Investigating entrepreneurial spirit with the rule approach: why self-employment is on the decline in Japan

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Abstract

This paper investigates the determinants of entrepreneurial spirit as measured by parental preference of self-employment for male heirs in Japan since 1992 through a statistical analysis. In addition to the relevance of our findings for entrepreneurship research, this empirical study serves as a showcase for the rule approach of Dopfer and Potts in applied research. It helps to understand how self-employment has become a less and less desirable occupational choice since the abandonment of Japan's high growth path in the early 1990s. For entrepreneurial spirit in Japan, business sentiment, interest rates (perceived cost of capital), changing family structures (declining number of siblings), and fear of unemployment are all identified to exert significant negative influence. While the former three are strongly significant during all of the investigation period (1992-2007), fear of unemployment is found to strongly influence entrepreneurial spirit in the general population from 1998 onwards only. The rule approach helps to motivate how agents have come to understand unemployment as a factor relevant for their economic lives in the course of the years following the burst of the Japanese bubble economy. Negative signs on both business sentiment, and on fear of unemployment relate to different subgroups of agents, namely to self-employed individuals (business sentiment), and to individuals in dependent employment (fear of unemployment). Improving business sentiment means higher viability of preferred occupational choice for the self-employed, whereas a higher degree of fear of unemployment discourages dependently employed individuals from embarking on the route of self-employment. Further findings include significant evidence that the nominal interest rate – rather than its real counterpart – likely influences entrepreneurial spirit in Japan.

Keywords: rule approach, Japan, entrepreneurial spirit, latent entrepreneurship, money illusion

JEL: B52, L26, Z13

1. Introduction

This article investigates entrepreneurial spirit as a measure of the general appreciation of self-employment in Japan since 1992. Ever since Japan's real estate and asset price bubble burst in the early 1990s, entrepreneurial activity has constantly been on the decline. In order to understand what factors are driving the perception of self-employment in this environment, we take a fresh look at the entrepreneur by relating the concept of entrepreneurial spirit to that of self-employment. For reasons that will become apparent as our analysis proceeds, Japan proves to be a particularly interesting empirical case.

We build our empirical work on two pillars: a theoretical frame represented by the rule approach (Dopfer 2001, 2005; Dopfer and Potts 2008, 2009), and a tailor-made methodology developed to enable applications of the rule approach in empirical studies. The purpose of our analysis is two-fold. Firstly, we propose an empirical study in its own right. Secondly, our study is also a showcase for demonstrating how the rule approach may lend itself to support empirical investigations.

1.1 The rule approach in a nutshell

The rule approach as a theoretical framework is enjoying increasing recognition (Strohmaier 2010, Beinhocker 2011) including a most significant positive appraisal by Ostrom and Basurto (2011). The starting point of an analysis based on the rule approach is the recognition that human knowledge lies at the core of all economic operations. The analytical essence of the rule approach is this: the economy is composed of two levels, namely a rule level, and a level of operations conducted upon those rules. At the rule level we see the economic agent as a carrier of knowledge. At the operational level, the agent employs his rule knowledge for economic operations. Applied to entrepreneurship, we conceive of latent entrepreneurship as a rule, while business formation represents the corresponding operation.

The rule approach further builds on a distinction between micro, meso and macro. While micro analyses how novel ideas originate, meso investigates the diffusion of that novel rule from one to many carriers, and defines the collective of rule adopters as a rule population. Macro, in turn, inquires about changes in the system of rules generated by the diffusion of a novel rule.

A complete taxonomy of rules is provided in Dopfer and Potts (2008: 8-9). At this point, it suffices to note that orders of rules explain how rules are effective in the economic system. Whilst 1st order rules are governing operations between agents, 2nd order rules enable the generation, adoption and retention of other rules. "Entrepreneurial spirit" as the

general appreciation of self-employment analyzed in this research, represents a 2nd order rule impacting positively on the 1st order rule of latent entrepreneurship. In turn, 0th order rules represent rules pertaining to the economic system as a whole (e.g., laws).

