Working Paper Series
Department of Economics
University of Verona

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WP Number: 38 December 2012

ISSN: 2036-2919 (paper), 2036-4679 (online)

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Abstract

We test the hypotheses of industry return rates either gravitating around or converging towards a common value in Taiwan and New Zealand. We adopt various econometric approaches. The results are then nested in a meta-analytic framework together with those of the past literature. Various kinds of limitations to capital mobility can hamper the tendential equalization of return rates. Focusing on those arising from different innovation capabilities across industries can pave the way to collaboration between evolutionary and radical political economics.

Keywords: capital mobility, gravitation, convergence, return rates on regulating capital, panel data.

JEL Codes: L16, L19, L60, L70, L80, L90, B51, B52

Introduction and key concepts

The economics literature has recently witnessed a proliferation of econometric tests regarding the tendential equalization of industrial rates of return. Figure 1 documents this trend. Yet the bulk of these tests have concerned countries in North America and Europe, as documented by Figure 2 (detailed data are set out in Table 4).

On reviewing the relevant literature, Vaona (2012) highlights three challenges for research in the field: (i) to shift the focus of the literature from the above geographic areas to other ones; (ii) to use different econometric methods; (iii) to gauge the results within a meta-analytic framework in order to determine whether previous patterns reported in the literature are affected.

The present study aims at meeting precisely these challenges. It focuses on two countries belonging to the southern part of the eastern hemisphere, namely Taiwan and New Zealand. It tests for the tendential equalization of industrial rates of return by making use of three different approaches proposed in Vaona (2011) and Vaona (2012). It further inserts the results into a meta-analytic exercise.

However, what is exactly the tendential equalization of industry return rates and why is it important? The tendential equalization of industry return rates can be defined in different ways.

For instance, Tsoulfidis and Tsaliki (2005) distinguish the actual and instantaneous equalization of profit rates (termed *convergence*) from their *gravitation*. In the latter case, capital – moving from one sector to the other in search of the highest possible profit – produces a turbulent phenomenon such that industry differences in profitability tend to cancel out in the long-run. Return rates' gravitation is a concept connected to the classical-Marxian-Schumpeterian tradition.[1]

[1] On this distinction see also Shaikh (1980) and Duménil and Lévy (1987). Duménil and Lévy (1993, 69-73) write that capital mobility can take the form of either firms' entries and exits – Marx and Adam Smith's view – or credit flows – Ricardo's view.

Convergence takes place under neoclassical perfect competition – a quiet state of equilibrium, where fully informed, rational and symmetric agents operate in a market without either entry or exit barriers, while they take prices as given.

The terms *convergence* and *gravitation* are used here in a different way. In the former case, return rates initially differ, but they tend to assume the same long-run value, albeit allowing for small stochastic deviations that prevent complete equalization. In the latter case, return rates randomly fluctuate around a common value (see D'Orlando, 2007 and, for a graphical account, Vaona, 2011, Figure 1).[2]

The literature contains different definitions of return rates as well. The *average profit rate* (π_t) is defined as total profits (P_t) over the current cost value of the capital stock (K_t):

$$\pi_t = \frac{P_t}{K_t} \tag{1}$$

The *return on regulating capital* has instead been recently defined by Shaikh (1997), Tsoulfidis and Tsaliki (2005) and Shaikh (2008). “Regulating” capital is capital that embodies “the best-practice methods of production” (Tsoulfidis and Tsaliki, 2005, p. 13) or, put otherwise, “the lowest cost methods operating under generally reproducible conditions” (Shaikh, 2008, p. 167). According to these economists, the tendential equalization (either convergence or gravitation, in our terms) of industry profit rates does not happen for average profit rates; it does so only for returns on regulating capital. The reason for this is that, in the presence of some adjustment costs, individual capitals accumulated in the past are not completely free to switch to best-practice methods of production, which are adopted only by new capitals entering a sector. Consequently, *average* profit rates are heterogeneous both within and between sectors, and neither gravitation nor convergence take place among them.

[2] These studies, and especially Tsoulfidis and Tsaliki (2005) and Duménil and Lévy (1993), conduct theoretical discussion on the concept of competition.

According to Shaikh (1997), the return on regulating capital can be approximated by the incremental rate of return (IROR). Total current profits can be divided between profits from the most recent investments ($r_{It} \cdot I_{t-1}$, where r_{It} is the return rate on previous period investments I_{t-1}) and profits from all previous investments (P^*):

$$P_t = r_{It} \cdot I_{t-1} + P^* \tag{2}$$

By subtracting profits lagged one period from both sides of (2), it is possible to obtain

$$P_t - P_{t-1} = r_{It} \cdot I_{t-1} + (P^* - P_{t-1}) \tag{3}$$

Next, it is imposed that $P^* = P_{t-1}$ because for short term horizons – up to one year according to Shaikh (1997) – current profits on carried-over vintages of capital goods (P^*) are close to the last period's profit on the same capital goods (P_{t-1}). As a consequence

$$r_{It} \approx \frac{\Delta P_t}{I_{t-1}} \equiv IROR_t \tag{4}$$

where Δ is the first-difference operator.

Vaona (2012) proposes a different approximation to returns on regulating capital. In that study, the equality $P^* - P_{t-1} = 0$ is not imposed; rather, it is assumed that $P^* - P_{t-1}$ is a stationary random variable, u_t, with zero mean and given variance. In other words, it is assumed that the difference between P^* and P_{t-1}, although it is not nil, does not tend to explode in absolute terms over time. So (3) changes into

$$P_t - P_{t-1} = \rho_t \cdot I_{t-1} + u_t \tag{5}$$

where ρ_t, a time-varying coefficient, is the approximation of the return rate on regulating capital. The assumption of the stationarity of u_t is well established in the reference literature (see, for instance, Shaikh, 1997, p. 395; Tsoulfidis and Tsaliki, 2011; Tsoulfidis, 2011, p. 130; and especially Shaikh, 2008, pp. 172-174).[3] Finally, profit margins on sales are not considered here, because if profit-capital ratios are equalized in the presence of unequal capital-output ratios, it will imply different profit margins (Tsoulfidis and Tsaliki, 2005).[4]

We investigate industry data, not firm-level data, although the latter have been the subject of a rather extensive literature (for a brief review see Vaona, 2011). This is because we accept the arguments advanced by Duménil and Lévy (1993, 145) and Tsoulfidis and Tsaliki (2005). The former study shows, by means of numerical simulations, that industry profit rates can be equalized even when individual firms have different technologies and, therefore, profitability. In other words, it is important to check that the results obtained for micro data also hold for aggregate ones.[5] According to Tsoulfidis and Tsaliki (2005) – under price equalization – profit rates are persistently unequal within sectors owing to non-reproducible elements of production, such as location, climate, natural resources and innovation capabilities.

Moreover, as stressed by Malerba (2002), on introducing the concept of *sectoral systems of innovation and production*, industry dynamics are affected also by organizations different from firms such as universities, financial institutions, government agencies and local authorities, as well as by institutions like specific norms, routines, habits, established practices, rules, laws, standards,

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[3] Indeed, it is so well established that it is customary to assume that $P^{*}-P_{t-1}$ is a just a constant equal to zero.

[4] On the basis of a recent unpublished paper by Duménil and Lévy (2012), it is possible to argue that either IROR in equation (4) or ΔP_t in equation (5) should be corrected to gauge returns on regulating capital properly. This correction should consider various factors, among them the capacity utilization rate. On the one hand, this may induce some measurement error in our dependent variable, which is known not to bias estimates (Wooldridge, 2001). On the other, it is not possible to implement this correction for the countries analysed owing to a lack of data on capacity utilization rates. However, this may prove a fruitful direction for future research.

[5] As also argued, in a different context, by Brown et al. (2009).

and so on. As a consequence, the performance of industries is of interest in itself and cannot be reduced solely to that of their firms.

The tendential equalization of industrial return rates is an important issue on both theoretical and policy grounds. On the one hand, prices of production – the subject of a large body of literature since Sraffa (1960) – are defined as those prices that are charged under a uniform industrial profit rate. On the other hand, if profit rates differ across economic sectors, the possible sources of such difference should be investigated, because it will imply that arbitrage does not take place and some profitable opportunities are left unexploited.

The rest of the paper is structured as follows. First, we introduce our dataset, econometric methods and results, which are then connected to the previous literature by means of a meta-analytic exercise. Finally, the implications for economic policies and for both theoretical and empirical future research are discussed.

The data

We analyse data produced by the national statistical offices of Taiwan from 1983 to 2010 and of New Zealand from 1972 to 2007.[6] The industry classification adopted depends on data availability. For Taiwan we consider the following industries: agriculture, forestry, fishing and animal husbandry; mining and quarrying; manufacturing; electricity and gas supply; water supply and remediation services; construction; wholesale and retail trade; transportation and storage; accommodation and food services; information and communication; finance and insurance; real estate. For New Zealand, instead, we consider the following industries: agriculture; forestry and

[6] Data for Taiwan can be downloaded from http://ebas1.ebas.gov.tw/pxweb/Dialog/statfile1L.asp (accessed on 4 September 2011), and for New Zealand from http://www.stats.govt.nz/infoshare/SelectVariables.aspx?pxID=78459448-8271-4d90-9a90-f8c1cdf0048c and from http://www.stats.govt.nz/infoshare/SelectVariables.aspx?pxID=6ec135dc-0b8f-4aab-8f04-bc0cf0de78c4 (accessed on 4 September 2012).

logging; fishing; mining; food, beverage and tobacco; textiles and apparel; wood and paper products; printing, publishing and recorded media; petroleum, chemical, plastic and rubber products; non-metallic mineral product manufacturing; metal product manufacturing; machinery and equipment manufacturing; furniture and other manufacturing; electricity, gas and water supply; construction; wholesale trade; retail trade; accommodation, restaurants and bars; transport and storage; communication services; finance and insurance.[7]

The public sector is not included in our analysis because investment choices may be driven in that sector by motivations other than the quest for the maximum possible return.

