649 | 0.2634 | 0.1034 | 0.0607 | 24.29 |
| the U S | 0.0826 | 0.00972 | 0.1415 | 1.9034 | 0.7604 | (0.0345) | 2.6979 | 0.3050 | 2.3182 | 0.2705 | 0.0524 | 0.0425 | 51.45 |
| Canada | 0.1168 | 0.00941 | 0.0956 | 1.9623 | 0.7361 | (0.0319) | 2.4991 | 0.2825 | 2.5027 | 0.2506 | 0.0382 | 0.0349 | 65.37 |
| Australia | 0.1553 | 0.01055 | 0.0924 | 1.9246 | 0.7234 | (0.0343) | 2.3493 | 0.2837 | 2.4922 | 0.2495 | 0.0393 | 0.0367 | 59.74 |
| New Zealand | 0.0795 | 0.00955 | 0.1018 | 2.0910 | 0.7765 | (0.0380) | 3.0908 | 0.3427 | 2.0633 | 0.3047 | 0.0329 | 0.0354 | 93.83 |
| Mexico | 0.2335 | 0.00995 | 0.1973 | 1.4306 | 0.6646 | (0.0236) | 1.5752 | 0.1928 | 3.6681 | 0.1692 | 0.1252 | 0.0544 | 12.58 |
| China | 0.3657 | 0.00509 | 0.4602 | 2.3978 | 0.8231 | (0.0155) | 2.4992 | 0.1966 | 3.5967 | 0.1811 | 0.1841 | 0.0534 | 13.57 |
| India | 0.3762 | 0.01437 | 0.4843 | 1.9679 | 0.8101 | (0.0385) | 2.1692 | 0.2889 | 2.4473 | 0.2504 | 0.2233 | 0.0927 | 9.72 |
| Indonesia | 0.2646 | 0.01193 | 0.2827 | 1.2181 | 0.6523 | (0.0243) | 1.3301 | 0.1799 | 3.9315 | 0.1555 | 0.2125 | 0.0719 | 6.26 |
| Japan | 0.0149 | (0.00086) | 0.1220 | 3.7570 | 0.7692 | 0.0033 | 2.9285 | 0.0981 | 7.2068 | 0.1014 | 0.0417 | 0.0117 | 70.28 |
| Korea | 0.2232 | 0.00396 | 0.2304 | 2.3473 | 0.7641 | (0.0129) | 2.4827 | 0.1788 | 3.9554 | 0.1659 | 0.0928 | 0.0346 | 26.76 |
| Malaysia | 0.1912 | 0.01656 | 0.3788 | 2.4713 | 0.8442 | (0.0649) | 3.3108 | 0.4637 | 1.5249 | 0.3988 | 0.1144 | 0.0862 | 28.94 |
| Philippines | 0.0831 | 0.01837 | 0.1708 | 1.4579 | 0.7571 | (0.0616) | 2.5377 | 0.3953 | 1.7887 | 0.3337 | 0.0673 | 0.0644 | 37.71 |
| Singapore | 0.2838 | 0.02895 | 0.4112 | 3.1437 | 0.8954 | (0.1584) | 4.8979 | 0.8808 | 0.8028 | 0.7224 | 0.0839 | 0.1153 | 58.34 |
| Thailand | 0.3274 | 0.00612 | 0.4645 | 3.1010 | 0.8620 | (0.0236) | 3.3245 | 0.2802 | 2.5240 | 0.2565 | 0.1397 | 0.0574 | 23.79 |
| Vietnam | 0.4370 | 0.01357 | 0.2398 | 2.3391 | 0.7748 | (0.0452) | 2.5811 | 0.3416 | 2.0701 | 0.2964 | 0.0929 | 0.0648 | 27.78 |
| Sri Lanka | 0.2104 | 0.00914 | 0.0996 | 1.2448 | 0.6051 | (0.0206) | 1.3670 | 0.1680 | 4.2095 | 0.1473 | 0.0728 | 0.0388 | 18.77 |
| Brazil | 0.2062 | 0.00973 | 0.1605 | 1.5549 | 0.6771 | (0.0251) | 1.7438 | 0.2090 | 3.3826 | 0.1840 | 0.0920 | 0.0480 | 18.95 |

| equilibrium | i | n | α | $\Omega^*$ | $\beta^*$ | $i_{VA(\Omega)}$ | $\Omega^*_{HA(i)}$ | $i_{Width(\Omega)}$ | Curvat.($\Omega^*$ | $i_{VA(\Omega)}+i_{Wid(\Omega}$ | $r^*_{HA(i)}$ | $i_{Width(r^*)}$ | $\Omega^*_{HA(i)}/r^*_{HA}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13EMU on a | 0.1464 | 0.00416 | 0.1276 | 1.6295 | 0.6683 | (0.0109) | 1.7508 | 0.1381 | 5.1191 | 0.1272 | 0.0729 | 0.0282 | 24.03 |
| Austria | 0.1284 | 0.00361 | 0.1439 | 2.0015 | 0.7180 | (0.0109) | 2.1717 | 0.1540 | 4.5918 | 0.1431 | 0.0662 | 0.0269 | 32.78 |
| Belgium | 0.1024 | 0.00570 | 0.0929 | 1.1066 | 0.5786 | (0.0122) | 1.2383 | 0.1229 | 5.7539 | 0.1107 | 0.0750 | 0.0302 | 16.51 |
| Finland | 0.1082 | 0.00379 | 0.1092 | 1.2347 | 0.5999 | (0.0084) | 1.3306 | 0.1057 | 6.6877 | 0.0973 | 0.0821 | 0.0263 | 16.22 |
| France | 0.1107 | 0.00535 | 0.0964 | 1.4526 | 0.6446 | (0.0135) | 1.6301 | 0.1485 | 4.7625 | 0.1350 | 0.0591 | 0.0283 | 27.58 |
| Germany | 0.0423 | (0.00097) | 0.1006 | 1.4886 | 0.6103 | 0.0022 | 1.4097 | 0.0562 | 12.5714 | 0.0585 | 0.0714 | 0.0127 | 19.76 |
| Greece | 0.1307 | 0.00270 | 0.2271 | 1.3739 | 0.6508 | (0.0060) | 1.4366 | 0.0925 | 7.6415 | 0.0866 | 0.1581 | 0.0307 | 9.09 |
| Ireland | 0.2722 | 0.01835 | 0.2584 | 2.8219 | 0.8339 | (0.0804) | 3.6557 | 0.5423 | 1.3040 | 0.4618 | 0.0707 | 0.0754 | 51.73 |
| Italy | 0.0838 | 0.00489 | 0.1173 | 1.3805 | 0.6425 | (0.0120) | 1.5784 | 0.1377 | 5.1352 | 0.1257 | 0.0743 | 0.0299 | 21.24 |
| Luxemburg | 0.0768 | 0.01028 | 0.2986 | 1.0046 | 0.6463 | (0.0202) | 1.2686 | 0.1600 | 4.4188 | 0.1398 | 0.2354 | 0.0689 | 5.39 |
| Netherlands | 0.0966 | 0.00425 | 0.1712 | 1.2219 | 0.6186 | (0.0092) | 1.3383 | 0.1110 | 6.3722 | 0.1018 | 0.1279 | 0.0343 | 10.46 |
| Portugal | 0.1117 | 0.00376 | 0.2014 | 1.7977 | 0.7118 | (0.0104) | 1.9648 | 0.1428 | 4.9521 | 0.1324 | 0.1025 | 0.0326 | 19.16 |
| Slovenia | 0.3028 | (0.05600) | 0.3091 | 0.9633 | 0.4913 | 0.0806 | 0.7070 | 0.2387 | 2.9627 | 0.3192 | 0.4372 | 0.1877 | 1.62 |
| Spain | 0.1434 | 0.00999 | 0.1078 | 1.5513 | 0.6764 | (0.0273) | 1.8463 | 0.2244 | 3.1516 | 0.1971 | 0.0584 | 0.0399 | 31.63 |

| equilibrium | i | n | α | $\Omega^*$ | $\beta^*$ | $i_{VA(\Omega)}$ | $\Omega^*_{HA(i)}$ | $i_{Width(\Omega)}$ | Curvat.($\Omega^*$ | $i_{VA(\Omega)}+i_{Wid(\Omega}$ | $r^*_{HA(i)}$ | $i_{Width(r^*)}$ | $\Omega^*_{HA(i)}/r^*_{HA}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 16 Europe o | 0.1752 | 0.00176 | 0.0956 | 0.7464 | 0.4567 | (0.0029) | 0.7588 | 0.0471 | 15.0212 | 0.0442 | 0.1260 | 0.0192 | 6.02 |
| Bulgaria | 0.3459 | (0.00654) | 0.1007 | 1.3657 | 0.5911 | 0.0145 | 1.3085 | 0.1377 | 5.1357 | 0.1522 | 0.0770 | 0.0334 | 17.00 |
| Czech Rep. | 0.2479 | 0.00487 | 0.2361 | 2.4235 | 0.7726 | (0.0163) | 2.5827 | 0.2050 | 3.4490 | 0.1887 | 0.0914 | 0.0386 | 28.25 |
| Denmark | 0.1638 | 0.00183 | 0.2037 | 1.2053 | 0.6080 | (0.0037) | 1.2327 | 0.0677 | 10.4418 | 0.0640 | 0.1652 | 0.0248 | 7.46 |
| Hungary | 0.0742 | (0.00340) | 0.0970 | 0.9789 | 0.4977 | 0.0061 | 0.8979 | 0.0742 | 9.5279 | 0.0803 | 0.1080 | 0.0257 | 8.31 |
| Iceland | 0.4585 | 0.05263 | 0.1430 | 1.7393 | 0.7448 | (0.1679) | 2.3763 | 0.6317 | 1.1194 | 0.4638 | 0.0602 | 0.1005 | 39.50 |
| Latvia | 0.2952 | (0.00441) | 0.0963 | 1.5695 | 0.6250 | 0.0107 | 1.5128 | 0.1270 | 5.5675 | 0.1377 | 0.0637 | 0.0261 | 23.77 |
| Norway | 0.1385 | 0.01059 | 0.3278 | 1.0477 | 0.6428 | (0.0197) | 1.1969 | 0.1537 | 4.6018 | 0.1339 | 0.2739 | 0.0735 | 4.37 |
| Poland | 0.1270 | (0.00079) | 0.0966 | 0.9044 | 0.4973 | 0.0014 | 0.8943 | 0.0356 | 19.8779 | 0.0370 | 0.1080 | 0.0124 | 8.28 |
| Romania | 0.2489 | (0.00420) | 0.0280 | 0.8972 | 0.4710 | 0.0077 | 0.8693 | 0.0820 | 8.6191 | 0.0898 | 0.0322 | 0.0158 | 27.00 |
| Russia | 0.1711 | (0.00387) | 0.0927 | 0.6447 | 0.4059 | 0.0059 | 0.6223 | 0.0608 | 11.6298 | 0.0667 | 0.1490 | 0.0297 | 4.18 |
| Slovak | 0.1814 | 0.00070 | 0.1175 | 1.4623 | 0.6259 | (0.0017) | 1.4757 | 0.0495 | 14.2858 | 0.0478 | 0.0796 | 0.0115 | 18.53 |
| Sweden | 0.0672 | 0.00546 | 0.1491 | 1.1675 | 0.6196 | (0.0121) | 1.3784 | 0.1294 | 5.4653 | 0.1172 | 0.1081 | 0.0362 | 12.75 |
| Switzerland | 0.1163 | 0.00399 | 0.2700 | 2.0696 | 0.7585 | (0.0120) | 2.2837 | 0.1657 | 4.2667 | 0.1537 | 0.1182 | 0.0377 | 19.31 |
| Turkey | 0.1245 | 0.01247 | 0.1073 | 0.5911 | 0.4368 | (0.0195) | 0.6838 | 0.1155 | 6.1210 | 0.0960 | 0.1569 | 0.0553 | 4.36 |
| the U K | 0.0295 | 0.00542 | 0.1734 | 1.3869 | 0.7228 | (0.0161) | 2.1431 | 0.1856 | 3.8105 | 0.1695 | 0.0809 | 0.0361 | 26.48 |

**Data source:** KEWT 4.10 of 59 countries by sector, 1990-2008, whose ten original data for the real assets come from *International Financial Statistics Yearbook*, IMF.