1.2 Putting the rule approach into practice

Responding to an implicit call by Ostrom and Basurto (2011: 334) we have developed a methodology for using the rule approach in empirical studies. At this point, it shall suffice to provide a brief sketch of this methodology. As premises we note: (1) Individual knowledge differs between agents. (2) The set of rules in an agent has a potential for change through learning. (3) The choice of agents as to which rule to apply depends on the decision problem in question. From these three premises we understand that there is not only variation over time, and variety between agents, but there is also variety within individual agents. Adding to these, there is one more premise: (4) There is a necessity to distinguish systematically between rule level and operational level in empirical inquiries. As a consequence, we start our empirical investigation with setting a response rule as explanandum. It is noteworthy, that contemporary entrepreneurship research explicitly recognizes the difference between rules and corresponding operations through the distinction of latent and actual entrepreneurship.

Next, we need to establish the System of Factor Rules (SFR) for the explanandum. In the SFR, we provide a detailed account of rules that are possibly influencing the explanandum, where influences always refer to the size of the response rule population. In doing so, it is important to make sure not to include operational variables such as prices or quantities. As subsequent steps follow: a categorization of factor rules according to the rule taxonomy, the determination of the existence and nature of relationships to the response rule, and an assessment of factor rules for interdependencies among their kind. Upon the completion of these procedures, we can assemble the SFR. Possible representations range from a simple tabulated list to graphical representations.

Subsequently, we extract the rules of the SFR that have generated changes in the response rule population during the investigation period; we refer to this as the changing sub-system (CSS). Changes at the rule level are seen as occurring in three ways: (1) The size of rule populations can fluctuate. (2) New rules can emerge and existing rules may perish. (3) New connections between rules can arise, e.g., when agents learn to recognize the significance of one rule for another.

We propose two criteria for extracting changing factor rules from the SFR:
(a) variation in the size of rule populations; and (b) variation in the strength of influence

exerted on the response rule population. By this assessment we can identify the CSS as the ensemble of factor rule populations with one or both criteria at sizeable values. All other rules belong to what we denote as the Meta-Stable Sub-System (MSSS), which consists of those factor rules that do not contribute to the variation in the explanandum. Statistically, MSSS rules account for the intercept, whilst CSS rules influence the slope. Finally, we develop and test hypotheses for the CSS. In order to increase explanatory power, we may establish subgroups of agents by determining differences in susceptibility to CSS factor rules.

1.3. Entrepreneurship reconsidered: on the perspective of the rule approach

For the purpose of our study, we define as entrepreneurship the changing from non-entrepreneur (however defined) to entrepreneur, i.e., from any other economic activity or unemployment to self-employment. In adopting this wider definition we acknowledge a general trend in empirical entrepreneurship research (Acs and Audretsch 1994).

Applied research has since long acknowledged the distinction between latent and actual entrepreneurship. What is more, the most prominent international entrepreneurship survey has also inquired about *entrepreneurial spirit* in its section on "entrepreneurial attitudes" since 1999 (Global Entrepreneurship Monitor; GEM). In our reading, entrepreneurial spirit represents a 2nd order rule (a rule for the adoption of other rules), while latent entrepreneurship represents a 1st order rule. In turn, acts of business formation represent operations conducted by applying that 1st order rule. So, from the perspective of inquiries into actual entrepreneurship, the primary significance of entrepreneurial spirit is its strong influence on the prevalence of latent entrepreneurship.

2. Entrepreneurial spirit in Japan: any evolution since 1992?

Unfortunately, the GEM survey on entrepreneurial attitudes for Japan comes with two drawbacks. Firstly, the data do not cover our entire observation period. Secondly, the data are arguably subject to a systematic bias overstating the appreciation of self-employment owing to the survey design.[1] What is more, the theoretical concept of entrepreneurial spirit

[1] When translating the survey, GEM researchers did not render the English term "own business" into its Japanese equivalent *ji'eigyō*, but into the borrowed English word *bijinesu*. While both terms are frequently used in everyday language, they come with completely different connotations. While *bijinesu* implies something fancy, modern, and big, *ji'eigyō* signifies a rather traditional, boring, and small-scale activity. What is more, behavioral studies among Japanese students have shown that English terms strongly activate

has not yet been analyzed satisfactorily for Japan, and even studies on latent and actual entrepreneurship can be considered relatively rare (e.g., Harada 2005, Masuda 2006). Therefore, it seems essential to complement this body of knowledge with an analysis of entrepreneurial spirit.