Following Duménil and Lévy (2002), among others, we not only consider all private economic sectors, we also restrict our focus to manufacturing industries alone. We do so because there may exist some measurement errors in the capital stocks of financial intermediation and wholesale trade sectors due to a lack of data on financial debts and assets. Furthermore, individual businesses, whose share is quite large in agricultural and construction activities, may not respond to profit rate differentials because of either a lack of information or the absence of a profit maximizing behaviour. Finally, the long duration of capital stocks may prevent their proper measurement in mining, transportation and electricity activities. In the end, restricting the analysis to manufacturing industries may yield results more favourable to the tendential equalization hypotheses.

Profits are always measured as gross operating surplus and investments as gross fixed capital formation. For Taiwan, there are no available data on the capital stock. We consequently focus only on measures of returns on regulating capital. The national statistical office of New Zealand, instead, publishes data on the net capital stock. Hence we can consider also a net average profit measure,

[7] Our level of aggregation is a rather high one, which may raise concerns that differences among large industries are smaller than among small industries. However, as will become apparent later in the meta-analysis, the level of aggregation does not appear to drive the results to a significant extent.

after subtracting the consumption of fixed capital from the gross operating surplus. All variables are taken in current prices.

Unfortunately, there are no data on the self-employed in New Zealand and Taiwan that can be matched with national accounts data on profitability. Therefore, we cannot correct gross operating surplus by the wage equivalent of the self-employed, as done in Shaikh (2008) among others. We share this limitation with all the studies on non-OECD countries, such as Kambhampati (1995), Maldonado-Filho (1998) and Bahçe and Eres (2011). Both for Taiwan and New Zealand, the gross operating surplus is net of indirect taxes and subsidies.[8]

In order to describe our data, we follow the example of Tsaliki and Tsoulfidis (2005, 2011) and project the absolute deviations of industry return rates from their cross-sectional means over time. When possible, we do so both for all private economic sectors and for manufacturing sectors only. Figures 3 to 11 show a pattern similar to that already highlighted in the literature. Absolute deviations of average profit rates can be highly persistent (as in the case of forestry and logging in New Zealand). Instead, those of IRORs, although they are sometimes sizeable (as in the cases of mining and quarrying in Taiwan and forestry and logging in New Zealand), they tend to die away rather quickly.[9,10]

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[8] Our profit measure is an accounting one. As a consequence, it is exposed to the possible shortcomings highlighted by Fisher and McGowan (1983). However, a defence of accounting returns is put forward in Muller (1986, 107) and Muller (1990, 9-14). Furthermore, at the industry level, there are hardly any alternative data. The importance of analysis at the industry level was highlighted in the Introduction.

[9] The Appendix contains tables regarding descriptive statistics on the analysed series as well as figures depicting the standard deviations of industrial return rates over time. Industries may differ in terms of the time averages of return rates as well as in terms of their dispersions. On analysing the series of the standard deviation of industrial return rates over time, it is difficult to detect clear long-run trends, as series can change direction rather quickly. However, movements in the standard deviation are slower for average profit rates than for IRORs.

Econometrics can shed more light on whether industry return rates either converge or gravitate around their cross-sectional mean. Specifically, we adopt the three approaches illustrated in the next section.

Econometric methods

The seemingly unrelated regression estimator robust to autocorrelation

Our first econometric approach builds on Vaona (2011). We model sectoral deviations of return rates from their cross-sectional means, $\tilde{x}_{it} \equiv x_{it} - \frac{\sum_i x_{it}}{N}$, by resorting to a nonlinear time trend and allowing for serial correlation in the shocks:

$$\tilde{x}_{it} = \alpha_i + \frac{\beta_i}{t} + \frac{\delta_i}{t^2} + \frac{\varphi_i}{t^3} + \varepsilon_{it} \quad (6)$$

$$\varepsilon_{it} = \rho_i \varepsilon_{it-1} + \xi_{it} \quad (7)$$

where $i=1,\dots,N$ is a sector index, ξ_{it} is a stochastic error with a normal distribution with zero mean and variance σ_{ξ}^2, t is time, α_i, β_i, δ_i, φ_i and ρ_i are parameters to be estimated.

Equation (6) was originally proposed by Mueller (1986, p. 12) in his study on long-run profit rates. A third order polynomial in the inverse of a time trend has a number of advantages over other possible specifications. A linear time trend implies a continuous decline in profit rates, even after the attainment of their competitive level. It is therefore unrealistic. Furthermore, the specification of (6) allows for two direction changes in the time-path of profitability not constraining either its peak

[10] It is worth noting that the Taiwanese series are somewhat unstable towards the end of the period of observation. This is due to a dramatic fall in the gross operating surplus in mining activities, which in 2007 was equal to 37988 million Taiwanese dollars, in 2008 to 1015 million Taiwanese dollars and in 2009 to 32973 million Taiwanese dollars. One might wonder about the reliability of these data. Therefore, our results do not change by dropping observations after 2004.

or trough in profitability to occur in the first observed time period. Finally, higher-order polynomials may be plagued by collinearity problems. It is worth noting, though, that Mueller (1986) assumed ε_{it} to be white noise. Hence our specification of (6)-(7) has a greater degree of generality.

We further account not only for serial correlation in the disturbance but also for its possible cross-sector correlation. In order to do so, we adopt a procedure similar to that proposed by Meliciani and Peracchi (2006). First (6) is estimated for each sector. Second, we use the exactly median unbiased (EMU) estimator of Andrews (1993) to estimate ρ_i and its confidence interval from the residuals of (6). Building on our point estimates of ρ_i, following Greene (2003, p. 272), we apply a feasible GLS transformation to our data in order to account for serial correlation.[11] Finally, we implement a seemingly unrelated regressions estimator (SURE) on the transformed data to obtain new estimates of α_i, β_i, δ_i and φ_i.

At this stage, it is possible to test the convergence hypothesis of industry rates of return, which entails

$$\alpha_i = 0 \text{ and } \beta_i \text{ or } \delta_i \text{ or } \varphi_i \neq 0 \text{ for all } i \tag{8}$$

and the gravitation hypothesis, which implies

$$\alpha_i = \beta_i = \varphi_i = \delta_i = 0 \text{ for all } i \tag{9}$$

[11] In order to apply the feasible GLS transformation in a model with an AR(1) disturbance, one pre-multiplies the vector of observations of the dependent variable and the matrix of observations of independent variables of sector *i* by the matrix below:

$$\begin{bmatrix} \sqrt{1-\hat{\rho}_i} & 0 & \cdots & 0 \\ -\hat{\rho}_i & 1 & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & -\hat{\rho}_i & 1 \end{bmatrix}$$

where $\hat{\rho}_i$ is an estimate of ρ_i.

We test (8) and (9) by means of a Wald test.

Finding α_i to be significantly different from 0 for some sectors implies that the deviations of the return rates of these sectors from their cross-sectional mean do not tend to die completely away as time passes. This will be evidence against both the hypotheses of convergence and gravitation. Instead, if one cannot reject (8) but it is possible to reject (9), this is a sign of convergence because the coefficients of the time trends drive our econometric result. In other words, return rates are on time paths that tend to collapse towards their cross-sectional mean as time passes. Finally, if it is not possible to reject (9), this is a sign of gravitation of return rates.

In AR(1) models, the OLS estimator is well known to have a downward bias in small samples (Quenouille, 1956 and Orcutt and Winokur, 1969). The estimator proposed by Andrews (1993) takes care of this problem. Given the OLS estimator of ρ_i, $\hat{\rho}_i$, whose median function is $m(\cdot)$, the EMU estimator of ρ_i is:

$$\tilde{\rho}_i = \begin{cases} 1, & if\ \ \hat{\rho}_i > m(1) \\ m^{-1}(\hat{\rho}_i), & if\ \ m(-1) < \hat{\rho}_i \leq m(1) \\ -1, & otherwise \end{cases} \tag{10}$$

where $m^{-1}(\cdot)$ is the inverse of $m(\cdot)$ and $m(-1) = \lim_{\rho_i \to -1} m(\rho_i)$. The median of $\hat{\rho}_i$ is usually obtained by numerical simulation and interpolation on a fine grid of ρ_i values. In similar fashion, it is possible to obtain the 5th and the 95th quantiles of $\hat{\rho}_i$ and to build a 95% confidence interval of $\tilde{\rho}_i$.[12]

[12] An extension of this estimator to the AR(p) case, with p as the number of lags, is provided in Andrews and Chen (1994). The EMU estimator requires prior knowledge about the distribution of ξ_{it},. However, Andrews (1993) showed that assuming it to be normal produces results robust to various non-normal distributions. One further assumption is that $m(\cdot)$ is continuous and strictly increasing. It is worth noting that in the empirical application by Meliciani and Peracchi (2006), not

