

Is the psychology of low profits favorable for industrial renewal?

Experimental evidence for the theory of transformation pressure

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Abstract:

The theory of transformation pressure predicts a countercyclical movement in productivity growth. Firm actors are supposed to be governed by changes in current profits through historical relativism, the peak-end rule and over- and underconfidence. The theory also suggests that firms have a status-quo bias in periods of increasing profits. They will first transform after an actual decline in profits though both under- and overreaction are possible.

The theory was tested by a role play where undergraduate students in macroeconomics acted as managers for an established company. The students could decide on investments and growth strategies when profits varied and also describe the underlying psychological mechanisms. The students primarily expected that they would have reacted rationally as managers. But the role play provided support for the hypotheses in the theory of transformation pressure that firms will overinvest and choose a status-quo alternative in a recovery, especially if profits become exceptionally high, and then upgrade their strategy when profits go down.

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1. Introduction

Today's analysis of economic growth and the business cycle has been largely unaffected by the insights of behavior economics (one exception is Jaimorich & Rebelo, 2007). In many respects, the psychology of financial markets is also the psychology of non-financial firms. In the 1990s, a combined psychological and structural theory of transformation pressure was developed in Sweden at the initiative of a productivity commission blaming devaluations for the country's poor productivity performance in the previous decade (Swedish Productivity Commission, 1992). The commission maintained that the associated profit increase in the exposed sector, notwithstanding its temporary character, delayed structural change and the firms' use of production slacks and introduction of new products, technologies and organizations. Accordingly, the theory of transformation pressure (henceforth TTP) came to emphasize that productivity growth is hampered by high current profits (Erixon, 2007).

The aim of this paper is to present the hypotheses about firm reactions and the underlying psychological mechanisms in the TTP. The theory sheds light on the importance of negative driving forces for the macroeconomic development and, therefore, on the countercyclical movement of productivity (growth). Firms governed by the peak-end rule, historical relativism, overconfidence and fundamental status-quo biases are expected to choose strategies with low productivity potential in a recovery. The TTP deviates from Schumpeterian economics stressing the importance of positive driving forces for innovations and productivity. In the Schumpeterian literature new technical opportunities, learning and spillover effects, scale advantages and large financial endowments (especially for R&D investments) will lead to firm renewal, procyclical innovations and productivity growth and to virtuous growth circles in the economy.¹ The positive driving forces are also psychological in Schumpeterian economics. Decision makers in the firms become more optimistic and risk-prone in a recovery leading to R&D investments and innovations (see Åkerman 1960: 142-143; Erixon, 2011). Evidence on the cyclical movement in total-factor and labor productivity growth is mixed, especially if we adjust for variable labor utilization (labor hoarding) favoring a procyclical productivity development (Aghion & Howitt, 1998: 239-243; Malley & Muscatelli, 1999; Estrella, 2004: 4-5, 23).²

¹ See Scherer & Ross, 1990: 637, 643; Scherer, 1992: 1420; Aghion & Howitt, 1992; Nelson, 1995: 68-72; Hanusch & Pyka, 2007.

² Neoclassical economists inspired by Schumpeter's notion of creative destruction have argued that productivity might move countercyclically through variations in the elimination of inefficient production units, the use of production slacks and also in training and R&D investments. But they emphasize that training and R&D investments are enhanced in a recession by low

A further aim of this paper is to present the results from an experimental role play testing the validity of the TTP. The role play was also designed to provide room for rational motives. The game was played by 136 undergraduate students in macroeconomics at Stockholm University. The students were asked to make decisions on investment and growth strategies by acting as chief executive officers (CEOs) of an established company. They were also asked to describe their own ex post view of the considerations and psychological biases that had governed a certain choice. The sequential design of the role play made it possible to follow each student's investment and strategy choices when profits varied over time.

This paper will disregard the productivity performance of new firms. Our focus on established firms is legitimized by empirical studies demonstrating the decisive role of "within-firm" effects (in contrast to changes in the composition of plants and firms) for productivity changes at the aggregate level (see World Bank, 2008, chap. 3). What is more the paper is only initially concerned with the *direct* relationship between the profit and productivity performance of established firms. The subsequent analysis considers the effects of profit changes on the firms' investment and strategy choices *of importance* for their productivity development. Furthermore the paper will only pay attention to the behavior of established firms in periods of increasing profits and the reaction by these firms to an expected or sudden decline in actual profits. Thus, in terms of the business cycle, the paper envisages the behavior of established companies in the recovery phase and at the upper turning point.