Official data, available from the Employment Status Survey comes with two drawbacks. Firstly, it is available only every five years. Secondly, it provides numbers of *individuals* wishing to engage in self-employment, i.e., those that refer to the 1st order rule of latent entrepreneurship. In contrast, the survey data we use in this research are available on an annual base, and refer to the *general* appreciation of self-employment. Conducted by Kuraray, Inc., Japan's close to monopolist provider of materials for primary school book satchels, the surveys we use inquire about the preferences of parents regarding the future careers of their 6-year old children.[2] With respect to 6-year olds, questions of education or employment conditions are naturally not yet to be considered. Consequently, the viewpoint of parents taken with regard to self-employment as a career option for their offspring represents their unbiased appraisal of entrepreneurship. It is for this reason that we refer to these data as a valid measurement of entrepreneurial spirit and note the rule as *ES*.

The values for *ES* fluctuate between 0.6 and 4.2% of respondents. While this low value can in part be explained by a number of professions with significant self-employment shares being listed as separate categories (such as physicians, lawyers, architects, etc.), even the very highest share of parents preferring traditional self-employment for their children of 4.2% in 1995 was still far below the 10% self-employed in the Japanese workforce[3]. Arguably, self-employment does not represent the preferred occupational choice even among many self-employed parents.

Western reasoning (Suzuki, T. and Y. Kuroda 1991, "A comparative analysis of the Arab culture: Arabic, English and Japanese languages and values," Behaviormetrika 30:40). Hence, the attractiveness of business in the West would be significantly reflected in the 26% positive survey responses in 2008.

2 The survey has been conducted every March since 1992; we accessed surveys from our investigation period (Kuraray, Inc. 1992-2007) which collected more than 2,000 responses on a nation-wide scale every year.

3 The number of self-employed among the professions scoring highest in Kuraray's survey account for only about 15% of total self-employment (approx. 850,000 of 5.8 million, counting 100,000 physicians, 30,000 lawyers, 150,000 pharmacists, 100,000 self-employed in transport, and about 500,000 independent craftsmen and architects). Adjusted for these professions, Kuraray's definition of self-employment accounts for about 8.5% of the total workforce.

2.1 Extracting the changing rule system for entrepreneurial spirit

After this discussion of the low base of *ES* in Japan, the following concentrates on the factors that cause this base to fluctuate over time. We consider what factors are driving the belief that self-employment is a desirable occupational choice; or, in terms of the rule approach, what factors make agents adopt or reject the response rule of *ES*.

Employing our explanandum to Japan since 1992, to establish the SFR we first have to identify rules that might exert influence on *ES*. After an extensive literature research and conducting a series of 24 expert interviews[4] involving scholars, response rule adopters, and rejecters, we obtain a list of 19 factor rules. Upon identification of the nature of relations between the factor rules and the response rule, we can transform our list into a hierarchical model.

Next, we identify that part of the SFR that has undergone changes during the observation period, i.e., the CSS. Based on the two criteria introduced in the methodological section, we are able to eliminate a large number of factor rules without significant variation between 1992 and 2007 constituting the MSSS[5]. Those factor rules with significant variation in at least one of the two criteria enter into the CSS. Yet, also within the CSS, we have found a number of factor rules to be of limited relevance only. Limitations either pertain to the time dimension, or to the group size of individuals concerned.[6] Table I provides a summary of this assessment. Pertaining to our findings on the CSS, we can expect that a most significant part of the fluctuation in the size of the rule population of entrepreneurial spirit *ES* has been generated by the factor rules of (1) business sentiment (*BizSent*), (2) fear of unemployment (*FearUE*), (3) perceived cost of capital (*pCoC*), and (4) filial piety (*FP*) via changing family structures. Individual rationales are discussed in the following section.

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[4] Interviews involved scholars and practitioners in economics (4), sociology (3), psychology and ethnology (1 each), business studies (3), venture finance (2), experienced entrepreneurs (2), employed individuals (4), and adult individuals in higher education (4)

[5] For instance, changes in the distribution of family assets and income as a measure of "egalitarianism" have been negligible since 1992 (Ōtake, F. (2005) *Nihon no fubyōdō: kakusa shakai no gensō to mirai* (Inequality in Japan - illusion and future of the divided society). Nikkei, Tokyo). Similarly, there have been no substantial changes in bankruptcy and banking legislation.