The varying coefficient least squares estimator

Our two further econometric approaches exploit varying coefficient estimators for panel data (Hsiao, 1996, 2003; Hsiao and Pesaran 2008).[13] We still build also on (6), but our starting point is now an equation similar to (5), though in panel format

$$\Delta P_{it} = \lambda_{it} \cdot I_{it-1} + u_{it} \tag{11}$$

where λ_{it} is a coefficient that can vary across both time and cross-sectional units. We impose some structure on λ_{it} to estimate it. Combining equations (6) and (11) one has us to write

$$\begin{aligned} \underset{NTx1}{\boldsymbol{\Delta P}} &= \underset{NTxNT}{\boldsymbol{D(I\ )}} \cdot \underset{NTxNT}{\frac{1}{N}(\boldsymbol{1_N} \otimes \boldsymbol{\mathfrak{I}_T}\ )} \cdot \underset{NTx1}{\boldsymbol{\lambda}} + \underset{NTxNT}{\boldsymbol{D(I\ )}} \cdot \underset{NTxNT}{[\boldsymbol{\mathfrak{I}_{NT}} - \frac{1}{N}(\boldsymbol{1_N} \otimes \boldsymbol{\mathfrak{I}_T}\ )]} \cdot \underset{NTx1}{\boldsymbol{\lambda}} + \underset{NTx1}{\boldsymbol{u}} \\ \underset{NTxNT}{[\boldsymbol{\mathfrak{I}_{NT}} - \frac{1}{N}(\boldsymbol{1_N} \otimes \boldsymbol{\mathfrak{I}_T}\ )]} \cdot \underset{NTx1}{\boldsymbol{\lambda}} &= \left(\boldsymbol{\mathfrak{I}_N} \otimes \underset{Tx4}{\boldsymbol{Z}}\right) \underset{(4N)x1}{\boldsymbol{\gamma}} + \underset{NTx1}{\boldsymbol{\eta}} \end{aligned} \tag{12}$$

where subscripts denote matrix dimensions, $\mathfrak{I}$ is an identity matrix, $\boldsymbol{D(I)}$ is a diagonal matrix with $\boldsymbol{I}$ – the column vector containing the data on investment – on its main diagonal, $\boldsymbol{1}$ is a matrix of ones, $\boldsymbol{\lambda}$ and $\boldsymbol{\gamma}$ are vectors of coefficients, $\boldsymbol{u}$ and $\boldsymbol{\eta}$ are vectors of stochastic errors and

$$\boldsymbol{Z} = \begin{bmatrix} 1 & 1 & 1 & 1 \\ \vdots & \vdots & \vdots & \vdots \\ 1 & t^{-1} & t^{-2} & t^{-3} \\ \vdots & \vdots & \vdots & \vdots \\ 1 & T^{-1} & T^{-2} & T^{-3} \end{bmatrix}$$

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resorting to the EMU estimator increases the frequency of rejection of the null hypothesis of equality of parameters across cross-sectional units.

[13] Models with time-varying parameters are special cases of unobserved components models, which – together with differencing and cointegration analyses – are among the econometric approaches used to treat possibly non-stationary time series (Pedregal and Young, 2002, pp. 76-77 and 80). The reason is that they explicitly model trends and the evolution of the error variance across time. Therefore, we are allowed to sidestep unit root, stationarity and cointegration tests for I_{it} and ΔP_{it}.

where T is the last period of observation. We denote matrices in bold characters.

Note that $\boldsymbol{\gamma}$ has the following structure

$$\gamma' = \left[\alpha_1, \beta_1, \delta_1, \phi_1, \cdots, \alpha_N, \beta_N, \delta_N, \phi_N\right]$$

$\underset{NTxNT}{[\boldsymbol{\mathfrak{I}_{NT}} - \frac{1}{N}(\boldsymbol{1_N} \otimes \boldsymbol{\mathfrak{I}_T})]}$ is a matrix that takes the deviations of the elements of a vector of panel data from their cross-sectional means.

In order to achieve an estimable equation, we can first substitute the second equation in (12) into the first one.

$$\boldsymbol{\Delta P} = \boldsymbol{D(I)} \cdot \frac{1}{N}(\boldsymbol{1_N} \otimes \boldsymbol{\mathfrak{I}_T}) \cdot \boldsymbol{\rho} + \boldsymbol{D(I)} \cdot (\boldsymbol{\mathfrak{I}_N} \otimes \boldsymbol{Z})\boldsymbol{\gamma} + \boldsymbol{D(I)\eta} + \boldsymbol{u}$$

Further note that because of the properties of the Kronecker product

$$\boldsymbol{1_N} \otimes \boldsymbol{\mathfrak{I}_T} = \boldsymbol{\iota_N \iota'_N} \otimes \boldsymbol{\mathfrak{I}_T} = (\boldsymbol{\iota_N} \otimes \boldsymbol{\mathfrak{I}_T})(\boldsymbol{\iota'_N} \otimes \boldsymbol{\mathfrak{I}_T})$$

where $\boldsymbol{\iota_N}$ is a column vector of ones.

Hence we can write

$$\boldsymbol{\Delta P} = \boldsymbol{D(I)} \cdot (\boldsymbol{\iota_N} \otimes \boldsymbol{\mathfrak{I}_T}) \cdot \frac{1}{N} \underset{Tx1}{\bar{\boldsymbol{\rho}}} + \boldsymbol{D(I)} \cdot (\boldsymbol{\mathfrak{I}_N} \otimes \boldsymbol{Z})\boldsymbol{\gamma} + \boldsymbol{D(I)\eta} + \boldsymbol{u} \qquad (13)$$

where $\underset{Tx1}{\bar{\boldsymbol{\rho}}}$ is a vector of coefficients that are constant across cross-sectional units. Thanks to these passages, the number of parameters to be estimated shrinks from NT to $T+4N$. Further note that, under the assumption that u_{it} is stationary, homoskedastic, and uncorrelated across time and cross-sectional units, (11) can be estimated by using a weighted least squares (WLS) approach. One first estimates

$$\boldsymbol{\Delta P} = \boldsymbol{D(I)} \cdot (\boldsymbol{\iota_N} \otimes \boldsymbol{\mathfrak{I}_T}) \cdot \frac{1}{N} \underset{Tx1}{\bar{\boldsymbol{\rho}}} + \boldsymbol{D(I)} \cdot (\boldsymbol{\mathfrak{I}_N} \otimes \boldsymbol{Z})\boldsymbol{\gamma} + v$$

by OLS and then uses as weights in a WLS regression the square roots of the fitted values of a regression of the squares of the elements of ***v*** over a constant and the squares of the elements of ***D(I)*** (Greene 2003, p. 228).

The tests for convergence and gravitation are again as in (8) and (9).

The two-way fixed effects estimator

In our last approach, we divide both sides of (3) by I_{t-1}. We can thus write

$$IROR_t = r_{It} + \zeta_t \tag{14}$$

where $\zeta_t \equiv (P^* - P_{t-1})/I_{t-1}$ is assumed to be a stationary random variable with zero mean and given variance. r_{It} is a coefficient that varies over time.

In panel format (14) is

$$IROR_{it} = r_{I,it} + \zeta_{it} \tag{15}$$

By adding and subtracting from the left hand side of (15), the average of $r_{I,it}$ at time t, $\bar{r}_{I,t}$, and using equation (6), one obtains

$$IROR_{it} = \alpha_i + \frac{\beta_i}{t} + \frac{\delta_i}{t^2} + \frac{\varphi_i}{t^3} + \bar{r}_{I,t} + \varepsilon_{it} + \zeta_{it} \tag{16}$$

$\bar{r}_{I,t}$ can be estimated by inserting time dummies into the model. $\varepsilon_{it} + \zeta_{it}$ is a random variable with zero mean and given variance. Finally, (16) can be estimated by resorting to a two-way fixed effect model with a third-order polynomial in the inverse of the time trend. Our gravitation and convergence tests are as in (8) and (9), but we use F tests in this case.

Results and connection to the literature

Our results on Taiwan and New Zealand are set out in Tables 1 to 3. According to our first approach, IRORs in Taiwan were neither converging nor gravitating around their cross-sectional means. The same applies to average profit rates in New Zealand, considering both all the private economic sectors and manufacturing sectors only. Tendential equalization was not taking place among IRORs in New Zealand when all private economic sectors are considered. Instead, they were gravitating around their cross-sectional means if the focus is on manufacturing industries only.

Our second approach provides evidence more favourable for the tendential equalization of return rates. In Taiwan, return rates on regulating capital were converging, while in New Zealand they were gravitating. Restricting the attention to manufacturing industries would not alter this result.

According to our last approach, return rates on regulating capital were converging towards their cross-sectional means in Taiwan. In New-Zealand, IRORs were converging when considering all private sectors, but not when focusing on manufacturing activities only. Therefore, according to this approach, in New-Zealand the pole of attraction of IRORs was not the cross-sectional mean of manufacturing industries, but that of all private industries.