**Table A2** $\delta_0$, the speed of convergence, DRC,
and variables by country and area 2008 (2)

| equilibrium | $delta_0$ | r* | $r_{REAL}=r^*-r^*_F$ | $\alpha/i\beta^*$ | $g_Y^*$ | $g_A^*$ | $1/\lambda^*$ | $\delta_0-\alpha$ | $(\delta_0-\alpha)/\alpha$ | $i_{VA(speed)}$ | $i_{Width(speed)}$ | $n_{VA(speed)}$ | $n_{Width(speed)}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 17 pacific c | 0.3503 | 0.1166 | 0.0132 | 1.6775 | 0.0695 | 0.0451 | 26.70 | 0.0907 | 0.3496 | (0.0554) | 0.0261 | (0.0396) | 0.0116 |
| the U S | 0.4426 | 0.0743 | 0.0219 | 2.2520 | 0.0330 | 0.0198 | 51.60 | 0.3011 | 2.1282 | (0.0625) | 0.0274 | (0.0129) | 0.0108 |
| Canada | 0.3428 | 0.0487 | 0.0105 | 1.1117 | 0.0438 | 0.0308 | 34.77 | 0.2472 | 2.5875 | (0.0491) | 0.0240 | (0.0224) | 0.0105 |
| Australia | 0.3191 | 0.0480 | 0.0087 | 0.8224 | 0.0584 | 0.0429 | 25.76 | 0.2267 | 2.4540 | (0.0509) | 0.0230 | (0.0322) | 0.0105 |
| New Zeala | 0.4077 | 0.0487 | 0.0158 | 1.6500 | 0.0295 | 0.0178 | 52.37 | 0.3059 | 3.0041 | (0.0648) | 0.0275 | (0.0117) | 0.0106 |
| Mexico | 0.4765 | 0.1379 | 0.0127 | 1.2715 | 0.1085 | 0.0783 | 20.42 | 0.2792 | 1.4151 | (0.0455) | 0.0239 | (0.0511) | 0.0112 |
| China | 0.4312 | 0.1919 | 0.0078 | 1.5290 | 0.1255 | 0.0647 | 25.29 | (0.0290) | (0.0630) | (0.0273) | 0.0315 | (0.0682) | 0.0136 |
| India | 0.5334 | 0.2461 | 0.0228 | 1.5890 | 0.1549 | 0.0714 | 24.55 | 0.0491 | 0.1014 | (0.0837) | 0.0336 | (0.0646) | 0.0139 |
| Indonesia | 0.6865 | 0.2321 | 0.0195 | 1.6377 | 0.1417 | 0.0920 | 26.74 | 0.4038 | 1.4285 | (0.0785) | 0.0303 | (0.0402) | 0.0118 |
| Japan | (0.0996) | 0.0325 | (0.0092) | 10.6419 | 0.0031 | 0.0034 | 330.56 | (0.2216) | (1.8158) | 0.0030 | 0.0199 | (0.0043) | 0.0107 |
| Korea | 0.2739 | 0.0981 | 0.0054 | 1.3511 | 0.0726 | 0.0526 | 24.23 | 0.0435 | 0.1890 | (0.0178) | 0.0242 | (0.0497) | 0.0114 |
| Malaysia | 0.4646 | 0.1533 | 0.0389 | 2.3470 | 0.0653 | 0.0298 | 38.11 | 0.0857 | 0.2263 | (0.1233) | 0.0346 | (0.0257) | 0.0127 |
| Philippines | 0.6684 | 0.1171 | 0.0498 | 2.7128 | 0.0432 | 0.0202 | 45.59 | 0.4976 | 2.9139 | (0.1891) | 0.0352 | (0.0081) | 0.0110 |
| Singapore | 0.4665 | 0.1308 | 0.0468 | 1.6179 | 0.0808 | 0.0297 | 30.41 | 0.0553 | 0.1346 | (0.3055) | 0.0423 | (0.0269) | 0.0130 |
| Thailand | 0.3823 | 0.1498 | 0.0101 | 1.6458 | 0.0910 | 0.0452 | 32.06 | (0.0823) | (0.1771) | (0.0385) | 0.0342 | (0.0521) | 0.0137 |
| Vietnam | 0.3124 | 0.1025 | 0.0096 | 0.7082 | 0.1448 | 0.0984 | 12.82 | 0.0726 | 0.3027 | (0.0666) | 0.0254 | (0.0890) | 0.0115 |
| Sri Lanka | 0.4866 | 0.0800 | 0.0071 | 0.7821 | 0.1023 | 0.0831 | 19.65 | 0.3870 | 3.8869 | (0.0406) | 0.0222 | (0.0474) | 0.0105 |
| Brazil | 0.4041 | 0.1032 | 0.0112 | 1.1491 | 0.0898 | 0.0666 | 20.90 | 0.2436 | 1.5181 | (0.0425) | 0.0228 | (0.0473) | 0.0109 |
| | | | | | | | | | | | | | |
| equilibrium | $delta_0$ | r* | $r_{REAL}=r^*-r^*_F$ | $\alpha/i\beta^*$ | $g_Y^*$ | $g_A^*$ | $1/\lambda^*$ | $\delta_0-\alpha$ | $(\delta_0-\alpha)/\alpha$ | $i_{VA(speed)}$ | $i_{Width(speed)}$ | $n_{VA(speed)}$ | $n_{Width(speed)}$ |
| 13EMU on | 0.3032 | 0.0783 | 0.0054 | 1.3038 | 0.0601 | 0.0486 | 26.69 | 0.1756 | 1.3765 | (0.0157) | 0.0208 | (0.0388) | 0.0107 |
| Austria | 0.2574 | 0.0719 | 0.0056 | 1.5602 | 0.0461 | 0.0362 | 33.35 | 0.1136 | 0.7893 | (0.0148) | 0.0219 | (0.0314) | 0.0108 |
| Belgium | 0.6805 | 0.0839 | 0.0089 | 1.5673 | 0.0535 | 0.0432 | 52.75 | 0.5876 | 6.3279 | (0.0384) | 0.0273 | (0.0152) | 0.0105 |
| Finland | 0.4795 | 0.0884 | 0.0064 | 1.6826 | 0.0526 | 0.0433 | 38.61 | 0.3703 | 3.3916 | (0.0162) | 0.0219 | (0.0253) | 0.0106 |
| France | 0.3728 | 0.0663 | 0.0072 | 1.3507 | 0.0491 | 0.0393 | 33.89 | 0.2765 | 2.8692 | (0.0217) | 0.0212 | (0.0273) | 0.0105 |
| Germany | 0.1128 | 0.0676 | (0.0038) | 3.8935 | 0.0174 | 0.0165 | 72.65 | 0.0122 | 0.1212 | 0.0025 | 0.0170 | (0.0163) | 0.0105 |
| Greece | 0.4898 | 0.1653 | 0.0072 | 2.6701 | 0.0619 | 0.0456 | 39.41 | 0.2626 | 1.1562 | (0.0117) | 0.0237 | (0.0301) | 0.0114 |
| Ireland | 0.3570 | 0.0916 | 0.0209 | 1.1381 | 0.0804 | 0.0452 | 23.43 | 0.0986 | 0.3817 | (0.1274) | 0.0306 | (0.0392) | 0.0116 |
| Italy | 0.4498 | 0.0850 | 0.0107 | 2.1788 | 0.0390 | 0.0300 | 48.08 | 0.3325 | 2.8346 | (0.0219) | 0.0225 | (0.0187) | 0.0106 |
| Luxemburg | 0.9925 | 0.2972 | 0.0619 | 6.0175 | 0.0494 | 0.0272 | 134.83 | 0.6939 | 2.3238 | (2.7067) | 0.1937 | (0.0003) | 0.0119 |
| Netherlands | 0.5854 | 0.1401 | 0.0122 | 2.8649 | 0.0489 | 0.0369 | 53.18 | 0.4142 | 2.4195 | (0.0223) | 0.0251 | (0.0184) | 0.0110 |
| Portugal | 0.3512 | 0.1120 | 0.0095 | 2.5340 | 0.0442 | 0.0322 | 41.87 | 0.1498 | 0.7437 | (0.0161) | 0.0231 | (0.0262) | 0.0112 |
| Slovenia | (0.0763) | 0.3208 | (0.1164) | 2.0778 | 0.1544 | 0.1540 | 7.87 | (0.3854) | (1.2468) | 0.0707 | 0.0135 | (0.2399) | 0.0120 |
| Spain | 0.4043 | 0.0695 | 0.0111 | 1.1109 | 0.0625 | 0.0464 | 27.35 | 0.2965 | 2.7516 | (0.0462) | 0.0228 | (0.0310) | 0.0106 |
| | | | | | | | | | | | | | |
| equilibrium | $delta_0$ | r* | $r_{REAL}=r^*-r^*_F$ | $\alpha/i\beta^*$ | $g_Y^*$ | $g_A^*$ | $1/\lambda^*$ | $\delta_0-\alpha$ | $(\delta_0-\alpha)/\alpha$ | $i_{VA(speed)}$ | $i_{Width(speed)}$ | $n_{VA(speed)}$ | $n_{Width(speed)}$ |
| 16 Europe | (0.6832) | 0.1281 | 0.0021 | 1.1948 | 0.1072 | 0.0952 | 6.18 | (0.7788) | (8.1481) | (0.0017) | 0.0105 | (0.1771) | 0.0105 |
| Bulgaria | 0.1541 | 0.0737 | (0.0032) | 0.4925 | 0.1497 | 0.1414 | 8.79 | 0.0534 | 0.5304 | 0.0170 | 0.0170 | (0.1330) | 0.0105 |
| Czech Rep. | 0.2762 | 0.0974 | 0.0060 | 1.2329 | 0.0790 | 0.0564 | 22.46 | 0.0401 | 0.1697 | (0.0226) | 0.0246 | (0.0534) | 0.0114 |
| Denmark | 0.5744 | 0.1690 | 0.0038 | 2.0447 | 0.0826 | 0.0642 | 34.73 | 0.3707 | 1.8205 | (0.0088) | 0.0245 | (0.0343) | 0.0112 |
| Hungary | (1.3553) | 0.0991 | (0.0089) | 2.6274 | 0.0377 | 0.0372 | 11.81 | (1.4523) | (14.9759) | 0.0026 | 0.0092 | (0.0971) | 0.0105 |
| Iceland | 0.4833 | 0.0822 | 0.0220 | 0.4186 | 0.1963 | 0.1170 | 9.47 | 0.3403 | 2.3801 | (0.3421) | 0.0275 | (0.0706) | 0.0108 |
| Latvia | 0.1175 | 0.0614 | (0.0023) | 0.5220 | 0.1175 | 0.1107 | 10.67 | 0.0213 | 0.2208 | 0.0120 | 0.0174 | (0.1081) | 0.0105 |
| Norway | 0.9207 | 0.3129 | 0.0390 | 3.6832 | 0.0849 | 0.0495 | 90.56 | 0.5929 | 1.8088 | (0.2514) | 0.0594 | (0.0058) | 0.0122 |
| Poland | (8.2042) | 0.1068 | (0.0012) | 1.5294 | 0.0698 | 0.0639 | 1.70 | (8.3008) | (85.9353) | 0.0002 | 0.0046 | (0.6505) | 0.0105 |
| Romania | 0.0640 | 0.0312 | (0.0010) | 0.2387 | 0.1307 | 0.1316 | 8.39 | 0.0361 | 1.2885 | 0.0082 | 0.0142 | (0.1268) | 0.0101 |
| Russia | (0.1524) | 0.1438 | (0.0052) | 1.3346 | 0.1077 | 0.1017 | 8.80 | (0.2451) | (2.6440) | 0.0051 | 0.0121 | (0.1291) | 0.0105 |
| Slovak | 0.2618 | 0.0803 | 0.0007 | 1.0347 | 0.0777 | 0.0679 | 19.72 | 0.1443 | 1.2285 | (0.0023) | 0.0190 | (0.0568) | 0.0106 |
| Sweden | 0.6826 | 0.1277 | 0.0195 | 3.5801 | 0.0357 | 0.0256 | 78.38 | 0.5335 | 3.5795 | (0.0385) | 0.0288 | (0.0095) | 0.0108 |
| Switzerland | 0.3645 | 0.1305 | 0.0122 | 3.0613 | 0.0426 | 0.0281 | 48.16 | 0.0945 | 0.3498 | (0.0190) | 0.0255 | (0.0244) | 0.0117 |
| Turkey | (1.0682) | 0.1815 | 0.0246 | 1.9735 | 0.0920 | 0.0701 | 6.41 | (1.1755) | (10.9577) | (0.0096) | 0.0093 | (0.1624) | 0.0106 |
| the U K | 0.6587 | 0.1251 | 0.0441 | 8.1440 | 0.0154 | 0.0082 | 137.60 | 0.4852 | 2.7978 | (0.0473) | 0.0325 | (0.0034) | 0.0110 |

**Data source:** KEWT 4.10 of 59 countries by sector, 1990-2008, whose ten original data for the real assets come from *International Financial Statistics Yearbook*, IMF.