[6] For instance, the 2006 lowering of capital requirements for incorporation was effective only in the last period of our investigation period. Similarly, the rise of non-regular employment is a phenomenon affecting specific age cohorts only (Blind and Lottanti (2012) "Neither Struck by the British, nor the Dutch Diseases: The Japanese Economy Comes along Quite Healthy"; in Chiavacci, D and I. Wieczorek: Japan 2012. Berlin: VSJF).

Table 1. Estimated relevance via (a) population fluctuation; (b) strength of relation.

Rule order	High	Limited	Negligible
0th order		- Capital requirements (from 2006)	- Bankruptcy legislation (a, b) - Labor unions (a, b) - Start-up aid as government duty (b) - Filial piety (a) - Egalitarianism (a)
1st order	- Demographic change I: Family structures - Perceived cost of capital - Business sentiment	in conjuction with - Non-regular employment* - Economically motivated crime*	- Start-up lending policy of banks (a) - Venture Capital (b) - Demographic change II: age structure (offset of a and b) - Seniority vs. performance principle* (b) - Emigration* (b) and suicide* (b)
2nd order	- Fear of unemployment*		- Image of failure (a) - Traditional class order (a)
Rule System	Full Rule System (SFR)		
	Changing Sub-System (CSS)		Meta-Stable Sub-System (MSSS)

* Pertaining to economic alternatives.

2.2 Sub-group-specific hypotheses

For our study, we distinguish a sub-group SE of self-employed agents, and a sub-group DE of dependently employed agents. Our distinction is warranted as occupational status represents the highest discriminatory criterion pertaining to *ES*. We expect an important share of parents who want their children to become self-employed in the future to be entrepreneurs themselves. Neglecting the negligible fraction of unemployed parents, we assume that all other parents are dependently employed individuals.

For the formulation of meaningful hypotheses, we rely on findings from the development of the SFR and from the extraction of the CSS. Regarding subgroup SE we argue that they are highly susceptible to business sentiment. In contrast, fear of unemployment is hardly a major concern to the self-employed. While not as pronounced, the opposite generally holds for sub-group DE of dependently employed individuals. In the following we provide considerations on the four factor rules in the CSS.

(a) BizSent (subgroup SE)

Intuitively, we might suppose that agents of sub-group SE should draw hopes from a rise in business sentiment with regard to their offspring as potential successors. However, three aspects are contradicting this intuition. Firstly, most agents in their mid-30s are likely not to be too much concerned about succession issues yet. Secondly, the vast majority of self-employed agents do not run a business needing a successor: about two in three Japanese businesses do not even have regular employees. Third, we recall that self-employment does not represent the preferred career for children even among self-employed parents.

Given these aspects, we propose the following argument: In times of recession an increasing number of agents in sub-group SE find their own situation relatively stable and endorse this view to their offspring. In turn, with business outlook on the rise, preferred occupational choices are considered more viable options again. Against this background, we propose our first hypothesis

H,i: *BizSent* has a negative influence on *ES* in sub-group SE.

(b) FearUE (sub-group DE)

As we are investigating rules and not operations, we argue that *FearUE*, rather than unemployment itself, represents the relevant factor driving *ES*. Given the idealized career path of a salaried employee, entrepreneurship can only be desirable in the form of "opportunity-driven" entrepreneurship; any thought of "necessity entrepreneurship" is beyond cognitive reach. Now, rising *FearUE* as the prime indicator of economic conditions for sub-group DE reduces the perceived viability of a potential opportunity-driven business start-up and vice versa. As our second hypothesis we propose

H,ii: *FearUE* has a negative influence on *ES* in sub-group DE.

As H,i suggests a negative influence of business sentiment, this would imply a contradiction, if we were not to consider sub-groups of agents.[7] However, acknowledging the heterogeneity of agents pertaining to their susceptibility to different factor rules, this seeming contraction becomes meaningless. Given this view, we propose a sub-hypothesis

H,iia: Both H,i and H,ii hold at the same time.

[7] In order to illustrate this, consider an economy entering an upswing path (improving *BizSent*), which would cause entrepreneurial spirit to decline. Yet, if *FearUE* was to decrease in the course of the economic upswing, this would translate into a rise in entrepreneurial spirit. Obviously, these opposing mechanisms can only coexist in a model with sub-groups of agents.