The above results are next inserted into a meta-analytic exercise. The relevant literature is defined as that which adopts data and definitions similar to ours. We therefore consider studies on the dynamics of industry profitability, defined with some reference to the advanced capital in the production process as in equations (1) and (4).[14]

The aim of this procedure is to test whether the results obtained by the studies in the literature are driven by some of their characteristics: that is, the country considered, the length of the observed

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[14] Table 3 in Vaona (2012) describes the studies considered, namely Glick and Ehrbar (1988, 1990), Rigby (1991), Lianos and Droucopoulos (1993a, b), Kambhampati (1995), Maldonhado-Filho (1998), Zacharias (2001), Duménil and Lévy (2002, 2004), Tsoulfidis and Tsaliki (2005), Shaikh (2008), Bahçe and Eres (2011), Tsoulfidis and Tsaliki (2011), Vaona (2011, 2012).

time period, the aggregation level, the method of analysis, the definition of return rate (either on all the capital stock or on regulating capital), the kind of equalization (either convergence or gravitation), the publication status, the econometric model adopted, the statistic of the return rates under analysis – the level of the return rates, their deviations from their cross-sectional means or their dispersion – and the industry coverage. The relevance of these characteristics is discussed in Vaona (2012).

In regard to the explanatory model adopted, seven cases are distinguished: no model, the autoregressive model with and without a trend, a trend model (independently of the degree of the polynomial in the trend), a two-way component model with trend, a plain two-way component model, and a two-way autoregressive component model. In the last cases the dependent variable is decomposed into two parts, which are either sector and time specific or sector and region specific, as in Rigby (1991). The last case further allows for the stochastic error of the model to be autocorrelated.

We have a binary dependent variable, which will assume a value of 1 if there is evidence in favour of tendential equalization and zero otherwise. The unit of observation is each analysis carried out within a study. For instance, if a study first considers all the sectors of a country and then manufacturing sectors only, it will have two entries in our dataset: one for the former results and one for the latter ones.

On including our results for Taiwan and New Zealand in the analysis, the number of observations rises to 159. In 52.83% of the cases, there was no evidence of tendential equalization, while in the remaining 47.17% there was.

Regarding the length of the time period considered, this ranges from 10 to 53 years, with an average of 29. Further descriptive statistics are set out in Table 4. They do not dramatically change with respect to those already available in the literature; hence they are not illustrated any further.

Our control group consists of the analyses by Shaikh (2008), focusing on 1 digit or greater industries in the US, adopting descriptive statistics, defining tendential equalization as gravitation and the return rate as the average profit rate, including all the private sectors, published in a book chapter, not using any model, and explaining the level of the return rate.

Also in the present case, the time period length was not found to be significant.[15] It was consequently dropped and a linear probability model was adopted, which can be used with a binary dependent variable when all the regressors are dummy variables (Wooldridge, 2001, 456-457).

Table 5 shows our results concerning the other explanatory variables. We start with results confirming those already available in the literature. Tendential equalization is more likely to occur in Denmark, Finland, Norway and West Germany than in the US. As a consequence, limitations to capital mobility can be inferred to be weaker in those countries than in the other countries in the sample. Also confirmed is that the level of aggregation, the estimation method, and the definition of tendential equalization do not significantly affect the probability of finding evidence in favour of either the gravitation or convergence of profit rates. Therefore, most of the econometric methods presented in the literature would not *per se* lead scholars in the field to reach conclusions different from descriptive statistics.

Focusing only on either manufacturing or selected industries significantly increases the likelihood of finding evidence in favour of return rates' tendential equalization. Defining them as return rates on regulating capital instead of average profit rates produces a similar effect, which supports the importance of adjustment costs when adopting best practice methods of production. Finally, there is no publication bias.

We have two novel results. The autoregressive model with trend tends to reject tendential equalization significantly more often than does eye inspection, which can therefore be considered a

[15] The relevance of this result is discussed in Vaona (2012).

second best. Considering return rates' dispersion instead of their deviations from the cross-sectional mean does not appear to increase the probability of finding support for tendential equalization.

Conclusions

The paper has considered the cases of Taiwan and New Zealand regarding the convergence and gravitation of industry return rates and connected them to the previous literature in a meta-regression. This approach helps to go beyond the focus of the literature on countries in the northern part of the western hemisphere. Compared to a previous meta-regression, the number of observations rises by 16%.

Most of previous results are confirmed. One exception is that there is some evidence that eye inspection of the data may be misleading, so that it is better to resort to formal modelling. Although this conclusion might seem intuitive, previously there was no evidence that demonstrated it. One further exception is that consideration of the dispersion of the return rates instead of their absolute deviations from the cross-sectional means does not increase the likelihood of finding support for tendential equalization.

The policy and research implications of past results have already been discussed by the literature. The lack of tendential equalization of average profit rates can be ascribed to adjustment costs in adopting best practice methods of production, but other kinds of limitations to capital mobility cannot be neglected, such as investors' lack of information, an uneven distribution of innovation capabilities, credit constraints and market power across economic sectors. One can further add that idiosyncratic risks of each sector may have a role as well, as stressed by Glick and Ehrbar (1988, 1990). These various kinds of limitations of capital mobility can be the target of various policy interventions, such as the creation of institutions able to spread information, antitrust policies, and support for small and medium firms, which often suffer most from credit constraints.

Further specific measures can be recommended by comparing, following Malerba (2002, 2005), low and high performing sectoral systems of production and innovation. This last kind of analysis can pave the way to collaboration between evolutionary economics, on the one hand, and radical political economics on the other, which would give an empirical twist to a debate that to date has been mainly epistemological and theoretical (Bowles, 2006, Hodgson, 2006, Elsner, 2007).

References

Andrews, D. 1993. Exactly median unbiased estimation of first order autoregressive unit root models. *Econometrica* 61: 139-165.

Andrews, D. and H.Y. Chen. 1994. Approximately Median Unbiased Estimation of Autoregressive Models. *Journal of Business and Economic Statistics* 12: 187-204.

Bahçe, S. and B. Eres. 2011. *Competing paradigms of competition: evidence from the Turkish manufacturing industry*. Mimeo.

Bowles, S. 2006. *Microeconomics: Behavior, Institutions and Evolution*. Princeton: Princeton University Press.

Brown, J. R., Steven M. Fazzari and Bruce C. Petersen, 2009. Financing Innovation and Growth: Cash Flow, External Equity, and the 1990s R&D Boom. *Journal of Finance* 64: 151-185.

D'Orlando, F. 2007. A Methodological Note on Long-period Positions. *Contributions to Political Economy* 26: 17-26.

Duménil, G. and D. Lévy. 1987. The Dynamics of Competition: a Restoration of the Classical Analysis. *Cambridge Journal of Economics* 11: 133-164.

Duménil, G. and D. Lévy. 1993. *The Economics of the Profit Rate: Competition, Crises, and Historical Tendencies in Capitalism*. Aldershot: Edward Elgar.

Duménil, G. and D. Lévy. 2002. The Field of Capital Mobility and the Gravitation of Profit Rates (USA 1948–2000). *Review of Radical Political Economics* 34: 417–36.

Duménil, G. and D. Lévy. 2004. The Real and Financial Components of Profitability (United States, 1952–2000). *Review of Radical Political Economics* 36: 82-110.

Duménil, G. and D. Lévy. 2012. *Is the IROR a plausible approximation of the profit rate on regulating capital?* http://www.jourdan.ens.fr/levy/dle2012m.pdf. Accessed on the 10th September 2012.

Elsner, W. 2007. Geoffrey M. Hodgson: Economics in the Shadows of Darwin and Marx. Essays on Institutional and Evolutionary Theme. *Journal of Evolutionary Economics* 17: 365-369.

Fisher, F. M. and J. J. McGowan. 1983. On the Misuse of Accounting Rates of Return to Infer Monopoly Profits. *American Economic Review* 73: 82-97.

Glick, M. and H. Ehrbar. 1988. Profit Rate Equalization in the U.S. and Europe: an Econometric Investigation. *European Journal of Political Economy*, 4: 179-201.

Glick, M. and H. Ehrbar. 1990. Long-run Equilibrium in the Empirical Study of Monopoly and Competition. *Economic Inquiry*, 28: 151-162.

Greene, W.H. 2003. *Econometric Analysis*. Upper Saddle River: Prentice Hall.

Hodgson, G. M. 2006. *Economics in the Shadows of Darwin and Marx. Essays on Institutional and Evolutionary Themes*. Cheltenham, UK: Edward Elgar.

Hsiao, C. 1996. Random Coefficients Models. In *The Econometrics of Panel Data*, eds. Mátyás, L. and P. Sevestre, 77-99. Dordrecht: Kluwer.

Hsiao, C. 2003. *Analysis of Panel Data*. Cambridge: Cambridge University Press.

Hsiao, C. and M. H. Pesaran. 2008. Random Coefficient Models. In *The Econometrics of Panel Data*, eds. L. Mátyás, and P. Sevestre, 185-213. Dordrecht: Springer.

Kambahampati, U. S. 1995. The Persistence of Profit Differentials in Indian Industries. *Applied Economics* 27: 353-361.

Lianos, T. P. and V. Droucopoulos. 1993a. Convergence and Hierarchy of Industrial Profit Rates: the Case of Greek Manufacturing. *Review of Radical Political Economics* 25: 67-80.

Lianos, T. P. and V. Droucopoulos. 1993b. The Persistence of Profits in the Greek Manufacturing Industry, 1963-88. *International Review of Applied Economics* 7: 163 – 176.