**Table E1** Elasticity values of parameters and variables w.r.t. $\alpha$ and $\beta^*$ in simulations (1)

| i | n | α | Ω* | b* | $i_{VA(\Omega)}$ | $\Omega^*_{HA(i)}$ | $i_{Width(\Omega)}$ | Curvat.(Ω* | $i_{VA(\Omega)}+i_{Wid(\Omega}$ | $r^*_{HA(i)}$ | $i_{Width(r^*)}$ | $\Omega^*_{HA(i)}/r^*_{HA}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Simu 1-1: changing alpha** | | | | | **To alpha:** | | **Elasticity at the discrete time=(2-1)/((1+2)/2)** | | | | | |
| 0.2 | 0.005 | **0.05** | 3.926 | 0.825 | | | | | | | | |
| 0.2 | 0.005 | **0.1** | 3.743 | 0.825 | (0.081) | (0.081) | (0.081) | 0.081 | (0.081) | 1.071 | 0.515 | (1.141) |
| 0.2 | 0.005 | **0.15** | 3.557 | 0.825 | (0.143) | (0.143) | (0.143) | 0.143 | (0.143) | 1.136 | 0.505 | (1.271) |
| 0.2 | 0.005 | **0.2** | 3.369 | 0.825 | (0.212) | (0.212) | (0.212) | 0.212 | (0.212) | 1.207 | 0.503 | (1.412) |
| 0.2 | 0.005 | **0.25** | 3.179 | 0.825 | (0.290) | (0.290) | (0.290) | 0.290 | (0.290) | 1.286 | 0.502 | (1.569) |
| 0.2 | 0.005 | **0.3** | 2.986 | 0.825 | (0.379) | (0.379) | (0.379) | 0.379 | (0.379) | 1.375 | 0.501 | (1.747) |
| 0.2 | 0.005 | **0.35** | 2.791 | 0.825 | (0.481) | (0.481) | (0.481) | 0.481 | (0.481) | 1.477 | 0.501 | (1.951) |
| 0.2 | 0.005 | **0.4** | 2.593 | 0.825 | (0.600) | (0.600) | (0.600) | 0.600 | (0.600) | 1.596 | 0.501 | (2.186) |
| 0.2 | 0.005 | **0.45** | 2.393 | 0.825 | (0.739) | (0.739) | (0.739) | 0.739 | (0.739) | 1.735 | 0.500 | (2.463) |
| **Simu 1-2 changing beta*** | | | | | **To beta*:** | | **Elasticity at the discrete time=(2-1)/((1+2)/2)** | | | | | |
| 0.2 | 0.005 | 0.25 | 1.070 | **0.6** | | | | | | | | |
| 0.2 | 0.005 | 0.25 | 1.316 | **0.65** | 1.667 | 1.596 | 0.814 | (1.000) | (1.023) | (1.202) | 0.188 | (10.515) |
| 0.2 | 0.005 | 0.25 | 1.639 | **0.7** | 2.077 | 1.477 | 0.839 | (1.000) | (1.018) | (1.171) | 0.163 | (12.112) |
| 0.2 | 0.005 | 0.25 | 2.083 | **0.75** | 2.636 | 1.375 | 0.864 | (1.000) | (1.014) | (1.141) | 0.138 | (14.273) |
| 0.2 | 0.005 | 0.25 | 2.730 | **0.8** | 3.444 | 1.286 | 0.889 | (1.000) | (1.011) | (1.113) | 0.113 | (17.355) |
| 0.2 | 0.005 | 0.25 | 3.761 | **0.85** | 4.714 | 1.207 | 0.914 | (1.000) | (1.008) | (1.085) | 0.088 | (22.097) |
| 0.2 | 0.005 | 0.25 | 5.660 | **0.9** | 7.000 | 1.136 | 0.940 | (1.000) | (1.005) | (1.058) | 0.063 | (30.249) |
| 0.2 | 0.005 | 0.25 | 10.326 | **0.95** | 12.333 | 1.071 | 0.967 | (1.000) | (1.003) | (1.031) | 0.038 | (46.869) |
| 0.2 | 0.005 | 0.25 | 25.781 | **0.99** | 32.333 | 1.017 | 0.992 | (1.000) | (1.001) | (1.008) | 0.015 | (90.099) |
| **Simu 2-1: changing alpha** | | | | | **To alpha:** | | **Elasticity at the discrete time=(2-1)/((1+2)/2)** | | | | | |
| 0.2 | **0.010** | **0.05** | 3.495 | 0.825 | | | | | | | | |
| 0.2 | **0.010** | **0.1** | 3.348 | 0.825 | (0.081) | (0.081) | (0.081) | 0.081 | (0.081) | 1.071 | 0.515 | (1.141) |
| 0.2 | **0.010** | **0.15** | 3.198 | 0.825 | (0.143) | (0.143) | (0.143) | 0.143 | (0.143) | 1.136 | 0.505 | (1.271) |
| 0.2 | **0.010** | **0.2** | 3.045 | 0.825 | (0.212) | (0.212) | (0.212) | 0.212 | (0.212) | 1.207 | 0.503 | (1.412) |
| 0.2 | **0.010** | **0.25** | 2.888 | 0.825 | (0.290) | (0.290) | (0.290) | 0.290 | (0.290) | 1.286 | 0.502 | (1.569) |
| 0.2 | **0.010** | **0.3** | 2.727 | 0.825 | (0.379) | (0.379) | (0.379) | 0.379 | (0.379) | 1.375 | 0.501 | (1.747) |
| 0.2 | **0.010** | **0.35** | 2.563 | 0.825 | (0.481) | (0.481) | (0.481) | 0.481 | (0.481) | 1.477 | 0.501 | (1.951) |
| 0.2 | **0.010** | **0.4** | 2.394 | 0.825 | (0.600) | (0.600) | (0.600) | 0.600 | (0.600) | 1.596 | 0.501 | (2.186) |
| 0.2 | **0.010** | **0.45** | 2.222 | 0.825 | (0.739) | (0.739) | (0.739) | 0.739 | (0.739) | 1.735 | 0.500 | (2.463) |
| **Simu 2-2 changing beta*** | | | | | **To beta*:** | | **Elasticity at the discrete time=(2-1)/((1+2)/2)** | | | | | |
| 0.2 | **0.010** | 0.25 | 1.019 | **0.6** | | | | | | | | |
| 0.2 | **0.010** | 0.25 | 1.247 | **0.65** | 1.667 | 2.660 | 2.164 | (2.164) | 2.236 | (2.660) | (0.500) | 5.260 |
| 0.2 | **0.010** | 0.25 | 1.542 | **0.7** | 2.077 | 3.068 | 2.573 | (2.573) | 2.642 | (3.068) | (0.500) | 6.058 |
| 0.2 | **0.010** | 0.25 | 1.940 | **0.75** | 2.636 | 3.625 | 3.132 | (3.132) | 3.197 | (3.625) | (0.500) | 7.138 |
| 0.2 | **0.010** | 0.25 | 2.505 | **0.8** | 3.444 | 4.429 | 3.938 | (3.938) | 4.001 | (4.429) | (0.500) | 8.680 |
| 0.2 | **0.010** | 0.25 | 3.373 | **0.85** | 4.714 | 5.690 | 5.203 | (5.203) | 5.263 | (5.690) | (0.500) | 11.051 |
| 0.2 | **0.010** | 0.25 | 4.874 | **0.9** | 7.000 | 7.955 | 7.479 | (7.479) | 7.536 | (7.955) | (0.500) | 15.128 |
| 0.2 | **0.010** | 0.25 | 8.097 | **0.95** | 12.333 | 13.214 | 12.776 | (12.776) | 12.827 | (13.214) | (0.500) | 23.439 |
| 0.2 | **0.010** | 0.25 | 15.599 | **0.99** | 32.333 | 32.881 | 32.609 | (32.609) | 32.640 | (32.881) | (0.500) | 45.054 |

**Note:** Elasticity values are only used for simulations. Within the endogenous system, all the parameters and variables are purely measured and with no help of elasticity value setting.

**Table E2** Elasticity values of parameters and variables w.r.t. $\alpha$ and $\beta^*$ in simulations (2)

| $delta_0$ | r* | $r_{REAL}=r^*-r^*_F$ | $\alpha/i\beta^*$ | $g_Y^*$ | $g_A^*$ | $1/\lambda^*$ | $\delta_0-\alpha$ | $(\delta_0-\alpha)/\alpha$ | $i_{VA(speed)}$ | $i_{Width(speed)}$ | $n_{VA(speed)}$ | $n_{Width(speed)}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **To alpha:** | **Simu 1-1: changing alpha** | | | | | **Elasticity at the discrete time=(2-1)/((1+2)/2)** | | | | | | |
| | | | | | | | | | | | | |
| 0.347 | 1.063 | 1.000 | 1.000 | 0.072 | 0.000 | 0.057 | (0.493) | (1.415) | (0.028) | 0.027 | 0.028 | 0.041 |
| 0.496 | 1.121 | 1.000 | 1.000 | 0.127 | 0.000 | 0.104 | (1.071) | (1.986) | (0.045) | 0.049 | 0.045 | 0.071 |
| 0.615 | 1.185 | 1.000 | 1.000 | 0.190 | 0.000 | 0.161 | (2.180) | (3.045) | (0.059) | 0.076 | 0.059 | 0.106 |
| 0.717 | 1.257 | 1.000 | 1.000 | 0.262 | 0.000 | 0.229 | (5.448) | (6.042) | (0.070) | 0.110 | 0.070 | 0.145 |
| 0.809 | 1.340 | 1.000 | 1.000 | 0.344 | 0.000 | 0.315 | 70.494 | 166.488 | (0.074) | 0.153 | 0.074 | 0.190 |
| 0.896 | 1.436 | 1.000 | 1.000 | 0.439 | 0.000 | 0.423 | 4.731 | 3.838 | (0.067) | 0.207 | 0.067 | 0.241 |
| 0.983 | 1.547 | 1.000 | 1.000 | 0.551 | 0.000 | 0.562 | 1.464 | 0.467 | (0.043) | 0.279 | 0.043 | 0.300 |
| 1.072 | 1.679 | 1.000 | 1.000 | 0.683 | 0.000 | 0.748 | (1.171) | (2.163) | 0.010 | 0.375 | (0.010) | 0.370 |
| **To beta*:** | **Simu 1-2 changing beta*** | | | | | **Elasticity at the discrete time=(2-1)/((1+2)/2)** | | | | | | |
| | | | | | | | | | | | | |
| (4.989) | (2.581) | (1.000) | (1.000) | (1.588) | (1.667) | (8.578) | (7.789) | (7.789) | (10.031) | (5.235) | 10.031 | 0.000 |
| (3.885) | (2.956) | (1.000) | (1.000) | (1.964) | (2.077) | (1.458) | (7.990) | (7.990) | (1.623) | (0.812) | 1.623 | 0.000 |
| (3.282) | (3.459) | (1.000) | (1.000) | (2.469) | (2.636) | 0.611 | (9.884) | (9.884) | 0.678 | 0.339 | (0.678) | 0.000 |
| (2.882) | (4.167) | (1.000) | (1.000) | (3.181) | (3.444) | 1.962 | (16.303) | (16.303) | 2.198 | 1.100 | (2.198) | 0.000 |
| (2.524) | (5.240) | (1.000) | (1.000) | (4.260) | (4.714) | 3.373 | (109.857) | (109.857) | 3.861 | 1.937 | (3.861) | 0.000 |
| (1.976) | (7.056) | (1.000) | (1.000) | (6.091) | (7.000) | 5.404 | 16.791 | 16.791 | 6.452 | 3.254 | (6.452) | 0.000 |
| (0.351) | (10.799) | (1.000) | (1.000) | (9.876) | (12.333) | 9.307 | 1.792 | 1.792 | 12.251 | 6.303 | (12.251) | 0.000 |
| 8.316 | (20.760) | (1.000) | (1.000) | (19.936) | (32.333) | 18.759 | ######## | ######## | 33.816 | 19.697 | (33.816) | 0.000 |
| **To alpha:** | **Simu 2-1: changing alpha** | | | | | **Elasticity at the discrete time=(2-1)/((1+2)/2)** | | | | | | |
| | | | | | | | | | | | | |
| 0.200 | 1.057 | 1.000 | 1.000 | 0.064 | 0.000 | 0.059 | (0.254) | (1.220) | (0.029) | 0.026 | 0.029 | 0.041 |
| 0.314 | 1.109 | 1.000 | 1.000 | 0.115 | 0.000 | 0.108 | (0.463) | (1.436) | (0.046) | 0.048 | 0.046 | 0.071 |
| 0.417 | 1.168 | 1.000 | 1.000 | 0.172 | 0.000 | 0.166 | (0.703) | (1.679) | (0.061) | 0.076 | 0.061 | 0.106 |
| 0.514 | 1.235 | 1.000 | 1.000 | 0.238 | 0.000 | 0.236 | (0.965) | (1.942) | (0.071) | 0.110 | 0.071 | 0.145 |
| 0.607 | 1.311 | 1.000 | 1.000 | 0.315 | 0.000 | 0.323 | (1.209) | (2.187) | (0.074) | 0.153 | 0.074 | 0.190 |
| 0.699 | 1.401 | 1.000 | 1.000 | 0.404 | 0.000 | 0.431 | (1.335) | (2.317) | (0.065) | 0.208 | 0.065 | 0.241 |
| 0.793 | 1.507 | 1.000 | 1.000 | 0.510 | 0.000 | 0.571 | (1.149) | (2.138) | (0.038) | 0.281 | 0.038 | 0.300 |
| 0.890 | 1.632 | 1.000 | 1.000 | 0.636 | 0.000 | 0.756 | (0.408) | (1.406) | 0.022 | 0.381 | (0.022) | 0.370 |
| **To beta*:** | **Simu 2-2 changing beta*** | | | | | **Elasticity at the discrete time=(2-1)/((1+2)/2)** | | | | | | |
| | | | | | | | | | | | | |
| (4.843) | (2.510) | (1.000) | (1.000) | (1.517) | (1.667) | (12.116) | (7.051) | (7.051) | (18.446) | (11.013) | 18.446 | 0.000 |
| (3.687) | (2.857) | (1.000) | (1.000) | (1.864) | (2.077) | (2.187) | (6.602) | (6.602) | (2.776) | (1.392) | 2.776 | 0.000 |
| (3.012) | (3.314) | (1.000) | (1.000) | (2.323) | (2.636) | 0.195 | (6.915) | (6.915) | 0.243 | 0.121 | (0.243) | 0.000 |
| (2.508) | (3.944) | (1.000) | (1.000) | (2.957) | (3.444) | 1.581 | (7.856) | (7.856) | 1.999 | 1.001 | (1.999) | 0.000 |
| (1.993) | (4.872) | (1.000) | (1.000) | (3.889) | (4.714) | 2.888 | (9.287) | (9.287) | 3.799 | 1.906 | (3.799) | 0.000 |
| (1.206) | (6.369) | (1.000) | (1.000) | (5.397) | (7.000) | 4.587 | (8.912) | (8.912) | 6.528 | 3.293 | (6.528) | 0.000 |
| 0.685 | (9.194) | (1.000) | (1.000) | (8.249) | (12.333) | 7.410 | 5.661 | 5.661 | 12.575 | 6.480 | (12.575) | 0.000 |
| 7.883 | (15.356) | (1.000) | (1.000) | (14.450) | (32.333) | 12.297 | 28.429 | 28.429 | 34.524 | 20.280 | (34.524) | 0.000 |