In our assessment of factor rules, we found that *BizSent*, *pCoC*, and *FP* have been relevant factors all through the observation period, and arguably, much longer. In contrast, *FearUE* has come to be part of conscious considerations in recent years only, likely not before the abandonment of Japan's steady high growth path after the 1991 bubble burst. Accordingly, we suppose that *FearUE* did not have a significant meaning (hence, influence) pertaining to parental preferences for self-employment as a career option for their children, but only until a tipping point or trigger event some time after the bubble burst.

(c) FP via family structures

At first sight, changing family structures are seemingly not connected to entrepreneurial spirit in an economy. In the case of Japan, however, there is an important connection with one of the rules in the MSSS, namely with filial piety (*FP*, *oyakōkō*), a 2nd order cognitive rule. Individuals in the West will tend to pursue their career choices quite independently from their parents. In contrast, Confucian tradition generates a strong parental super-ego exerting significant influence on career choices. Naturally, parental expectations toward their offspring on a per capita basis decrease with the number of siblings in a family (Leibenstein 1978). It is a well-documented fact in Japan that the rule of *FP* has had institutional status for decades, showing little if any fluctuation in population size[8]. While the value remains largely stable, the burden of *FP*, i.e., paying respect to and taking care of parents, has come to rest on ever fewer shoulders as the average number of siblings per family has decreased dramatically. As a consequence, the relevance of *FP* on a per capita basis has increased significantly. Adding to this our finding on the preference for traditional self-employment scoring lower than the self-employed share of the workforce, we understand that parental preferences for occupations other than self-employment are gaining increasing weight in their offspring's occupational choice.

To add a further perspective, the individual risk associated with self-employment, as seen from the perspective of a family risk-pool, decreases with the number of siblings in stable dependent employment. The latter, quite naturally, is directly linked to the number of siblings in a family. From these considerations, we establish our third hypothesis:

H,iii: The average number of siblings has a positive influence on *ES* in the

[8] The "Studies on the Japanese National Character" confirm the meta-stability of the corresponding rule population (Institute for Statistical Mathematics 1963-2008, Tokyo). The survey includes a question on the "two most highly appreciated values." In the relevant editions of the survey in 1993, 1998, and 2003, 69, 60, and 73% of respondents gave references to filial piety.

general population, i.e., equally for sub-groups SE and DE.

(d) pCoC

Applying the rationale of rules vs. corresponding operations in the discussion of monetary policy, we point to the distinction of the real cost of capital and the corresponding perception thereof. While in the neoclassical standard model only real interest rates are relevant, the rule approach looks into *pCoC*. With inflation close to zero for almost the entire observation period, and deflation being hardly more than a vaguely familiar term to the majority of agents, we argue that easy-to-grasp nominal interest rates represent the principal point of reference. Therefore, our fourth hypothesis is

> H,iv: *pCoC* as stated in terms of the nominal interest rate has a negative influence on *ES*.

2.3 Data used in the analysis

Having formulated our hypotheses, we now have to choose a technique for testing them. We opt for a statistical analysis. This is appropriate, because we have not only met the critical requirement of providing a sound qualitative analysis, but also because we are disposing of a set of suitable quantitative data (as listed in Appendix 1):

- *BizSent*: Business Confidence Indices from quarterly Tankan reports (Bank of Japan)[9].
- *FearUE*: Data from bimonthly surveys conducted by the Nippon Research Institute for the calculation of their Consumer Sentiment Index (NRI 1992-2007).[10]
- *FP* via changing family structures: Annual data on the average number of siblings of parents of 6-year olds, calculated from the National Family Survey (NFRC 1999, 2004).[11]
- *pCoC*: Official discount rates (Bank of Japan).[12]

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[9] In order to match the state of mind at the time when the response variable is measured (every March), we employ the last data published preceding the response variable survey, i.e., values as of January 1st.

[10] We use data of April editions from 1992 to 2007 measuring the share of respondents stating to be "somewhat, or quite worried about their job security" or having slight anxiety referring to unemployment.

[11] Calculations are made for the entire sample period based on the 1999 and 2004 editions of the Survey. For instance, 70% of individuals in their late 30s (one of the age groups with highest self-employment commencement rates) had two or more siblings in 1992; by 2007 this number was down to 40% (1999, 2004: microdata)

2.4 Statistical analysis

A first multivariate regression of all four factor rules yields highly significant parameter estimates (1% level) for the first three factor rules: *BizSent*, *FearUE*, and *FP* via family structures; the parameter estimate for the discount rate as a measure of *pCoC* is close to a satisfactory significance level (at 89% probability).