Maldonado-Filho, E. 1998. *Competition and Equalization of Inter-industry Profit Rates: the Evidence for the Brazilian Economy, 1973-85*. Paper presented at the mini-conference of the International Working Group on Value Theory at the Eastern Economic Association in New York. Accessed at www.iwgvt.org/files/98fri1a-mal on the 2nd June 2011.

Malerba, F. 2002. Sectoral Systems of Innovation and Production. *Research Policy* 31: 247-264.

Malerba, F. 2005. Sectoral Systems of Innovation: a Framework for Linking Innovation to the Knowledge Base, Structure and Dynamics of Sectors. *Economics of Innovation and New Technology*, 14: 63-82.

Meliciani, V. and F. Peracchi. 2006. Convergence in per-capita GDP across European regions: a reappraisal. *Empirical Economics* 31: 549-568.

Mueller, D. (ed.). 1990. *The Dynamics of Company Profits*. Cambridge: Cambridge University Press.

Mueller, D. 1986. *Profits in the long run*. Cambridge: Cambridge University Press.

Orcutt, G.H. and H.S. Winokur. 1969. First order autoregressions: inference, estimation and prediction. *Econometrica* 37: 1-14.

Pedregal, D. J and P. C. Young. 2002. Statistical Approaches to Modelling and Forecasting Time Series. In *A Companion to Economic Forecasting*, eds. Clements, M. P. and D. A. Hendry, 69-104, Oxford: Blackwell.

Quenouille, M.H. 1956. Notes on bias in estimation. *Biometrika* 43: 353-360.

Rigby, David L. 1991. The Existence, Significance, and Persistence of Profit Rate Differentials. *Economic Geography* 67: 210-222.

Shaikh, Anwar. 1980. Marxian Competition Versus Perfect Competition: Further Comments on the So-called Choice of Technique. *Cambridge Journal of Economics* 4: 75-83.

Shaikh, Anwar. 1997. The Stock Market and the Corporate Sector: A Profit-based Approach. In *Essays in honour of Geoff Harcourt*, eds. Arestis, P., Palma, G. and M. Sawyer. London: Routledge.

Shaikh, A. 2008. Competition and Industrial Rates of Return. In *Issues in Finance and Industry: Essays in Honour of Ajit Singh*, eds. Arestis, P. and J. Eatwell. New York: Palgrave.

Sraffa P. 1960. *Production of Commodities by means of Commodities*. *Prelude to a Critique of Economic Theory*, Cambridge University Press, Cambridge.

Tsoulfidis, L. 2011. *Competing Schools of Economic Thought.* Dordrecht: Springer.

Tsoulfidis, L. and P. Tsaliki. 2005. Marxian Theory of Competition and the Concept of Regulating Capital: Evidence from Greek Manufacturing. *Review of Radical Political Economics* 37: 5-22.

Tsoulfidis, L. and P. Tsaliki. 2011. *Classical Competition and Regulating Capital: Theory and Empirical Evidence*. Thessaloniki: University of Macedonia, Department of Economics, Discussion Paper 2.

Vaona, A. 2011. An Empirical Investigation into the Gravitation and Convergence of Industry Return Rates in OECD Countries. *International Review of Applied Economics* 25: 465-502.

Vaona, A. 2012. Further econometric evidence on the gravitation and convergence of industrial rates of return on regulating capital. *Journal of Post-Keynesian Economics* 35: 111-135.

Wooldridge, M. 2001. *Econometric Analysis of Cross-section and Panel Data*. Cambridge MA: MIT Press.

Zacharias, A. 2001. *Testing Profit Rate Equalization in the U.S. Manufacturing Sector: 1947–1998*. New York: Jerome Levy Economics Institute Working Paper No. 321.

Figure 1 - Number of tests available in the literature on the tendential equalization of industrial rates of return per year

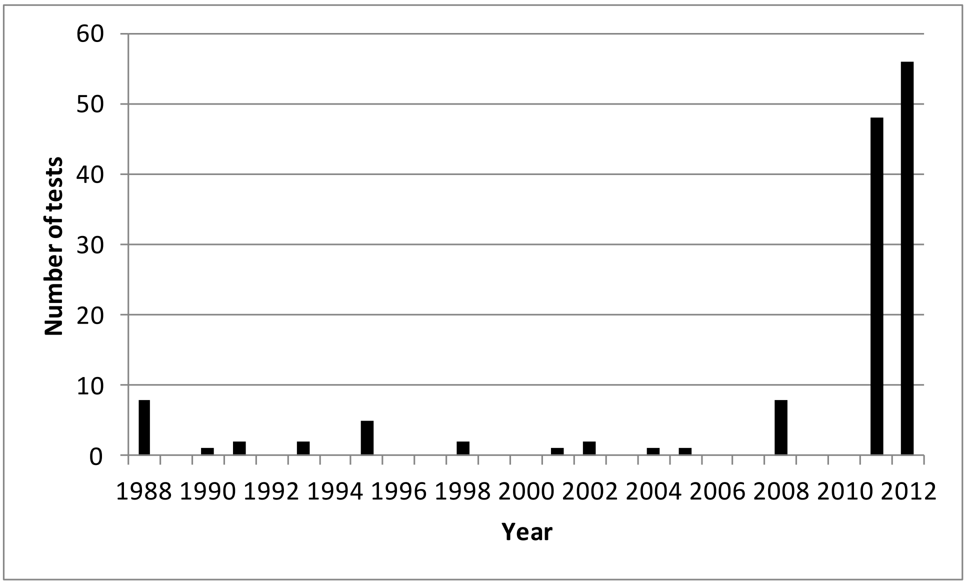

Figure 2 - Country coverage of the tests available in the literature on the tendential equalization of industrial rates of return

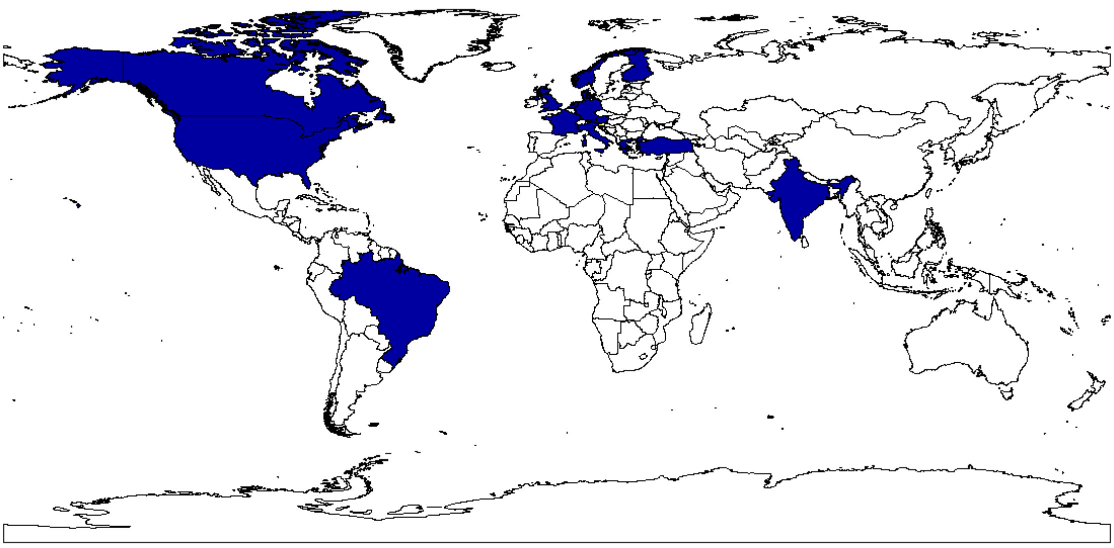

Figure 3 - Deviations of IRORs from the cross-sectional mean of all sectors in Taiwan from 1983 to 2010, by sector

Figure 4 - Deviations of IRORs from the cross-sectional mean of all sectors in Taiwan from 1983 to 2010, mining and quarrying sector

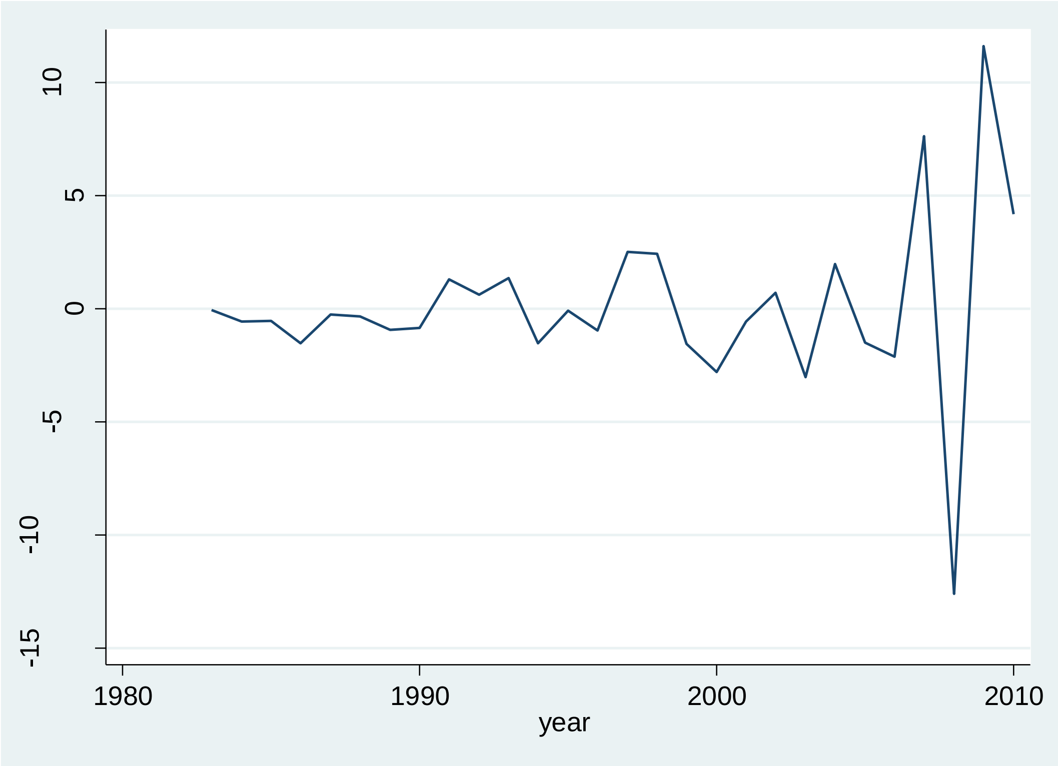

Figure 5 - Deviations of average profit rates from the cross-sectional mean of all sectors in New Zealand from 1973 to 2007, by sector