**Table E3** Elasticity values of parameters and variables w.r.t. $\alpha$ and $\beta^*$ in simulations (3)

| i | n | α | Ω* | b* | $i_{VA(\Omega)}$ | $\Omega^*_{HA(i)}$ | $i_{Width(\Omega)}$ | Curvat.(Ω* | $i_{VA(\Omega)}+i_{Wid(\Omega}$ | $r^*_{HA(i)}$ | $i_{Width(r^*)}$ | $\Omega^*_{HA(i)}/r^*_{HA}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Simu 3-1: changing alpha** | | | | | **To alpha:** | | **Elasticity at the discrete time=(2-1)/((1+2)/2)** | | | | | |
| ***0.075*** | 0.005 | **0.05** | 3.276 | 0.825 | | | | | | | | |
| ***0.075*** | 0.005 | **0.1** | 3.148 | 0.825 | (0.081) | (0.081) | (0.081) | 0.081 | (0.081) | 1.071 | 0.515 | (1.141) |
| ***0.075*** | 0.005 | **0.15** | 3.016 | 0.825 | (0.143) | (0.143) | (0.143) | 0.143 | (0.143) | 1.136 | 0.505 | (1.271) |
| ***0.075*** | 0.005 | **0.2** | 2.879 | 0.825 | (0.212) | (0.212) | (0.212) | 0.212 | (0.212) | 1.207 | 0.503 | (1.412) |
| ***0.075*** | 0.005 | **0.25** | 2.739 | 0.825 | (0.290) | (0.290) | (0.290) | 0.290 | (0.290) | 1.286 | 0.502 | (1.569) |
| ***0.075*** | 0.005 | **0.3** | 2.595 | 0.825 | (0.379) | (0.379) | (0.379) | 0.379 | (0.379) | 1.375 | 0.501 | (1.747) |
| ***0.075*** | 0.005 | **0.35** | 2.446 | 0.825 | (0.481) | (0.481) | (0.481) | 0.481 | (0.481) | 1.477 | 0.501 | (1.951) |
| ***0.075*** | 0.005 | **0.4** | 2.293 | 0.825 | (0.600) | (0.600) | (0.600) | 0.600 | (0.600) | 1.596 | 0.501 | (2.186) |
| ***0.075*** | 0.005 | **0.45** | 2.135 | 0.825 | (0.739) | (0.739) | (0.739) | 0.739 | (0.739) | 1.735 | 0.500 | (2.463) |
| **Simu 3-2 changing beta*** | | | | | **To beta*:** | | **Elasticity at the discrete time=(2-1)/((1+2)/2)** | | | | | |
| ***0.075*** | 0.005 | 0.25 | 0.996 | **0.6** | | | | | | | | |
| ***0.075*** | 0.005 | 0.25 | 1.213 | **0.65** | 1.667 | 2.660 | 2.164 | (2.164) | 2.213 | (2.660) | (0.500) | 5.260 |
| ***0.075*** | 0.005 | 0.25 | 1.494 | **0.7** | 2.077 | 3.068 | 2.573 | (2.573) | 2.620 | (3.068) | (0.500) | 6.058 |
| ***0.075*** | 0.005 | 0.25 | 1.867 | **0.75** | 2.636 | 3.625 | 3.132 | (3.132) | 3.176 | (3.625) | (0.500) | 7.138 |
| ***0.075*** | 0.005 | 0.25 | 2.390 | **0.8** | 3.444 | 4.429 | 3.938 | (3.938) | 3.981 | (4.429) | (0.500) | 8.680 |
| ***0.075*** | 0.005 | 0.25 | 3.176 | **0.85** | 4.714 | 5.690 | 5.203 | (5.203) | 5.244 | (5.690) | (0.500) | 11.051 |
| ***0.075*** | 0.005 | 0.25 | 4.485 | **0.9** | 7.000 | 7.955 | 7.479 | (7.479) | 7.518 | (7.955) | (0.500) | 15.128 |
| ***0.075*** | 0.005 | 0.25 | 7.107 | **0.95** | 12.333 | 13.214 | 12.776 | (12.776) | 12.811 | (13.214) | (0.500) | 23.439 |
| ***0.075*** | 0.005 | 0.25 | 12.365 | **0.99** | 32.333 | 32.881 | 32.609 | (32.609) | 32.630 | (32.881) | (0.500) | 45.054 |
| **Simu 4-1: changing alpha** | | | | | **To alpha:** | | **Elasticity at the discrete time=(2-1)/((1+2)/2)** | | | | | |
| ***0.4*** | 0.005 | **0.05** | 4.174 | 0.825 | | | | | | | | |
| ***0.4*** | 0.005 | **0.1** | 3.968 | 0.825 | (0.081) | (0.081) | (0.081) | 0.081 | (0.081) | 1.071 | 0.515 | (1.141) |
| ***0.4*** | 0.005 | **0.15** | 3.760 | 0.825 | (0.143) | (0.143) | (0.143) | 0.143 | (0.143) | 1.136 | 0.505 | (1.271) |
| ***0.4*** | 0.005 | **0.2** | 3.551 | 0.825 | (0.212) | (0.212) | (0.212) | 0.212 | (0.212) | 1.207 | 0.503 | (1.412) |
| ***0.4*** | 0.005 | **0.25** | 3.340 | 0.825 | (0.290) | (0.290) | (0.290) | 0.290 | (0.290) | 1.286 | 0.502 | (1.569) |
| ***0.4*** | 0.005 | **0.3** | 3.128 | 0.825 | (0.379) | (0.379) | (0.379) | 0.379 | (0.379) | 1.375 | 0.501 | (1.747) |
| ***0.4*** | 0.005 | **0.35** | 2.914 | 0.825 | (0.481) | (0.481) | (0.481) | 0.481 | (0.481) | 1.477 | 0.501 | (1.951) |
| ***0.4*** | 0.005 | **0.4** | 2.699 | 0.825 | (0.600) | (0.600) | (0.600) | 0.600 | (0.600) | 1.596 | 0.501 | (2.186) |
| ***0.4*** | 0.005 | **0.45** | 2.483 | 0.825 | (0.739) | (0.739) | (0.739) | 0.739 | (0.739) | 1.735 | 0.500 | (2.463) |
| **Simu 4-2 changing beta*** | | | | | **To beta*:** | | **Elasticity at the discrete time=(2-1)/((1+2)/2)** | | | | | |
| ***0.4*** | 0.005 | 0.25 | 1.094 | **0.6** | | | | | | | | |
| ***0.4*** | 0.005 | 0.25 | 1.350 | **0.65** | 1.667 | 2.660 | 2.164 | (2.164) | 2.213 | (2.660) | (0.500) | 5.260 |
| ***0.4*** | 0.005 | 0.25 | 1.689 | **0.7** | 2.077 | 3.068 | 2.573 | (2.573) | 2.620 | (3.068) | (0.500) | 6.058 |
| ***0.4*** | 0.005 | 0.25 | 2.158 | **0.75** | 2.636 | 3.625 | 3.132 | (3.132) | 3.176 | (3.625) | (0.500) | 7.138 |
| ***0.4*** | 0.005 | 0.25 | 2.852 | **0.8** | 3.444 | 4.429 | 3.938 | (3.938) | 3.981 | (4.429) | (0.500) | 8.680 |
| ***0.4*** | 0.005 | 0.25 | 3.981 | **0.85** | 4.714 | 5.690 | 5.203 | (5.203) | 5.244 | (5.690) | (0.500) | 11.051 |
| ***0.4*** | 0.005 | 0.25 | 6.143 | **0.9** | 7.000 | 7.955 | 7.479 | (7.479) | 7.518 | (7.955) | (0.500) | 15.128 |
| ***0.4*** | 0.005 | 0.25 | 11.950 | **0.95** | 12.333 | 13.214 | 12.776 | (12.776) | 12.811 | (13.214) | (0.500) | 23.439 |
| ***0.4*** | 0.005 | 0.25 | 38.224 | **0.99** | 32.333 | 32.881 | 32.609 | (32.609) | 32.630 | (32.881) | (0.500) | 45.054 |