Recalling our above conjecture about the influence of *FearUE* developing over time only, we checked the media coverage of unemployment during the sampling period. When the unemployment rate rose sharply above 4% for the first time in 1998, the media presence of keywords such as "unemployment", "unemployed person" etc. reveals a very sharp rise.[13] Arguably, prior to this, the topic did not enjoy active awareness among most agents. In terms of the rule approach, we see evidence for our conjecture that the following process has taken place: When unemployment reached a critical level in 1997, a new connection between *ES* and *FearUE* was initiated among sub-group DE. To further corroborate our conjecture, we can compare significance levels and explanatory power of a univariate regression of *FearUE* for the entire sampling period with the values obtained through the introduction of a dummy from 1998 onwards, noted as *FearUE98+*. Whilst we have obtained an already significant estimate at the 90% level with an adjusted R^2 of 18% for *FearUE*, i.e., for the entire period, it turns out that *FearUE98+* shows much higher levels of significance (95%) and adjusted R^2 (0.28).

Re-running the multivariate regression replacing *FearUE* by *FearUE98+*, we obtain highly significant parameter estimates (1% level) for all four factor rules. This result comes in spite of the small sample size with annual observations from 1992 to 2007 and the relatively high number of four factor rules. Table II provides the estimation output for the fully normalized data.

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[12] Again, we use data for April of each year in order to match the situation at the time of the survey for the response rule.

[13] For instance, the keyword "unemployment rate" had climbed to 240% of its 1997 levels in Japan's largest newspaper Yomiuri Shimbun by 1998.

Table 2. Estimation output for multivariate regression of factor rules I–IV on entrepreneurial spirit.

	Coefficient	Std. Error	*t*-Statistic	Prob.
Intercept	0.0000	0.1041	0.000	1.00000
BizSent	−0.4955	0.1111	−4.462	0.00096***
FearUE98+	−0.4440	0.1360	−3.265	0.00753**
pCoC	−0.5110	0.1452	−3.518	0.00481**
FP via family structure	−0.6049	0.1759	−3.439	0.00553**
R-Squared	0.8809	*F*-statistic		20.34
Adjusted *R*-squared	0.8376	DF		11
S.E. of regression	0.1041	corresp. *p*-value		4.837e-05
Sum squared resid	0.1191	Durbin-Watson stat		1.252
S.D. dependent var	0.258199	corresp. *p*-value		0.005138

Response rule: Entrepreneurial Spirit, Method. Ordinary Least Squares; Sample period: 1992-2007.

Given the large proportion of factor rules to observations, and the high levels of R^2 attained, multicollinearity is a likely threat. Yet, variance inflation factors (VIFs) are all far below the commonly cited conservative critical level of 5, and the two cases where correlation is >0.5 do not show a structural link (Appendix 2). We also apply a number of tests pertaining to our selection of factor rules, but find no evidence pointing to a reduced model.[14] Individual confidence intervals confirm negative signs for all four factor rules at the 90% level. Using ridge regression we are able to confirm sign stability and to tighten confidence intervals (Appendices 3 and 4).

With these results we have found evidence supporting hypotheses H,i through H,iv. Although the multivariate case already includes hypothesis H,iia, we test it separately through a bivariate regression of *BizSent* and of *FearUE98+*. The regression turns out to produce significant parameter estimates at negative signs. Hence, we can corroborate the existence of subgroups SE and DE.

[14] Backward selection does not point to omitting any factor rules, neither via AIC (Akaike Information Criterion), nor via the stricter BIC (Bayesian Information Criterion). Likewise, "leave-one-out" cross validation does also not suggest a reduced model. What is more, when looking into univariate regressions of *BizSent*, of *FearUE* (with and without the 1998 dummy), and of *FP*, we find strong evidence of positive auto-correlation. As auto-correlation typically results from the omission of relevant factors, this further corroborates the multivariate case.

For the sake of completeness we also investigated a potential influence of real interest rates as should be expected from a monetarist point of view. However, we find that these rates do not produce significant parameter estimates neither in a univariate regression, nor in its multivariate counterparts.