The business-cycle perspective in this paper conceals that the TTP is basically a theory of economic growth. Negative shocks may stimulate productivity growth by fostering innovations and also irreversible changes in industrial composition. The focus in this paper is not on the "structural" hypothesis in the TTP, and also in Schumpeterian economics, that high profits in general will delay the elimination of inefficient firms (and plants) and the phasing out of stagnating industries having a negative effect on aggregate productivity growth. Furthermore this paper will not contain the argument in the TTP that falling profits will stimulate the creativity and skill of firm actors, thus that necessity is the mother of invention (see Erixon, 2007: 338-339).

Our study has the ambition to understand macroeconomic phenomena. Yet it focuses on the respond by established firms (in terms of investment and strategy choices) to changes in profits at the microeconomic level. Thus the paper will scrutinize neither the macroeconomic and structural

opportunity costs and abundant resources, not by low profits (Aghion & Howitt, 1998: 239-243; Malley & Muscatelli, 1999: 340; Barlevy, 2004). The gap to the TTP has been narrowed by neoclassical-Schumpeterian theories stating that harder competition (e.g. through entry) will stimulate innovations by incumbent firms close to the technological frontier (see e.g. Aghion et al., 2009).

conditions defining the outside pressure on established firms, nor the impact of the reaction by these firms on the rest of the economy.

2. Basic notions and hypotheses about investments and growth strategies

Transformation pressure is here defined as a change in external circumstances for established firms leading to a perpetual decline in profits and eventually to their closure unless steps are taken to increase productivity. The central idea in the TTP that productivity is stimulated by falling profits is not new. For example, theories of bounded rationality have envisaged the growth-enhancing effects of negative driving forces. They suggest, as the TTP, that deviations from profit maximization are smaller if firms are put under external pressure. In his theory of X-inefficiencies, Harvey Leibenstein postulated a positive relationship between product competition and productivity through variations in managerial effort. The literature on X-inefficiencies focuses on the use of production slacks (rationalization). But Leibenstein has also considered the possibility that external pressure would augment the use, and even development, of new technologies (Leibenstein, 1980: 39, 46, 234-236).

There are, however, some unique features of the TTP in relation to the theory of X-inefficiencies. First, when analyzing enforced changes in productivity, the TTP abandons the principal-agent perspective in the X-inefficiency (and corporate-governance) literature. The theory posits that both managers and owners are influenced by the mental processes leading to a negative relationship between profits and productivity (growth). Second, the TTP suggests that firms will first respond to external challenges when the profit decline is manifested or almost certain. Third, the TTP takes us a step further in relation to the theory of X-inefficiencies by assuming that firms will only react to a *recent* decline in profits.

An assumption that firms are governed by current changes in profits builds a bridge between macroeconomics and central notions of heuristic behavior in psychology. It will thereby reestablish the psychological aspects of X-inefficiencies that were elaborated by Leibenstein but largely obscured by his followers (see Leibenstein, 1979: 484-485 and 1985: 6-7). Through the assumption that firm agents are governed by current outcomes, i.e. not by outcomes in the past, the TTP also departs from the rational expectation theory of adaptive learning and the option theory of investment under risk. In these theories, the expectations of economic agents are based on actual observations during a long period, thus making it possible to separate between stochastic and systematic changes in prices and profits. A decline in current profits is merely an additional source of information for rational firm agents continuously making efforts to discriminate between temporary and long-run profit developments

(Lucas, 1986: S414-416; Dixit & Pindyck, 1994). In contrast, the TTP maintains that some recent observations of a profit decline will be decisive for investment and also work as an alarm clock inducing firm actors to become more rational.³

In the TTP, an actual fall in profits will force managers and owners to start collecting and processing information about the origin of the profit fall (which may be firm specific), external challenges in the future and alternative growth strategies. They will also meet an actual reduction in profits by launching productivity-enhancing programs, possibly by switching to a new strategy. However, notwithstanding the assumption that a decline in current profits makes firms more rational, the TTP provides room for both under- and overreaction. Firm actors may underreact through the lingering impact of psychological distortions. On the other hand, they can overreact by introducing extensive measures to increase productivity after a profit decline that is modest, temporary and basically not a threat to the firm's existence. The TTP does not preclude that overreaction (or underreaction) reflects the lack of reliable information. But it emphasizes that agents will incorrectly confuse an actual profit decline with harder transformation pressure for psychological reasons.