**Table E4** Elasticity values of parameters and variables w.r.t. $\alpha$ and $\beta^*$ in simulations (4)

| $delta_0$ | r* | $r_{REAL}=r^*-r^*_F$ | $\alpha/i\beta^*$ | $g_Y^*$ | $g_A^*$ | $1/\lambda^*$ | $\delta_0-\alpha$ | $(\delta_0-\alpha)/\alpha$ | $i_{VA(speed)}$ | $i_{Width(speed)}$ | $n_{VA(speed)}$ | $n_{Width(speed)}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **To alpha:** | **Simu 3-1: changing alpha** | | | | | **Elasticity at the discrete time=(2-1)/((1+2)/2)** | | | | | | |
| | | | | | | | | | | | | |
| 0.156 | 1.053 | 1.000 | 1.000 | 0.060 | 0.000 | 0.061 | (0.210) | (1.183) | (0.030) | 0.026 | 0.030 | 0.041 |
| 0.252 | 1.103 | 1.000 | 1.000 | 0.107 | 0.000 | 0.110 | (0.374) | (1.353) | (0.048) | 0.048 | 0.048 | 0.071 |
| 0.344 | 1.158 | 1.000 | 1.000 | 0.162 | 0.000 | 0.169 | (0.553) | (1.535) | (0.063) | 0.075 | 0.063 | 0.106 |
| 0.433 | 1.221 | 1.000 | 1.000 | 0.224 | 0.000 | 0.240 | (0.736) | (1.720) | (0.073) | 0.109 | 0.073 | 0.145 |
| 0.522 | 1.294 | 1.000 | 1.000 | 0.298 | 0.000 | 0.327 | (0.897) | (1.883) | (0.076) | 0.152 | 0.076 | 0.190 |
| 0.612 | 1.380 | 1.000 | 1.000 | 0.383 | 0.000 | 0.435 | (0.982) | (1.970) | (0.066) | 0.208 | 0.066 | 0.241 |
| 0.705 | 1.482 | 1.000 | 1.000 | 0.485 | 0.000 | 0.574 | (0.899) | (1.891) | (0.037) | 0.282 | 0.037 | 0.300 |
| 0.803 | 1.604 | 1.000 | 1.000 | 0.607 | 0.000 | 0.757 | (0.530) | (1.527) | 0.026 | 0.383 | (0.026) | 0.370 |
| **To beta*:** | **Simu 3-2 changing beta*** | | | | | **Elasticity at the discrete time=(2-1)/((1+2)/2)** | | | | | | |
| | | | | | | | | | | | | |
| (4.761) | (2.466) | (1.000) | (1.000) | (1.471) | (1.667) | (13.872) | (6.748) | (6.748) | (27.083) | #NUM! | 27.083 | 0.000 |
| (3.580) | (2.794) | (1.000) | (1.000) | (1.801) | (2.077) | (2.510) | (6.087) | (6.087) | (3.508) | (1.761) | 3.508 | 0.000 |
| (2.873) | (3.224) | (1.000) | (1.000) | (2.232) | (2.636) | (0.004) | (6.008) | (6.008) | (0.005) | (0.003) | 0.005 | 0.000 |
| (2.326) | (3.810) | (1.000) | (1.000) | (2.821) | (3.444) | 1.380 | (6.164) | (6.164) | 1.895 | 0.948 | (1.895) | 0.000 |
| (1.755) | (4.655) | (1.000) | (1.000) | (3.671) | (4.714) | 2.615 | (6.031) | (6.031) | 3.774 | 1.893 | (3.774) | 0.000 |
| (0.908) | (5.983) | (1.000) | (1.000) | (5.007) | (7.000) | 4.126 | (3.916) | (3.916) | 6.579 | 3.319 | (6.579) | 0.000 |
| 0.965 | (8.369) | (1.000) | (1.000) | (7.415) | (12.333) | 6.423 | 4.163 | 4.163 | 12.746 | 6.574 | (12.746) | 0.000 |
| 7.321 | (13.095) | (1.000) | (1.000) | (12.163) | (32.333) | 9.726 | 20.091 | 20.091 | 34.809 | 20.520 | (34.809) | 0.000 |
| **To alpha:** | **Simu 4-1: changing alpha** | | | | | **Elasticity at the discrete time=(2-1)/((1+2)/2)** | | | | | | |
| | | | | | | | | | | | | |
| 0.518 | 1.067 | 1.000 | 1.000 | 0.076 | 0.000 | 0.056 | (1.310) | (2.016) | (0.027) | 0.027 | 0.027 | 0.041 |
| 0.675 | 1.128 | 1.000 | 1.000 | 0.134 | 0.000 | 0.102 | (10.913) | (8.293) | (0.043) | 0.050 | 0.043 | 0.071 |
| 0.787 | 1.195 | 1.000 | 1.000 | 0.200 | 0.000 | 0.158 | 4.283 | 3.598 | (0.057) | 0.077 | 0.057 | 0.106 |
| 0.877 | 1.271 | 1.000 | 1.000 | 0.275 | 0.000 | 0.227 | 2.111 | 1.141 | (0.068) | 0.111 | 0.068 | 0.145 |
| 0.956 | 1.357 | 1.000 | 1.000 | 0.361 | 0.000 | 0.312 | 1.337 | 0.341 | (0.072) | 0.154 | 0.072 | 0.190 |
| 1.032 | 1.456 | 1.000 | 1.000 | 0.459 | 0.000 | 0.420 | 0.759 | (0.242) | (0.066) | 0.208 | 0.066 | 0.241 |
| 1.107 | 1.571 | 1.000 | 1.000 | 0.575 | 0.000 | 0.560 | 0.107 | (0.893) | (0.043) | 0.279 | 0.043 | 0.300 |
| 1.186 | 1.706 | 1.000 | 1.000 | 0.710 | 0.000 | 0.747 | (0.865) | (1.859) | 0.008 | 0.374 | (0.008) | 0.370 |
| **To beta*:** | **Simu 4-2 changing beta*** | | | | | **Elasticity at the discrete time=(2-1)/((1+2)/2)** | | | | | | |
| | | | | | | | | | | | | |
| (5.089) | (2.619) | (1.000) | (1.000) | (1.626) | (1.667) | (7.323) | (8.294) | (8.294) | (7.855) | (4.030) | 7.855 | 0.000 |
| (4.026) | (3.011) | (1.000) | (1.000) | (2.019) | (2.077) | (1.146) | (9.098) | (9.098) | (1.207) | (0.604) | 1.207 | 0.000 |
| (3.482) | (3.539) | (1.000) | (1.000) | (2.550) | (2.636) | 0.800 | (13.086) | (13.086) | 0.842 | 0.421 | (0.842) | 0.000 |
| (3.178) | (4.293) | (1.000) | (1.000) | (3.307) | (3.444) | 2.144 | (39.503) | (39.503) | 2.267 | 1.135 | (2.267) | 0.000 |
| (2.986) | (5.453) | (1.000) | (1.000) | (4.476) | (4.714) | 3.617 | 25.457 | 25.457 | 3.868 | 1.941 | (3.868) | 0.000 |
| (2.757) | (7.474) | (1.000) | (1.000) | (6.514) | (7.000) | 5.841 | 8.476 | 8.476 | 6.382 | 3.218 | (6.382) | 0.000 |
| (1.820) | (11.874) | (1.000) | (1.000) | (10.969) | (12.333) | 10.442 | 3.574 | 3.574 | 12.011 | 6.173 | (12.011) | 0.000 |
| 6.599 | (25.398) | (1.000) | (1.000) | (24.664) | (32.333) | 24.105 | (17.769) | (17.769) | 33.134 | 19.150 | (33.134) | 0.000 |

**Table F1** Frequency by country and by sub-area to close-to-disequilibrium and disequilibrium: the Pacific and non-European area, using KEWT 4.10 data-sets (1)

| Frequency | close-to-disequilibirum (0 to 5 years of speed) | | | | disequiliibrum (minus or more than 1000 yeas ) | | | | Numbers |
|---|---|---|---|---|---|---|---|---|---|
| Pacific countries | sum | Total econo | G sector | PRI sector | sum | Total econo | G sector | PRI sector | (times) |
| 1. the US | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 19 |
| 2. Canada | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 19 |
| 3. Australia | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 19 |
| 4. New Zealand | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 19 |
| 5. Mexico | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 2 | 19 |
| 6. China | 13 | 4 | 5 | 4 | 0 | 0 | 0 | 0 | 19 |
| 7. India | 5 | 2 | 3 | 0 | 0 | 0 | 0 | 0 | 19 |
| 8. Indonesia | 4 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 19 |
| 9. Japan | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 19 |
| 10. Korea | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 19 |
| 11. Malaysia | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 19 |
| 12. Philippines | 9 | 3 | 0 | 6 | 0 | 0 | 0 | 0 | 19 |
| 13. Singapore | 3 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 19 |
| 14. Thailand | 3 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 19 |
| 15. Vietnam | 5 | 3 | 0 | 2 | 0 | 0 | 0 | 0 | 18 |
| 16. Sri Lanka | 12 | 4 | 6 | 2 | 1 | 0 | 1 | 0 | 18 |
| 17. *Brazil* | 13 | 4 | 5 | 4 | 3 | 0 | 3 | 0 | 19 |
| total | 70 | 23 | 23 | 24 | 7 | 0 | 4 | 3 | 321 |
| Frequency (rate) | 0.2181 | 0.0717 | 0.0717 | 0.0748 | 0.0218 | 0.0000 | 0.0125 | 0.0093 | 1.0000 |
| total (excl.Brazil) | 57 | 19 | 18 | 20 | 4 | 0 | 1 | 3 | 302 |
| Freq.excl.Brazil ( | 0.1887 | 0.0629 | 0.0596 | 0.0662 | 0.0132 | 0.0000 | 0.0033 | 0.0099 | 1.0000 |

| Frequency | close-to-disequilibirum (0 to 5 years of speed) | | | | disequiliibrum (minus or more than 1000 yeas ) | | | | Numbers |
|---|---|---|---|---|---|---|---|---|---|
| Other countries | sum | Total econo | G sector | PRI sector | sum | Total econo | G sector | PRI sector | (times) |
| *Latin America, 5* | | | | | | | | | |
| 16. Argentina | 4 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 19 |
| 17. Brazil | 13 | 4 | 5 | 4 | 3 | 0 | 3 | 0 | 19 |
| 18. Chile | 8 | 3 | 2 | 3 | 0 | 0 | 0 | 0 | 19 |
| 19. Colombia | 5 | 3 | 1 | 1 | 3 | 0 | 3 | 0 | 18 |
| 20. Peru | 11 | 3 | 5 | 3 | 0 | 0 | 0 | 0 | 19 |
| *Middle East, 5* | | | | | | | | | |
| 21. Iran | 11 | 4 | 4 | 3 | 2 | 2 | 0 | 0 | 18 |
| 22. Kazakhstan | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 13 |
| 23. Kuwait | 1 | 0 | 0 | 1 | 8 | 0 | 6 | 2 | 18 |
| 24. Pakistan | 8 | 1 | 4 | 3 | 2 | 1 | 1 | 0 | 19 |
| 25. Saudi Arabia | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 19 |
| *Africa, 5* | | | | | | | | | |
| 26. Egypt | 5 | 1 | 2 | 2 | 1 | 1 | 0 | 0 | 18 |
| 27. Kenya | 10 | 3 | 2 | 5 | 0 | 0 | 0 | 0 | 17 |
| 28. Nigeria | 11 | 3 | 7 | 1 | 0 | 0 | 0 | 0 | 14 |
| 29. South Africa | 8 | 2 | 2 | 4 | 0 | 0 | 0 | 0 | 19 |
| 30. Tanzania | 7 | 3 | 1 | 3 | 0 | 0 | 0 | 0 | 16 |
| total | 105 | 32 | 37 | 36 | 19 | 4 | 13 | 2 | 265 |
| Frequency (rate) | 0.3962 | 0.1208 | 0.1396 | 0.1358 | 0.0717 | 0.0151 | 0.0491 | 0.0075 | 1.0000 |

**Table F2** Frequency by country and by sub-area to close-to-disequilibrium and disequilibrium: the Euro and others in Europe, using KEWT 4.10 data-sets (2)

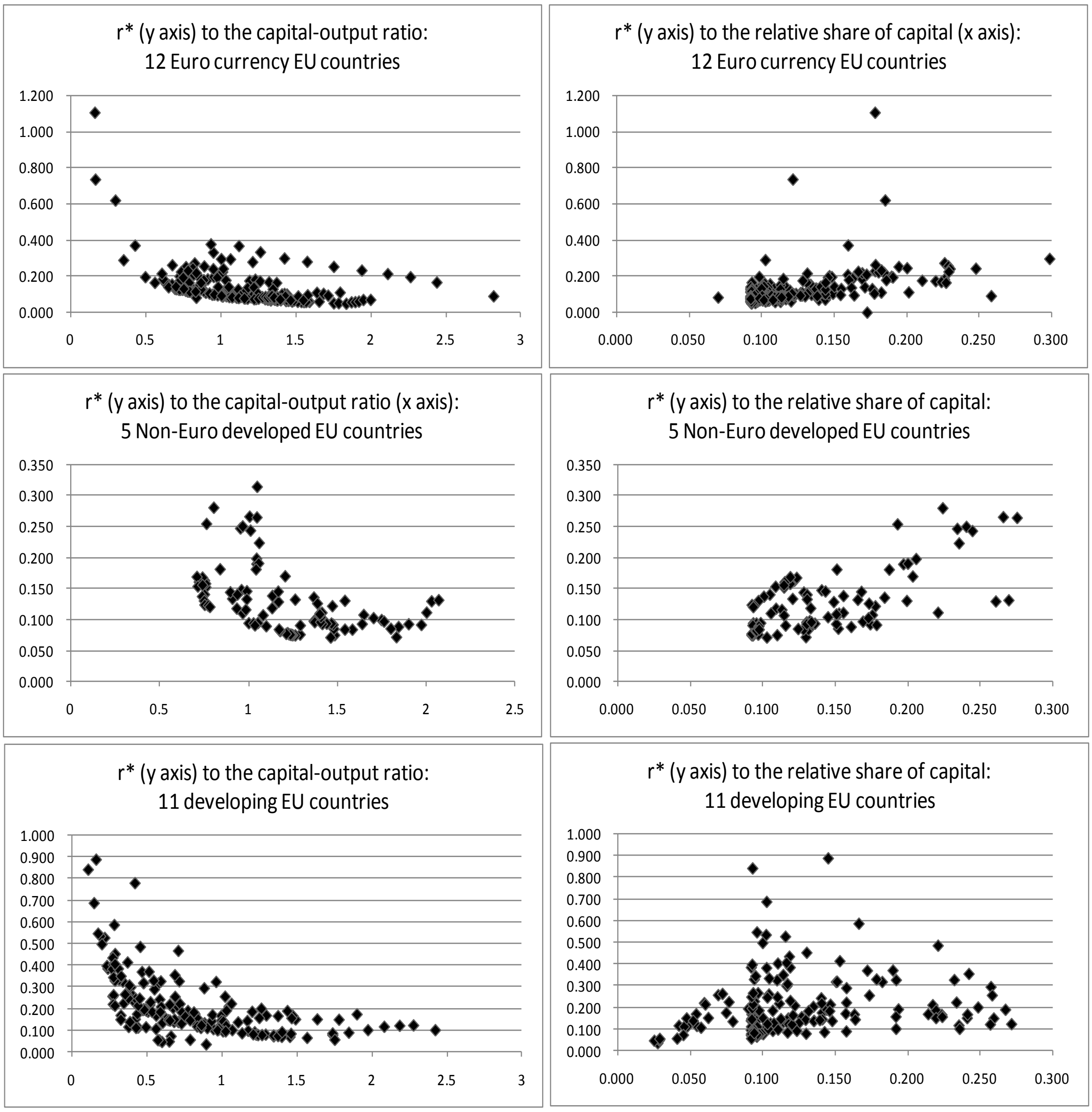
| Frequency | close-to-disequilibirum (0 to 5 years of speed) | | | | disequiliibrum (minus or more than 1000 yeas ) | | | | Numbers |
|---|---|---|---|---|---|---|---|---|---|
| countries | sum | Total econo | G sector | PRI sector | sum | Total econo | G sector | PRI sector | (times) |
| *12 Euro sub-are* | 62 | 17 | 24 | 21 | 11 | 1 | 6 | 4 | 223 |
| E1. Austria | 3 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 19 |
| E2. Belgium | 5 | 2 | 2 | 1 | 1 | 0 | 0 | 1 | 19 |
| E3. Finland | 8 | 5 | 0 | 3 | 0 | 0 | 0 | 0 | 19 |
| E4. France | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 19 |
| E5. Germany | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 19 |
| E6. Greece 299 | 17 | 2 | 7 | 8 | 1 | 0 | 1 | 0 | 19 |
| E7. Ireland | 9 | 2 | 5 | 2 | 0 | 0 | 0 | 0 | 19 |
| E8. Italy | 2 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 19 |
| E9. Luxemburg | 2 | 1 | 1 | 0 | 5 | 1 | 2 | 2 | 14 |
| E10. Netherlands | 6 | 3 | 2 | 1 | 0 | 0 | 0 | 0 | 19 |
| E11. Portugal | 5 | 0 | 2 | 3 | 0 | 0 | 0 | 0 | 19 |
| E12. Spain | 5 | 1 | 2 | 2 | 3 | 0 | 2 | 1 | 19 |
| Frequency (rate) | 0.2780 | 0.0762 | 0.1076 | 0.0942 | 0.0493 | 0.0045 | 0.0269 | 0.0179 | 1.0000 |
| | | | | | | | | | |
| Frequency | close-to-disequilibirum (0 to 5 years of speed) | | | | disequiliibrum (minus or more than 1000 yeas ) | | | | Numbers |
| Non Euro sub-are | sum | Total econo | G sector | PRI sector | sum | Total econo | G sector | PRI sector | (times) |
| *5 Developed sub* | 12 | 3 | 5 | 4 | 2 | 1 | 0 | 1 | 95 |
| 1.Denmark | 4 | 1 | 2 | 1 | 0 | 0 | 0 | 0 | 19 |
| 2. Sweden | 2 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 19 |
| 3. the U K | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 19 |
| 4. Norway | 2 | 0 | 2 | 0 | 1 | 1 | 0 | 0 | 19 |
| 5. Switzerland | 3 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 19 |
| Frequency (rate) | 0.1263 | 0.0316 | 0.0526 | 0.0421 | 0.0211 | 0.0105 | 0.0000 | 0.0105 | 1.0000 |
| | | | | | | | | | |
| *11 Developing su* | 60 | 12 | 29 | 19 | 13 | 3 | 5 | 5 | 174 |
| 1. Bulgaria | 4 | 1 | 1 | 2 | 4 | 1 | 2 | 1 | 14 |
| 2. Czech Republi | 8 | 4 | 1 | 3 | 0 | 0 | 0 | 0 | 14 |
| 3. Hungary | 8 | 1 | 5 | 2 | 0 | 0 | 0 | 0 | 19 |
| 4. Iceland | 3 | 0 | 3 | 0 | 2 | 0 | 0 | 2 | 19 |
| 5. Latvia | 2 | 0 | 1 | 1 | 2 | 1 | 1 | 0 | 14 |
| 6. Poland | 3 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 19 |
| 7. Romania | 5 | 0 | 2 | 3 | 2 | 0 | 2 | 0 | 14 |
| 8. Russia | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 |
| 9. Slovak | 4 | 1 | 1 | 2 | 3 | 1 | 0 | 2 | 14 |
| 10E. *Slovenia* | 8 | 2 | 4 | 2 | 0 | 0 | 0 | 0 | 14 |
| 11. Turkey | 15 | 2 | 11 | 2 | 0 | 0 | 0 | 0 | 19 |
| Frequency (rate) | 0.3448 | 0.0690 | 0.1667 | 0.1092 | 0.0747 | 0.0172 | 0.0287 | 0.0287 | 1.0000 |
| | | | | | | | | | |
| *16 Non Euro sub* | 72 | 15 | 34 | 23 | 15 | 4 | 5 | 6 | 269 |
| Frequency (rate) | 0.2677 | 0.0558 | 0.1264 | 0.0855 | 0.0558 | 0.0149 | 0.0186 | 0.0223 | 1.0000 |