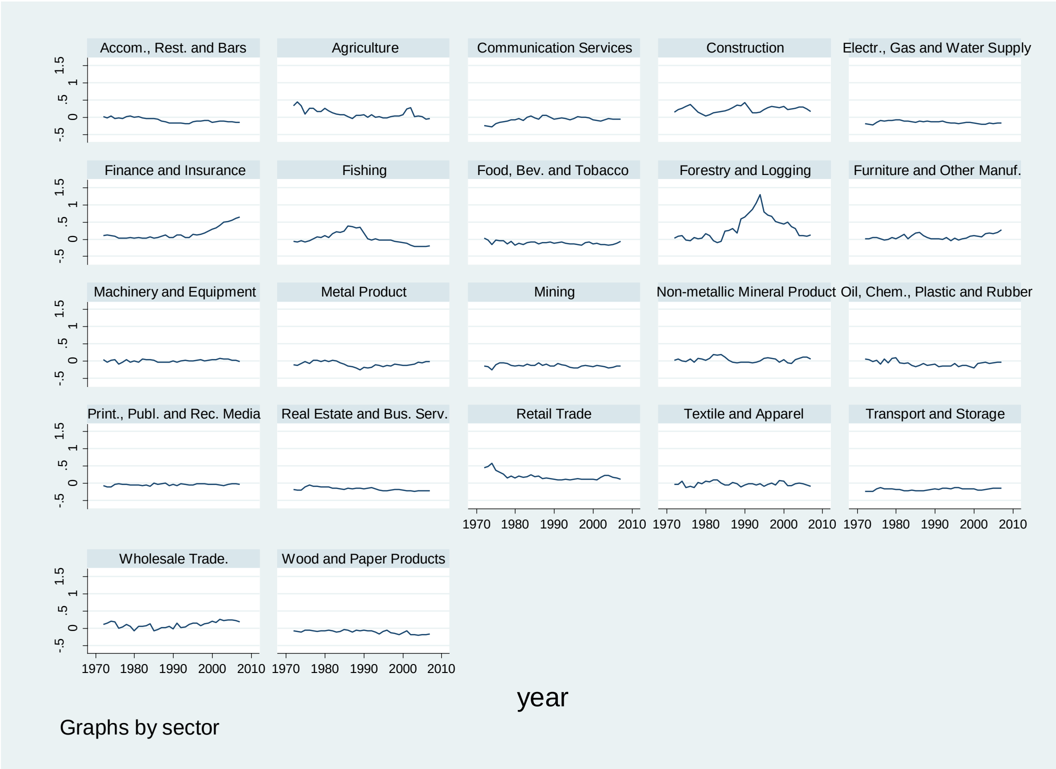

Figure 6 - Deviations of IRORs from the cross-sectional mean of all sectors in New Zealand from 1973 to 2007, by sector

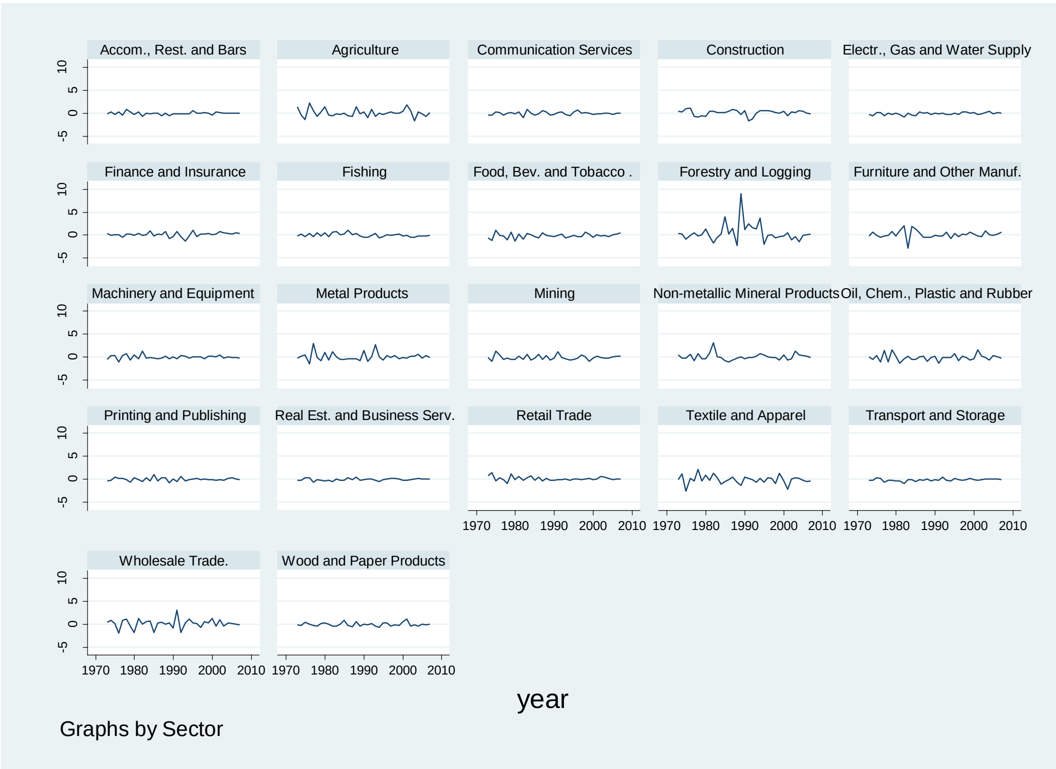

Figure 7 - Deviations of average profit rates from the cross-sectional mean of manufacturing sectors in New Zealand from 1973 to 2007, selected sectors

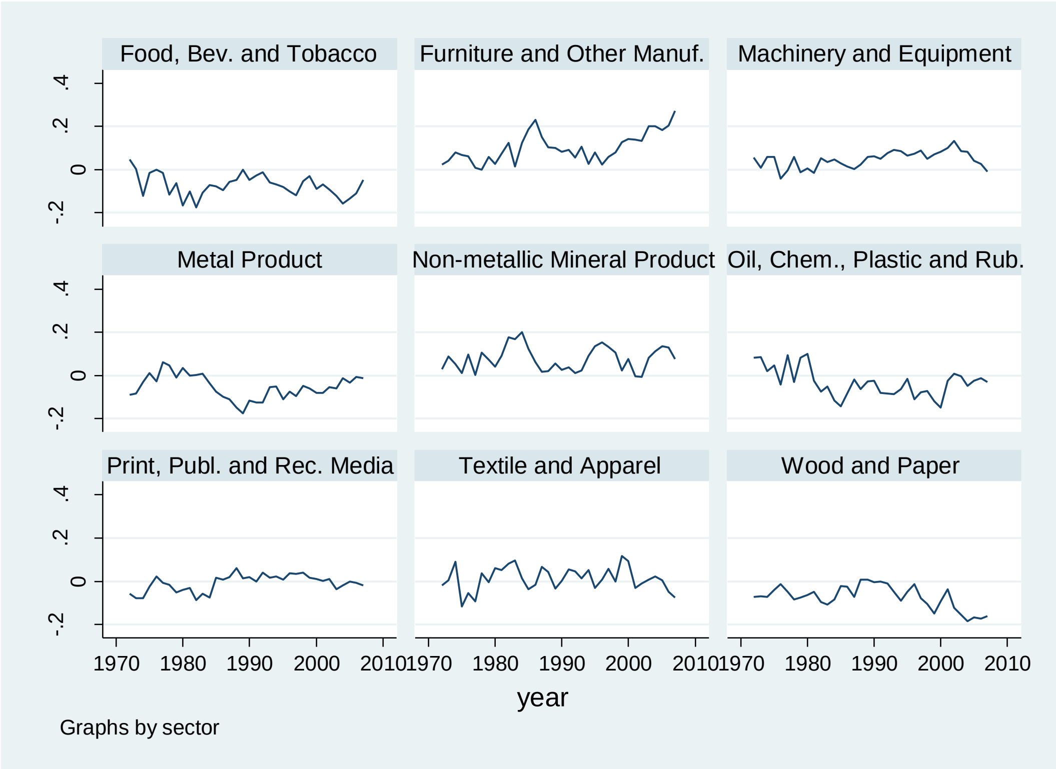

Figure 8 - Deviations of IRORs from the cross-sectional mean of manufacturing sectors in New Zealand from 1973 to 2007, selected sectors