2.5 Discussion of findings on entrepreneurial spirit in Japan

What is the conclusion with regard to entrepreneurial spirit since 1992? Entrepreneurial spirit is measured as the population of individuals who see self-employment as the best occupational choice for their children. We have collected evidence that the fluctuation in this population stems from four main influences. Firstly, the increased per-capita burden of *FP* – caused by a demographic trend toward fewer siblings – exerts a negative influence. Secondly, a decrease in the *pCoC* expectedly fosters *ES*. We also find, that this perception relates to nominal interest rates rather than real interest rates. Thirdly and fourthly, we have identified two subgroups in the rule population of *ES*: self-employed vs. dependently employed individuals. Although we cannot directly infer their shares of the total, our analysis has corroborated their sizeable existence by identifying corresponding influences on the overall population. Both *FearUE98+* and *BizSent* exert a negative influence on *ES*. While *FearUE98+* in dependently employed individual reduces the belief in opportunity-driven self-employment as a viable alternative source of income, self-employed individuals naturally are hardly concerned about unemployment at all. Their key point of reference is *BizSent*. In times of recession increasing numbers of self-employed individuals find their own situation relatively stable and endorse this view for their offspring. With business outlook on the rise, they tend to revert to the cherished ideal of a salaried employee as their preference for the future career of their children.

With the secular trend to smaller families ongoing and with nominal interest rates already bottoming for more than a decade the pressure on entrepreneurial spirit in Japan is likely to continue. What is more, *FearUE98+* and *BizSent* exert opposing influences on *ES* in the course of the business cycle. So, even though the relative size of subgroups SE and DE – and with it the sign of the resulting net effect – cannot be known at this point, we understand that they have a partially offsetting effect on each other. Before that background, it seems that policymakers have to devise means beyond these four factor rules in order to revive entrepreneurial spirit in Japan.

3. The rule approach in applied research: a synopsis

The rule approach proves to be a most useful facility to conceive of evolutionary change in an economic system. It does so by proposing an analytical framework that helps to track the development of knowledge from idea to rule (micro), rule diffusion and emergence of institutions (meso) up to its interdependent development (macro). It enables the integration of theoretical, historical, and statistical inquiries (called for many years ago by Schumpeter (1939)).

In terms of the rule approach, we have done a macro analysis. With agents undergoing a learning process (*FearUE* entering the macro rule system of *ES* around 1998), we have identified a meso trajectory with a very short diffusion time owing to the involvement of mass media.

Beyond the insights pertaining specifically to Japan, the empirical research in this paper has produced five findings supporting the general evolutionary tenet. First, the inclusion of a wide set of potential factors transgressing the horizon of orthodox analysis, e.g., filial piety, is critical to producing meaningful analyses.

Second, the distinction of rules versus operations proves to be a crucial instrument for making the right choice of analytical objects. With the subject-matter of *ES* as a rule population, all explanatory factors identified were approached via their rule properties, and not via the properties of corresponding operations. This meant choosing business sentiment over GDP growth, perceived cost of capital over real interest rates, and fear of unemployment over realized unemployment.

Third, the rationale of human agents was shown to be dependent on its environment, and thus to be susceptible to change. This has been evinced by fear of unemployment starting to exert significant influence on entrepreneurial spirit only from 1998 onwards.

Fourth, we identified two distinct subgroups of agents whose rationales differ depending on their individual economic reality. Whereas dependently employed individuals are much concerned with their job security, their self-employed counterparts derive most of their economic worldview from an appraisal of the business cycle.

Fifth, we found evidence for the bounded rationality of agents by showing that nominal rather than real interest rates exert significant influence on entrepreneurial spirit. This is particularly revealing, as it supplements conceptual challenges to the Lucas critique (Chen 2005) with an empirical finding. It seems that money illusion is close to perfect when inflation rates are fluctuating around zero such as in Japan. In terms of the rule approach, Japanese economic agents are simply not following a real interest rule.