**Table F3** Endogenous real rate of return and endogenous inflation/deflation rate for the NAIRU by country 2008

| | For the inflanflation rate | | For the real rate of return | | For endogenous unemployment | | |
|---|---|---|---|---|---|---|---|
| **equilibrium** | r* | $r^*_{HA(i)}$ | $r^*/r^*_{HA(i)}$ | $r^*-r^*_{HA(i)}$ | $n_E$ | n | $n_E-n$ |
| 17 pacific on ave | 0.1166 | 0.1034 | 1.1277 | 0.0132 | 0.01095 | 0.01095 | 0.00000 |
| the U S | 0.0743 | 0.0524 | 1.4174 | 0.0219 | 0.00972 | 0.0097 | 0.00000 |
| Canada | 0.0487 | 0.0382 | 1.2736 | 0.0105 | 0.00941 | 0.0094 | 0.00000 |
| Australia | 0.0480 | 0.0393 | 1.2207 | 0.0087 | 0.01055 | 0.0106 | 0.00000 |
| New Zealand | 0.0487 | 0.0329 | 1.4782 | 0.0158 | 0.00955 | 0.0095 | 0.00000 |
| Mexico | 0.1379 | 0.1252 | 1.1011 | 0.0127 | 0.00995 | 0.0100 | 0.00000 |
| China | 0.1919 | 0.1841 | 1.0423 | 0.0078 | 0.00509 | 0.0051 | 0.00000 |
| India | 0.2461 | 0.2233 | 1.1023 | 0.0228 | 0.01437 | 0.0144 | 0.00000 |
| Indonesia | 0.2321 | 0.2125 | 1.0919 | 0.0195 | 0.01193 | 0.0119 | 0.00000 |
| Japan | 0.0325 | 0.0417 | 0.7795 | (0.0092) | (0.00086) | (0.0009) | 0.00000 |
| Korea | 0.0981 | 0.0928 | 1.0577 | 0.0054 | 0.00396 | 0.0040 | 0.00000 |
| Malaysia | 0.1533 | 0.1144 | 1.3397 | 0.0389 | 0.01656 | 0.0166 | 0.00000 |
| Philippines | 0.1171 | 0.0673 | 1.7407 | 0.0498 | 0.01837 | 0.0184 | 0.00000 |
| Singapore | 0.1308 | 0.0839 | 1.5580 | 0.0468 | 0.02895 | 0.0290 | 0.00000 |
| Thailand | 0.1498 | 0.1397 | 1.0721 | 0.0101 | 0.00612 | 0.0061 | 0.00000 |
| Vietnam | 0.1025 | 0.0929 | 1.1034 | 0.0096 | 0.01357 | 0.0136 | 0.00000 |
| Sri Lanka | 0.0800 | 0.0728 | 1.0981 | 0.0071 | 0.00914 | 0.0091 | 0.00000 |
| Brazil | 0.1032 | 0.0920 | 1.1215 | 0.0112 | 0.00973 | 0.0097 | 0.00000 |
| | For the inflation rate | | For the real rate of return | | For endogenous unemployment | | |
| equilibrium | r* | $r^*_{HA(i)}$ | $r^*/r^*_{HA(i)}$ | $r^*-r^*_{HA(i)}$ | $n_E$ | n | $n_E-n$ |
| 13EMU on ave. | 0.0783 | 0.0729 | 1.0744 | 0.0054 | 0.00121 | 0.00560 | (0.00440) |
| Austria | 0.0719 | 0.0662 | 1.0850 | 0.0056 | 0.00361 | 0.0036 | 0.00000 |
| Belgium | 0.0839 | 0.0750 | 1.1191 | 0.0089 | 0.00570 | 0.0057 | 0.00000 |
| Finland | 0.0884 | 0.0821 | 1.0777 | 0.0064 | 0.00379 | 0.0038 | 0.00000 |
| France | 0.0663 | 0.0591 | 1.1222 | 0.0072 | 0.00535 | 0.0053 | 0.00000 |
| Germany | 0.0676 | 0.0714 | 0.9470 | (0.0038) | (0.00097) | (0.0010) | 0.00000 |
| Greece | 0.1653 | 0.1581 | 1.0456 | 0.0072 | 0.00270 | 0.0027 | 0.00000 |
| Ireland | 0.0916 | 0.0707 | 1.2955 | 0.0209 | 0.01835 | 0.0183 | 0.00000 |
| Italy | 0.0850 | 0.0743 | 1.1434 | 0.0107 | 0.00489 | 0.0049 | 0.00000 |
| Luxemburg | 0.2972 | 0.2354 | 1.2629 | 0.0619 | 0.01028 | 0.0103 | 0.00000 |
| Netherlands | 0.1401 | 0.1279 | 1.0952 | 0.0122 | 0.00425 | 0.0043 | 0.00000 |
| Portugal | 0.1120 | 0.1025 | 1.0929 | 0.0095 | 0.00376 | 0.0038 | 0.00000 |
| Slovenia | 0.3208 | 0.4372 | 0.7339 | (0.1164) | (0.05600) | 0.0011 | (0.05714) |
| Spain | 0.0695 | 0.0584 | 1.1901 | 0.0111 | 0.00999 | 0.0100 | 0.00000 |
| | For the inflation rate | | For the real rate of return | | For endogenous unemployment | | |
| equilibrium | r* | $r^*_{HA(i)}$ | $r^*/r^*_{HA(i)}$ | $r^*-r^*_{HA(i)}$ | $n_E$ | n | $n_E-n$ |
| 16 Europe on ave | 0.1281 | 0.1260 | 1.0167 | 0.0021 | 0.00467 | 0.00476 | (0.00009) |
| Bulgaria | 0.0737 | 0.0770 | 0.9581 | (0.0032) | (0.00654) | (0.0065) | 0.00000 |
| Czech Rep. | 0.0974 | 0.0914 | 1.0657 | 0.0060 | 0.00487 | 0.0049 | 0.00000 |
| Denmark | 0.1690 | 0.1652 | 1.0227 | 0.0038 | 0.00183 | 0.0018 | 0.00000 |
| Hungary | 0.0991 | 0.1080 | 0.9173 | (0.0089) | (0.00340) | (0.0020) | (0.00141) |
| Iceland | 0.0822 | 0.0602 | 1.3662 | 0.0220 | 0.05263 | 0.0526 | 0.00000 |
| Latvia | 0.0614 | 0.0637 | 0.9639 | (0.0023) | (0.00441) | (0.0044) | 0.00000 |
| Norway | 0.3129 | 0.2739 | 1.1425 | 0.0390 | 0.01059 | 0.0106 | 0.00000 |
| Poland | 0.1068 | 0.1080 | 0.9889 | (0.0012) | (0.00079) | (0.0008) | 0.00000 |
| Romania | 0.0312 | 0.0322 | 0.9689 | (0.0010) | (0.00420) | (0.0042) | 0.00000 |
| Russia | 0.1438 | 0.1490 | 0.9653 | (0.0052) | (0.00387) | (0.0039) | 0.00000 |
| Slovak | 0.0803 | 0.0796 | 1.0092 | 0.0007 | 0.00070 | 0.0007 | 0.00000 |
| Sweden | 0.1277 | 0.1081 | 1.1807 | 0.0195 | 0.00546 | 0.0055 | 0.00000 |
| Switzerland | 0.1305 | 0.1182 | 1.1034 | 0.0122 | 0.00399 | 0.0040 | 0.00000 |
| Turkey | 0.1815 | 0.1569 | 1.1568 | 0.0246 | 0.01247 | 0.0125 | 0.00000 |
| the U K | 0.1251 | 0.0809 | 1.5453 | 0.0441 | 0.00542 | 0.0054 | 0.00000 |

**Data source:** KEWT 4.10 of 59 countries by sector, 1990-2008, whose ten original data for the real assets come from *International Financial Statistics Yearbook*, IMF.