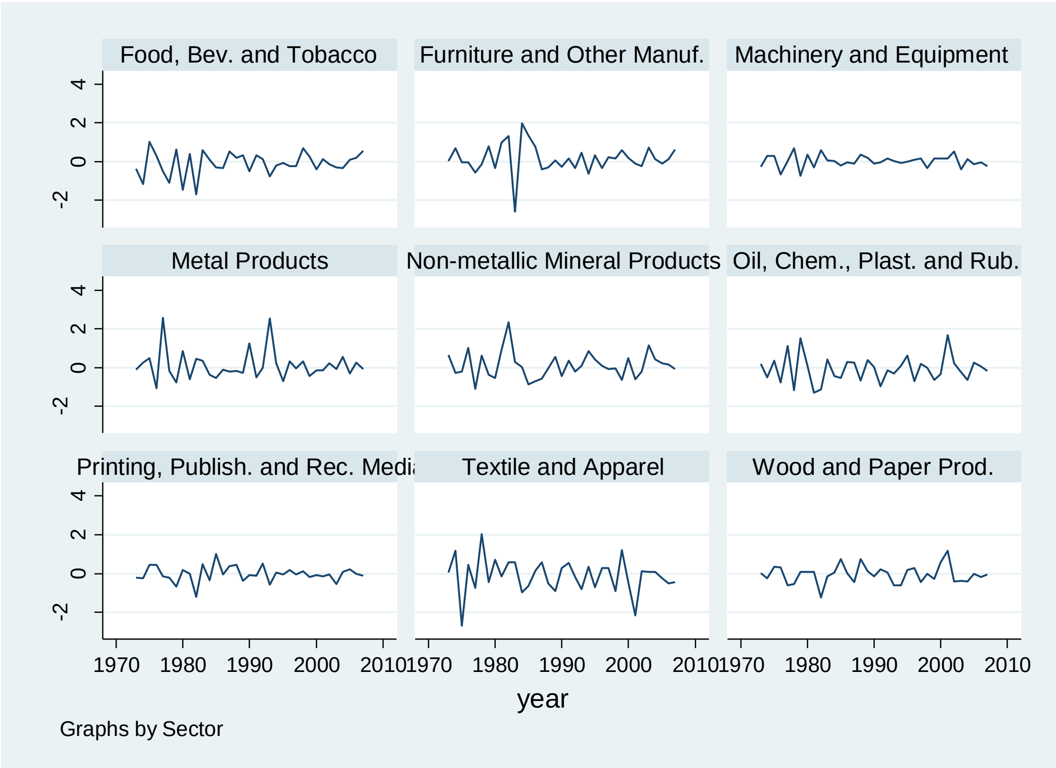

Table 1 - Econometric tests for the convergence and gravitation of industrial return rates.

Estimation method: SURE robust to autocorrelation

	All private sectors			Manufacturing sectors only		
	χ^2	degrees of freedom	p-value	χ^2	degrees of freedom	p-value
Convergence hypothesis						
Taiwan - IROR	65.39	12	0.00	-	-	-
New Zealand - AP	2864.31	22	0.00	67.00	9	0.00
New Zealand - IROR	34.42	22	0.04	5.74	9	0.80
Gravitation hypothesis						
Taiwan - IROR	361.41	48	0.00	-	-	-
New Zealand - AP	7246.25	88	0.00	195.70	34	0.00
New Zealand - IROR	237.48	88	0.00	28.71	36	0.80

Notes. AP: average profit rate. IROR: incremental rate of return. On dropping observations after 2004, for Taiwan the convergence test returns a statistic of 76.95 with 12 degrees of freedom and a p-value equal to 0.00. The gravitation test, instead, returns a statistic of 376.4 with 48 degrees of freedom and a p-value equal to 0.00

Table 2 - Econometric tests for the convergence and gravitation of return rates on regulating capital.

Estimation method: varying coefficient weighted least squares

	All private sectors			Manufacturing sectors only		
	χ^2	degrees of freedom	p-value	χ^2	degrees of freedom	p-value
Convergence hypothesis						
Taiwan - regulating capital	10.38	12	0.58	-	-	-
New Zealand - regulating capital	20.28	22	0.56	6.78	9	0.66
Gravitation hypothesis						
Taiwan - regulating capital	220.63	47	0.00	-	-	-
New Zealand - regulating capital	56.59	80	0.99	16.63	35	0.99

Table 3 - Econometric tests for convergence and gravitation of return rates on regulating capital.

Estimation method: two-way least squares dummy variables

	All private sectors				Manufacturing sectors only			
	χ^2	degrees of freedom	degrees of freedom	p-value	χ^2	degrees of freedom	degrees of freedom	p-value
Convergence hypothesis								
Taiwan (1983-2010)	1.1	12	264	0.36	-	-	-	-
New Zealand (1973-2007)	0.72	22	651	0.82	14.87	9	248	0.00
Gravitation hypothesis								
Taiwan (1983-2010)	711.68	45	264	0.00	-	-	-	-
New Zealand (1973-2007)	1024.44	85	651	0.00	783.31	33	248	0.00

Notes. On dropping observations after 2004, for Taiwan the convergence test returns a statistic of 1.37 with 12 and 198 degrees of freedom and a p-value equal to 0.18. The gravitation test, instead, returns a statistic of 7438.25 with 45 and 198 degrees of freedom and a p-value equal to 0.00

Table 4 – A statistical description of the literature

	Freq.	Percent
Countries		
Austria	12	7.55
Brazil	2	1.26
Canada	2	1.26
Denmark	4	2.52
Finland	16	10.06
France	1	0.63
Germany	1	0.63
Greece	5	3.14
India	5	3.14
Italy	17	10.69
Netherlands	12	7.55
New Zealand	16	10.06
Norway	12	7.55
OECD	2	1.26
Taiwan	6	3.77
Turkey	4	2.52
UK	1	0.63
US	29	18.24
West Germany	12	7.55
Total	159	100
Aggregation levels		
1 digit or greater	133	83.65
2 digits industries	15	9.43
3 digits industries	11	6.92
Total	159	100

(continues)

Table 4 – A statistical description of the literature

(continued)

	Freq.	Percent
Estimation methods		
ANOVA	1	0.63
Descriptive stat.	11	6.92
Maximum likelihood robust to autocorrelation	8	5.03
Least squares	43	27.04
OLS robust to autocorrelation	2	1.26
SURE robust to autocorrelation	52	32.7
SURE	1	0.63
Unit root/cointegration	6	3.77
Varying coefficient weighted least squares	34	21.38
Weighted least squares robust to autocorrelation	1	0.63
Total	159	100
Type of equalization		
Convergence	63	39.62
Gravitation	96	60.38
Total	159	100
Industry coverage		
All private sectors	63	39.62
Manufacturing	84	52.83
Selected	12	7.55
Total	159	100
Publication status		
Book chapters	8	5.03
Journal Articles	120	75.47
Unpublished	31	19.5
Total	159	100

(continues)

Table 4 – A statistical description of the literature

(continued)

	Freq.	Percent
Models		
Autoregressive model	11	6.92
Autoregressive model with trend	57	35.85
No model	11	6.92
Trend model	36	22.64
Twoway autoregressive components model	9	5.66
Twoway components model	1	0.63
Twoway components model with trend	34	21.38
Total	159	100
Explained statistics of the return rate		
Deviations from cross-sectional mean	105	66.04
Level	53	33.33
Dispersion	1	0.63
Total	159	100
Return rate definition		
Average profit rate	49	30.82
Return rate on regulating capital	110	69.18
Total	159	100

Table 5 – A quantitative assessment of the literature.

Method: linear probability model with robust standard errors. Dependent variable: probability of finding evidence in favour of the tendential equalization of return rates. Observations: 159.

	Coefficients	t-stat.	p-values
Country dummies			
Austria	0.07	0.17	0.67
Brazil	-0.06	1.37	0.96
Canada	-0.43	0.52	0.41
Denmark	0.36	0.16	0.03
Finland	0.39	0.14	0.01
France	-0.30	0.23	0.19
Germany	-0.30	0.23	0.19
Greece	0.24	0.34	0.48
Italy	0.00	0.16	1.00
Netherlands	0.16	0.17	0.36
New Zealand	0.64	0.59	0.28
Norway	0.41	0.15	0.01
OECD	0.12	0.30	0.69
Taiwan	0.46	0.61	0.45
Turkey	0.35	1.25	0.78
UK	-0.30	0.23	0.19
West Germany	0.41	0.16	0.01
Aggregation level dummies			
2 digits industries	-0.09	0.40	0.82
3 digits industries	-0.19	0.86	0.82
Estimation method dummies			
Maximum likelihood robust to autocorrelation	0.21	0.49	0.67
OLS	0.68	0.64	0.29
OLS robust to autocorrelation	0.43	0.82	0.60
Unit root/cointegration	0.68	0.80	0.40
Varying coefficient weighted least squares	0.40	1.19	0.74

(continues)

Table 5– A quantitative assessment of the literature.