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Appendix 1: Data Used in the Analysis

Year	*ES*	*BizSent*	*FearUE*	*FP*	*pCoC*	Real Interest
1992	0.60	12	45.0	0.42	3.75	1.32
1993	3.80	-26	46.6	0.37	2.50	1.57
1994	3.80	-36	50.0	0.43	1.75	0.93
1995	4.20	-18	54.0	0.46	1.00	1.20
1996	3.90	-19	54.0	0.47	0.50	0.30
1997	2.80	-7	56.5	0.46	0.50	-1.42
1998	3.00	-22	58.8	0.51	0.50	0.10
1999	2.90	-49	63.8	0.53	0.50	0.60
2000	3.00	-26	62.4	0.51	0.50	1.29
2001	2.60	-14	68.5	0.49	0.25	0.95
2002	1.60	-40	72.0	0.54	1.75	2.86
2003	1.60	-28	71.0	0.59	0.10	0.20
2004	1.30	-15	71.1	0.54	0.10	0.51
2005	0.90	1	67.0	0.56	0.10	0.30
2006	0.70	5	67.6	0.58	0.10	0.20
2007	1.40	8	62.2	0.60	0.75	0.75

Notes: *ES:* Entrepreneurial spirit; *BizSent:* Business sentiment; *FearUE:* Fear of unemployment; *FP:* Filial piety; *pCoC*: Perceived cost of capital.

Appendix 2: Correlation Coefficients and Variance Inflation Factors (VIFs)

Correlation Coefficients	*BizSent*	*FearUE98+*	*pCoC*	*FP*
BizSent	1.00	-0.11	0.06	0.13
FearUE98+		1.00	-0.35	0.61
pCoC			1.00	-0.67
FP				1.00
Variance Inflation Factors	1.14	1.71	1.95	2.86

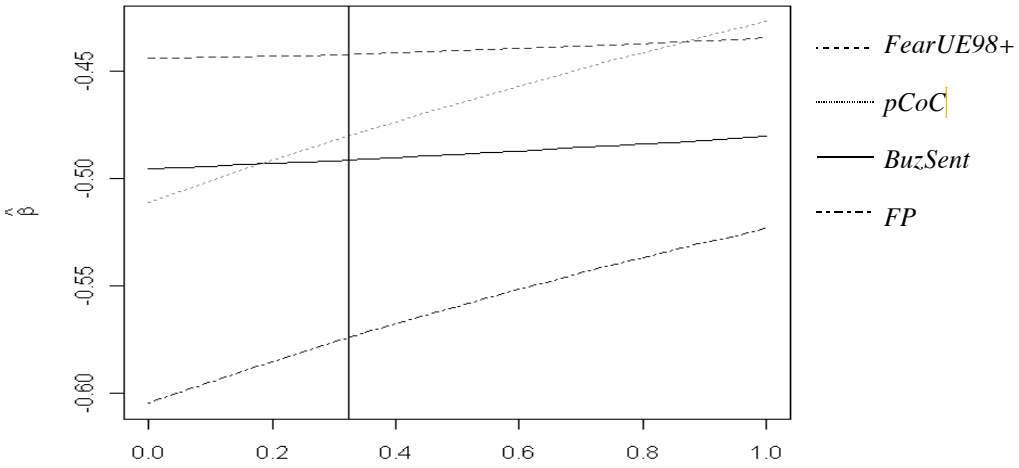
Notes: *BizSent:* Business sentiment; *FearUE98+:* Fear of unemployment entering from 1998 onwards via dummy, *FP:* Filial piety; *pCoC*: Perceived cost of capital

Appendix 3: Parameter Estimates and 90% Confidence Intervals of Ordinary Least Squares OLS vs. Ridge$_{hkb}$

Parameter Estimates [90% Confidence Intervals]	*BizSent*	*FearUE98+*	*pCoC*	*FP*
OLS	-0.49 [-0.70,-0.30]	-0.44 [-0.69,-0.20]	-0.51 [-0.77,-0.25]	-0.60[-0.92,-0.29]
Ridge (λ_{hkb} = 0.32)	-0.49 [-0.69,-0.31]	-0.44 [-0.67,-0.21]	-0.48 [-0.73,-0.23]	-0.57[-0.87.-0.28]

Notes: *BizSent:* Business sentiment; *FearUE98+:* Fear of unemployment entering from 1998 onwards via dummy; *FP:* Filial piety; *pCoC*: Perceived cost of capital

Appendix 4: Ridge Traces for the 4-Factor Model for Modified hkb-estimator at 0.32



Notes: *BizSent:* Business sentiment; *FearUE98:* Fear of unemployment entering from 1998 onwards via dummy; *FP:* Filial piety; *pCoC*: Perceived cost of capital