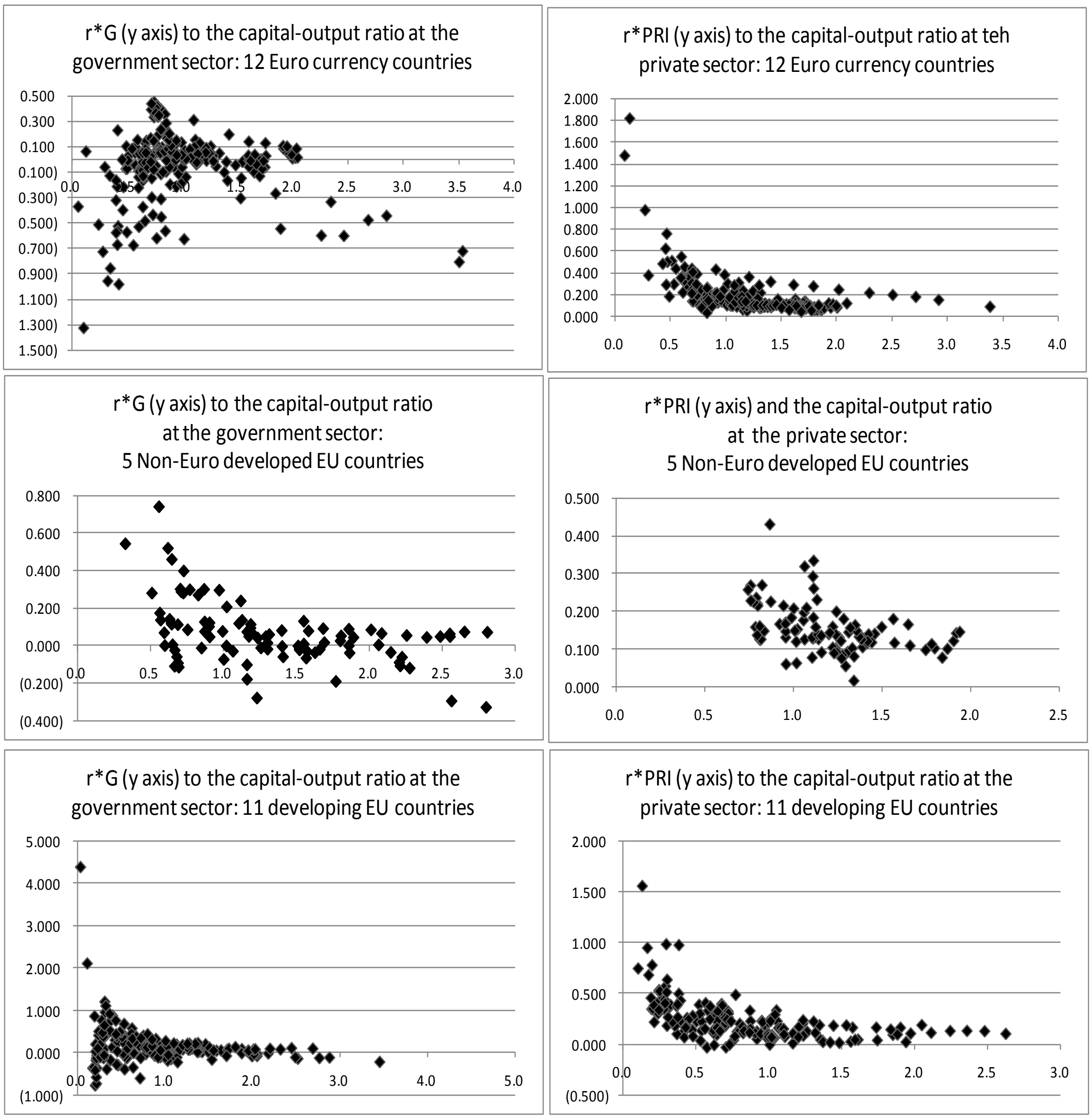
**Note:** Shadowed cells show unstable results, partly due to a minus rate of change in population in equilibrium. Seventeen Pacific area countries 2008 do not show this instability except for Japan. A minus value of $n_E - n$ shows unemployment even in equilibrium.




**Data source:** 13 Euro currency Sub-Area, 15 Non-Euro Sub-Area, and 31 other country Area outside Europe, using KEWT 4.10 by sector, 1990-2008, whose ten original data come from *International Financial Statistics Yearbook*, IMF (hereafter, the same).

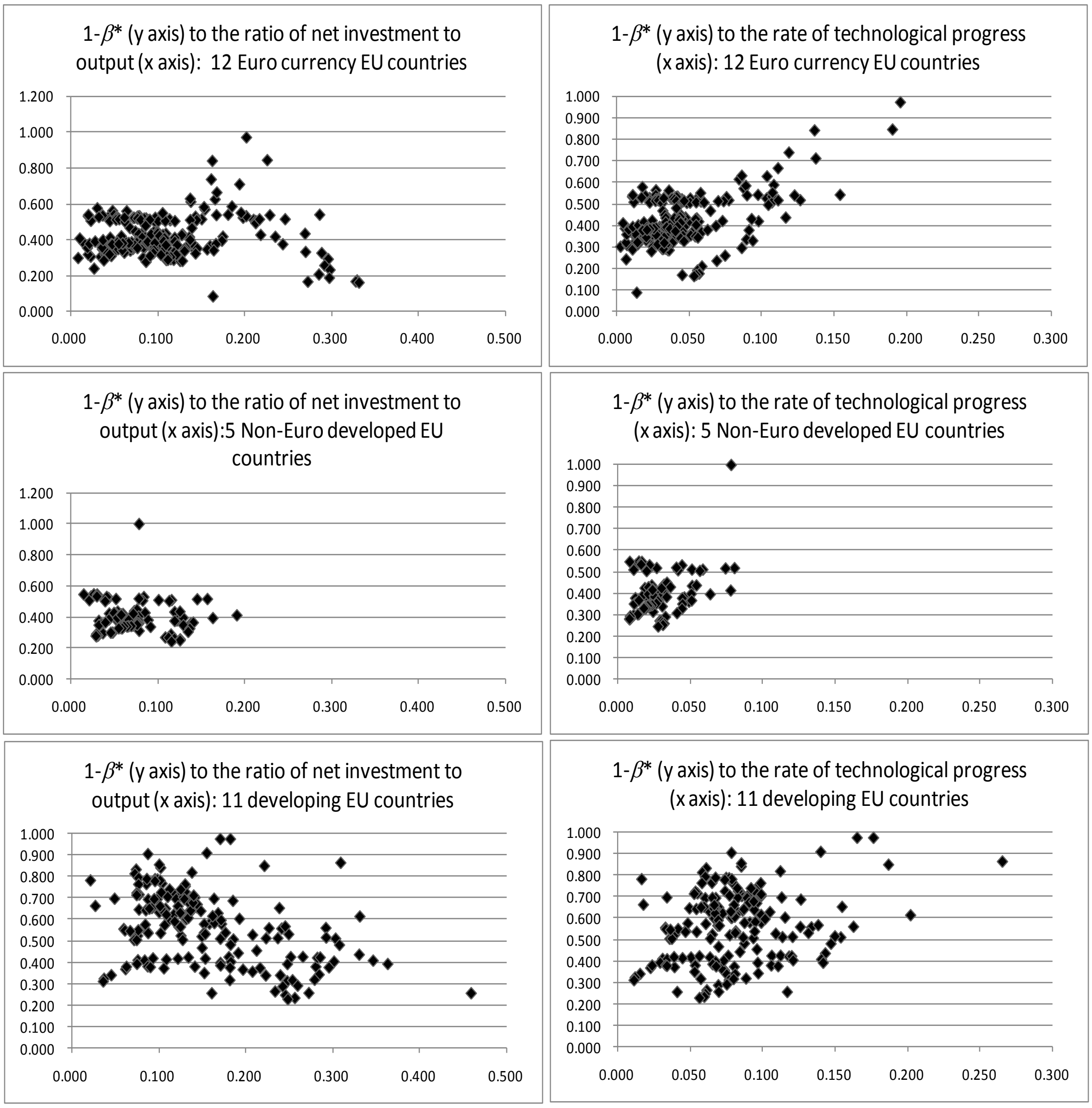
**Note:** Policy-oriented core parameters are united by $\alpha = r^* \cdot \Omega^*$, and by sector.

**Figure P1** Relative share of capital as the product of the rate of return and the capital-output ratio: developed versus developing countries in Europe



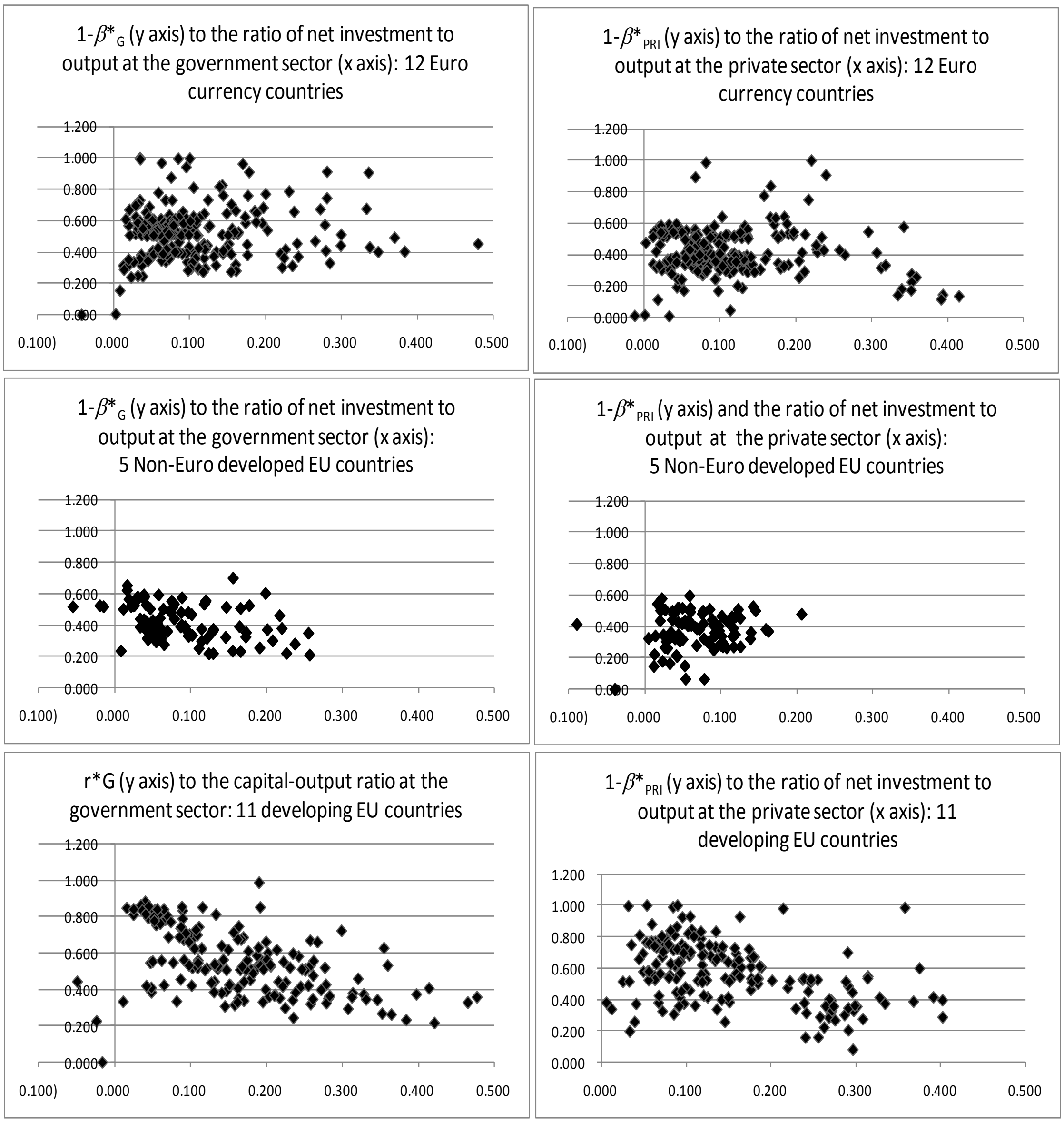

**Note:** The purpose of these figures is to compare developing with developed countries in Europe. Five developed countries that do not use Euro currency are: Denmark, Norway, Sweden, Switzerland, the UK. Eleven developing countries in Europe are Bulgaria, Czech Rep., Hungary, Iceland, Latvia, Poland, Romania, Russia, Slovak, Slovenia, and Turkey, where a few countries still fall into disequilibrium a few times in 1990-2008. When 'deficit' is available by year, the author is able to increase the number of countries in Europe.

**Figure P2** Relative share of capital, by sector, as the product of the rate of return and the capital-output ratio: developed versus developing countries in Europe




**Note:** Extreme values happen when an economy gets into disequilibrium once ten years or so.

**Figure P3** Endogenous rate of technological progress as the product of the ratio of qualitative investment to total investments and the ratio of net investment to output: developed versus developing countries in Europe




**Note:** The government sector is closely related to the private sector, although there are differences between two sectors.