(continued)

	Coefficients	t-stat.	p-values
Type of equalization			
Convergence	0.14	0.07	0.06
Industry coverage			
Manufacturing	0.24	0.08	0.00
Selected	0.57	0.20	0.01
Publication status dummies			
Journal Article	0.40	0.31	0.19
Unpublished	-0.03	0.43	0.94
Model dummies			
Autoregressive	-0.56	0.61	0.37
Autoregressive with trend	-0.71	0.36	0.05
Trend	-0.75	1.19	0.53
Twoway autoregressive component model	-0.43	0.52	0.41
Twoway components model with trend	-1.06	0.74	0.15
Explained statistic of the return rate			
Level	-0.12	0.30	0.69
Dispersion	0.26	0.33	0.43
Return rate definition			
Return rate on regulating capital	0.51	0.10	0.00
Constant	-0.12	0.24	0.63
R^2		0.56	

Notes: the dummies for India, for the methods analysis of variance, SURE, SURE robust to autocorrelation, weighted least squares robust to autocorrelation and for the two-way components model were dropped due to collinearity

Appendix

Table A1 - Descriptive statistics of incremental rates of return in Taiwan by industry, 1983-2010

	MEAN	ST.DEV.	MIN.	MAX.
A. Agriculture, Forestry, Fishing and Animal Husbandry	0.23	0.69	-1.02	1.91
B. Mining and Quarrying	0.30	4.26	-13.69	12.77
C. Manufacturing	0.11	0.26	-0.26	1.13
D. Electricity and Gas Supply	0.00	0.18	-0.44	0.59
E. Water Supply and Remediation Services	0.13	0.18	-0.12	0.56
F. Construction	0.17	0.54	-0.92	1.59
G. Wholesale and Retail Trade	0.47	0.29	-0.29	1.06
H. Transportation and Storage	0.09	0.20	-0.27	0.87
I. Accommodation and Food Services	0.23	0.29	-0.35	0.84
J. Information and Communication	0.11	0.09	-0.06	0.26
K. Finance and Insurance	0.50	0.87	-0.93	3.12
L. Real Estate	0.17	0.12	-0.16	0.38

Table A2 - Descriptive statistics of incremental rates of return in New Zealand by industry, 1973-2007

	MEAN	ST.DEV.	MIN.	MAX.
Accommodation, Restaurants and Bars	0.23	0.31	-0.47	1.08
Agriculture	0.31	0.82	-1.49	2.08
Communication Services	0.22	0.27	-0.10	1.07
Construction	0.38	0.62	-1.53	1.43
Electricity, Gas and Water Supply	0.16	0.16	-0.13	0.46
Finance and Insurance	0.43	0.45	-0.89	1.53
Fishing	0.27	0.47	-0.40	1.67
Food, Beverage and Tobacco Manufacturing	0.15	0.44	-0.86	1.00
Forestry and Logging	0.74	2.07	-2.36	9.50
Furniture and Other Manufacturing	0.41	0.93	-2.56	3.10
Machinery and Equipment Manufacturing	0.28	0.56	-1.11	2.36
Metal Product Manufacturing	0.37	1.00	-1.52	3.76
Mining	0.18	0.43	-0.97	1.36
Non-metallic Mineral Product Manufacturing	0.36	0.84	-0.81	4.11
Petroleum, Chemical, Plastic and Rubber Product Manufacturing	0.18	0.78	-1.23	2.30
Printing, Publishing and Recorded Media	0.24	0.40	-0.33	1.69
Real Estate and Business Services	0.19	0.11	-0.02	0.51
Retail Trade	0.37	0.53	-0.63	2.02
Textile and Apparel Manufacturing	0.15	1.01	-2.81	2.48
Transport and Storage	0.12	0.15	-0.26	0.42
Wholesale Trade	0.40	1.06	-2.00	3.19
Wood and Paper Products Manufacturing	0.22	0.42	-0.48	1.42

Table A3 - Descriptive statistics of average profit rates in New Zealand by industry, 1972-2007

	MEAN	ST.DEV.	MIN.	MAX.
Accommodation, Restaurants and Bars	0.15	0.06	0.04	0.30
Agriculture	0.34	0.12	0.19	0.71
Communication Services	0.17	0.10	-0.03	0.30
Construction	0.46	0.12	0.19	0.65
Electricity, Gas and Water Supply	0.09	0.03	0.02	0.13
Finance and Insurance	0.40	0.22	0.15	0.92
Fishing	0.25	0.15	0.07	0.60
Food, Beverage and Tobacco Manufacturing	0.13	0.06	-0.02	0.30
Forestry and Logging	0.56	0.37	0.07	1.58
Furniture and Other Manufacturing	0.30	0.10	0.13	0.55
Machinery and Equipment Manufacturing	0.25	0.08	0.03	0.38
Metal Product Manufacturing	0.15	0.07	-0.03	0.27
Mining	0.10	0.04	0.01	0.17
Non-metallic Mineral Product Manufacturing	0.28	0.08	0.13	0.41
Petroleum, Chemical, Plastic and Rubber Product Manufacturing	0.17	0.08	0.03	0.33
Printing, Publishing and Recorded Media	0.19	0.06	0.08	0.28
Real Estate and Business Services	0.07	0.01	0.03	0.08
Retail Trade	0.43	0.12	0.30	0.85
Textile and Apparel Manufacturing	0.21	0.08	0.01	0.34
Transport and Storage	0.06	0.06	-0.04	0.16
Wholesale Trade	0.34	0.13	0.09	0.56
Wood and Paper Products Manufacturing	0.13	0.04	0.05	0.22

Figure A1 - Natural logarithm of the standard deviation of industrial incremental return rates in Taiwan, 1983-2010

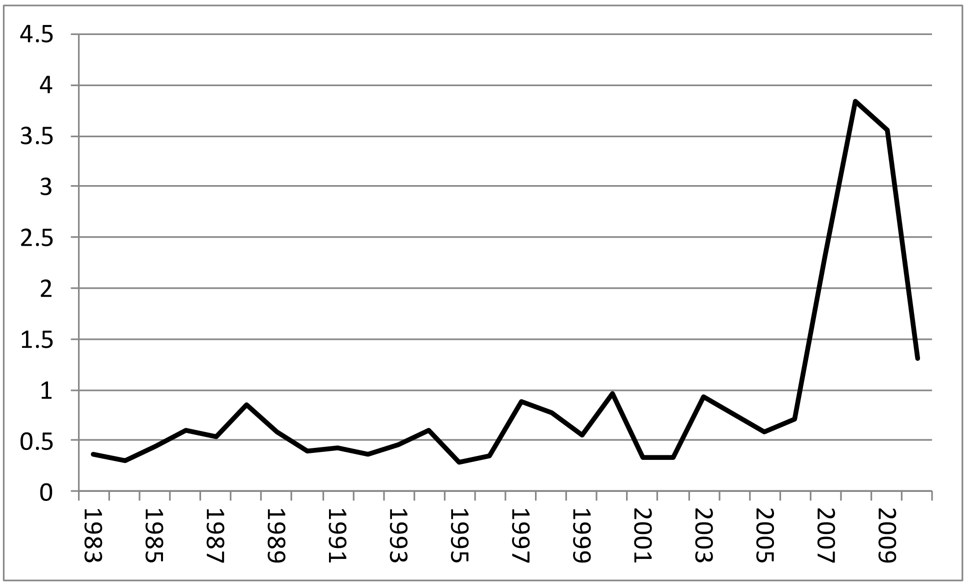

Figure A2 - Natural logarithm of the standard deviation of industrial incremental return rates in New Zealand, 1973-2007

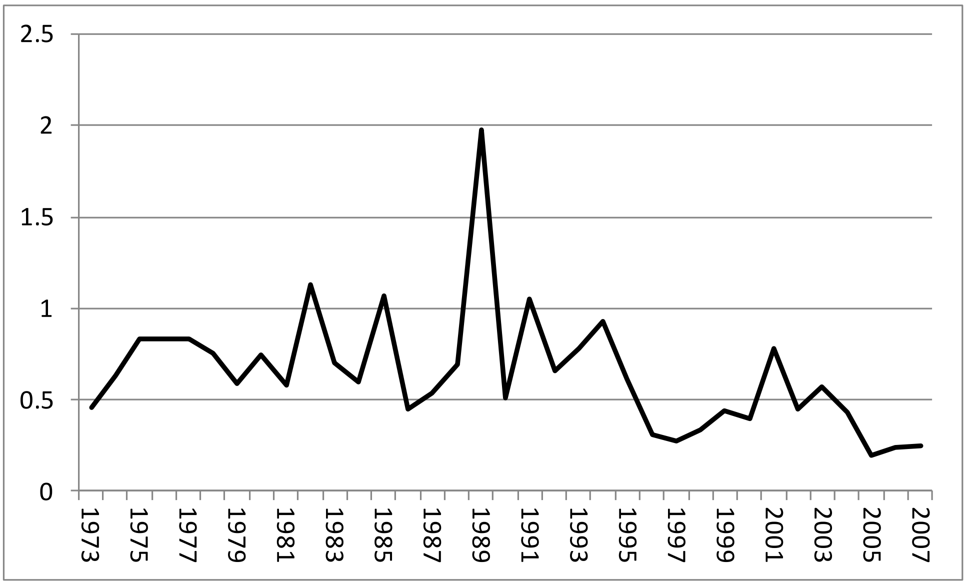

Figure A3 - Natural logarithm of the standard deviation of industrial average profit rates in New Zealand, 1972-2007