**Figure P4** Endogenous rate of technological progress, by sector, as the product of the ratio of qualitative investment to total investments and the ratio of net investment to output: developed versus developing countries in Europe

# Structural Analysis of the Speed Years for Convergence in Equilibrium by Country: Six Hyperbolas with Each Simulation

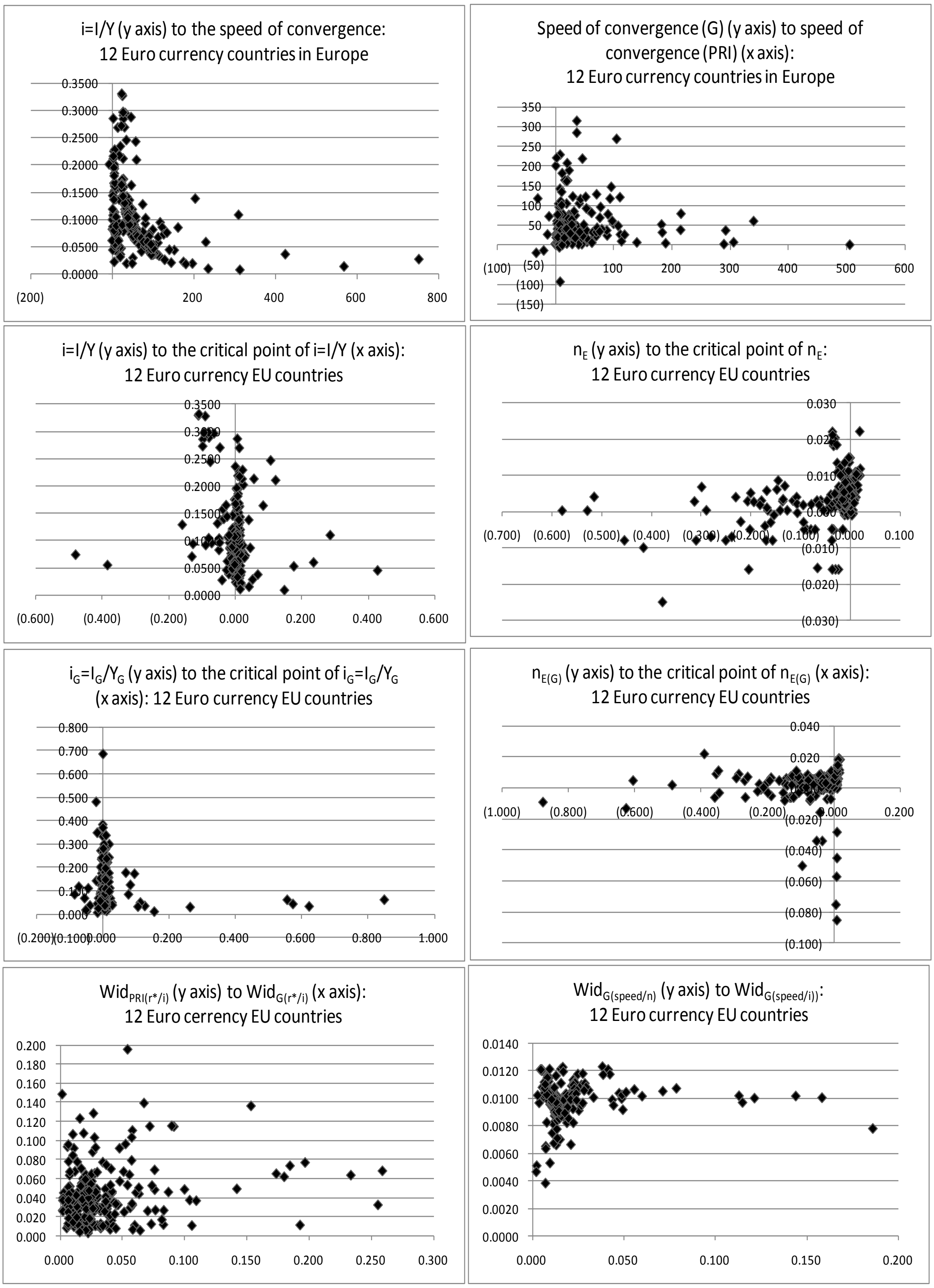



**Figure P5** Mechanics in equilibrium: the 12 Euro currency countries

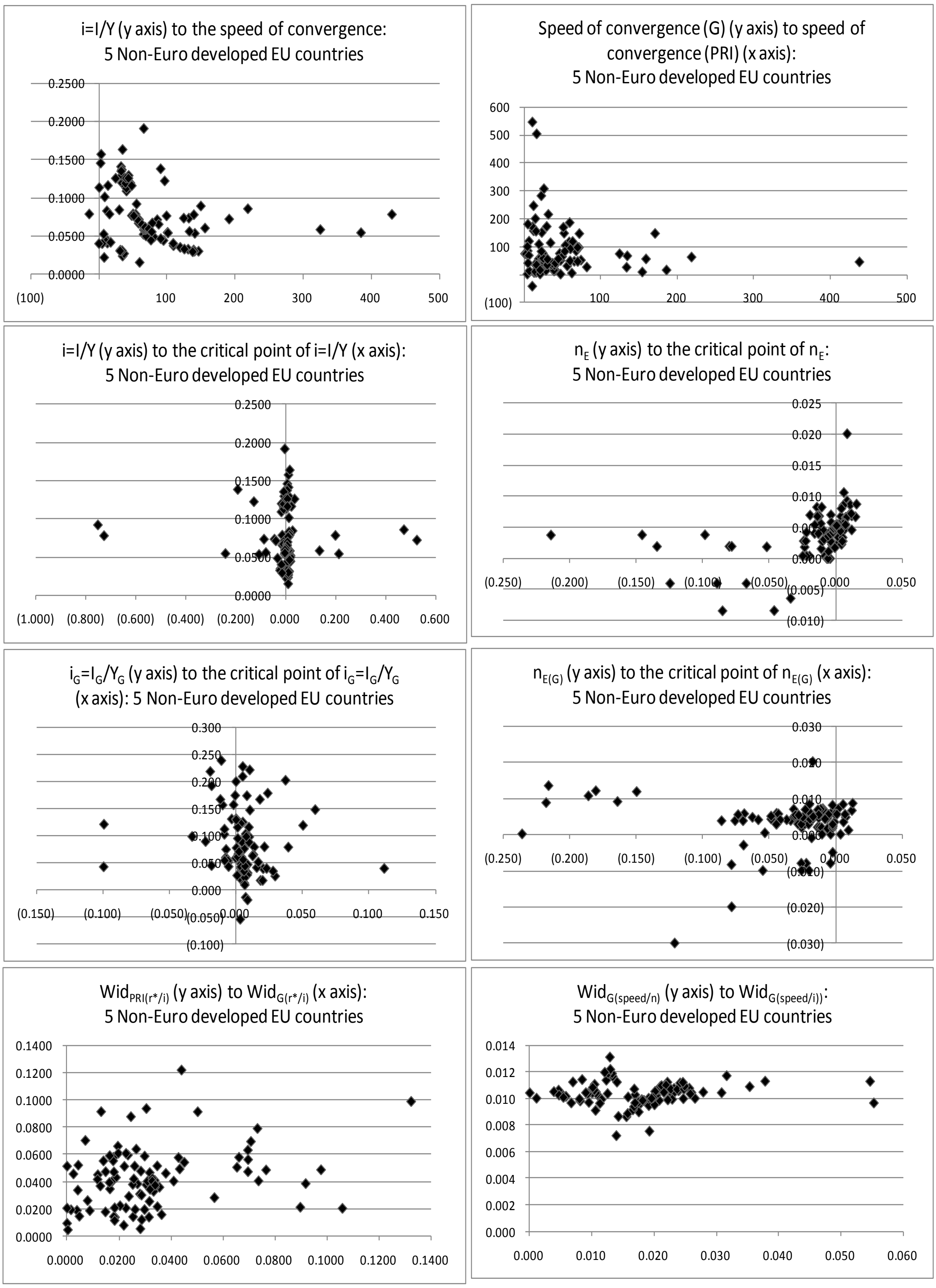



**Figure P6** Mechanics in equilibrium: the 5 Non-Euro currency developed countries

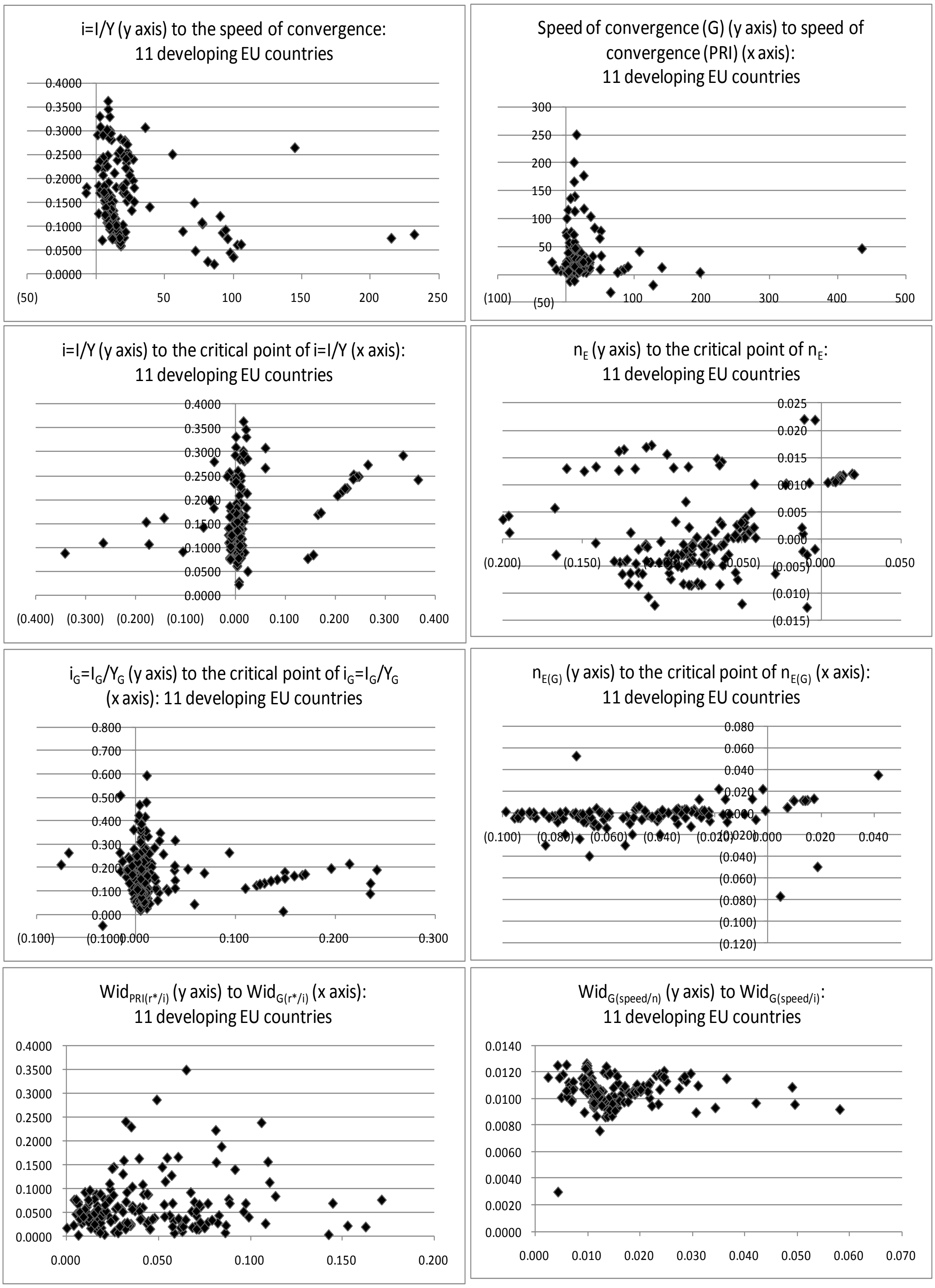



**Figure P7** Mechanics in equilibrium: the 11 developing countries in Europe

## Chapter 7

### References


Barro, R. J., and Mankiw, Gregory, N. (1995). Capital Mobility in Neoclassical Models of Growth. *American Economic Review* 85 (Mar, 1): 103-115.

Barro, Robert, J., and Xavier Sala-i-Martin. (1995). *Economic Growth.* New York and London: McGraw-Hill (1st Ed), 36-39, 80-92.

De Long, Bradford, J. (1988). Productivity Growth, Convergence, and Welfare: Comment. *American Economic Review* 78 (Dec, 5): 1138-1154.

Gilfason, Thorvaldur. (1993). Optimal Saving, Interest Rates, and Endogenous Growth. *Scandinavian Journal of Economics* 95(4): 517-533.

Javier Andres, Rafael Doménech and César Molinas. (1996). Growth and Convergence in OECD Countries: A Closer Look, pp.347-387. In: "*Quantitative Aspects of Post-War European Economic Growth*," edited by van Ark, Bart, and Nicholas Crafts, Cambridge: Cambridge University Press, 442p.

Klein, Lawrence, R. (1950a). *Economic Fluctuations in the United States, 1921-1941*,1-12, 39-57, N.Y.: John Wiley. 174p.

Klein, Lawrence, R. (1950b). Stock and Flow Analysis in Economics. *Econometrica* 18 (July, 3): 236-24.

Klein, Lawrence, R., and A. S., Goldberger. (1964). *An Econometric Model of the United States, 1929-1952.* Amsterdam: North-Holland (Yale Univ.), 165p.

Maddison Angus. (1987). Growth and Slowdown in Advanced Capitalist Economies: Techniques of Quantitative Assessment. *Journal of Economic Literature* 25 (June): 649-698.

McQuinn, Kieran, and Karl Whelan. (2007). Conditional Convergence and the Dynamics of the Capital-Output Ratio. *Journal of Economic Growth* 12 (June, 2): 159-184.

Phelps, Edmund S. (1965). Second Essay on the Golden Rule of Accumulation. *American Economic Review*, 55 (Sep, 4): 793-814.

Phelps, Edmund, S. (1966). *Golden Rules of Economic Growth.* New York: W.W. Norton, 189+19p.

Sala-i-Martin, X. (1990a). Lecture Notes on Economic Growth (I): Introduction to the Literature and Neoclassical Models. *NBER Working paper* No.3563. (the concept of the convergence coefficient, *lambda*, first appears, in this paper). 44p.

Sala-i-Martin, X. (1990b). Lecture Notes on Economic Growth (II): Introduction to the Literature and Neoclassical Models. *NBER Working paper* No.3564. 49p.

Sato, Ryuzo. (1963). Fiscal Policy in a Neo-Classical Growth Model: An Analysis of Time Required for Equilibrating Adjustment. *Review of Economic Studies* 30 (Feb, 1): 16-23.