In many cases firm actors must take steps already today to meet inevitable challenges tomorrow. But in the TTP - they don't. The negative relationship between current profits and productivity in the theory does not depend on any specific assumption about uncertainty and risk. When (the probabilities of) future outcomes are relatively easy to predict, firms are not supposed to search for available information and take actions until the day of an actual decline in profits. The profit fall comes as a shock to firm actors who have ignored relevant information under the spell of misleading psychological forces. The TTP also proposes that companies will postpone measures to increase productivity to the date of a decrease in current profits in the case of large uncertainties. In this case, firms cannot gain any reliable information about external challenges by waiting. But a rational firm would have considered alternatives to its chosen investment strategy and have taken precautions to increase the flexibility in production and marketing already before an actual decline in profits. The TTP posits that firm actors will first look for a large number of investment opportunities and make the technical and organizational arrangements needed to increase the firm's adjustment capacity at the time of an actual fall in profits.

³ The notion of rationality has a general and specific meaning in this paper. In the specific case, rationality is defined in terms of (expected) utility and profit maximization (given the information costs) and the underlying axioms or in terms of Bayes's rule. In the general case, rational behavior is seen as a deliberate activity by firm actors aimed at increasing their knowledge about existing technologies and markets (see learning-by-doing), possible investment options and the probability of different outcomes in the future. The calculation of expected profits is possibly based on retrospective studies of outcomes in the past.

It seems near at hand to assume that harder external circumstances will stimulate not only productivity but also investments, especially in R&D. Firm actors may have the survival of the firm as a superior goal, permitting even negative net present values of investments. They may also be convinced that the firm can mobilize the necessary competencies to meet external challenges. But the TTP in this paper assumes that physical investments, and also total investments, will increase under easier external circumstances by psychological reasons. Furthermore, in the TTP, firms react to fluctuations in current profits, not to changes in external circumstances *per se*. The theory therefore suggests that a previous increase in actual profits will stimulate investments by having a positive effect on the expectations of future profits (*proposition 1*).

In the TTP current profit conditions will determine not only the investments but also the strategy choices by established firms. Throughout the paper, we assume that firms make a choice between three growth strategies that are mutually exclusive. The first strategy is a pure status-quo option without any changes in technologies, product composition or organizations whatsoever. Investments are only made to increase production capacity or substitute labor. There is not even any room here for rationalization, i.e. for the use of production slacks in the firms. Thus, this strategy is not connected to any increase in total factor productivity. The second growth strategy represents a status-quo oriented transformation. Firms will increase total factor productivity by rationalization or by marginal changes in technologies, product composition and organizations. The third growth strategy is a radical transformation constituted by major changes in technologies, product structures or organizations. Though possibly riskier a radical transformation is assumed here to have a larger growth potential in terms of total factor productivity than a status-quo oriented transformation, both for the firm itself and for society at large.

The TTP maintains that firms have a tendency to opt for a status-quo oriented strategy in periods of increasing actual profits (*proposition 2*). This view on firm behavior in good times does not exclude that status-quo oriented firms spend resources on marginal changes in technologies, product compositions and organizations or on rationalization. The TTP claims that short-run increases in actual profits are unfavorable to radical transformation. And the theory further suggests that firms will take fewer measures in general to increase total factor productivity in good times. Thus, low total factor productivity growth within firms in a recovery reflects that decision makers will then not only resist radical transformation but also take limited steps to increase productivity by status-quo oriented measures.

A reasonable idea is that total factor productivity growth in firms will be especially low if a recovery turns into a profit boom. According to a special case of the TTP, firms are particularly anxious to avoid a radical transformation if short-run profits rise to record levels. The number of firms choosing a radical transformation during a period of increasing profits is supposed to be particularly low if the period ends with a profit boom (*proposition 3*). The confirmation of the specific TTP also requires that firms will switch to (or hold) options with a lower degree of transformation when profits soar to record levels. Firms that would have chosen a transformation along a status-quo strategy during a “normal” profit increase are supposed to have a tendency to follow a strategy without any transformation at all in a profit boom (*proposition 4*). Moreover, firms that preferred a radical transformation when there was a general increase in profits are expected to choose one of the status-quo options when profits become exceptionally high (*proposition 5*). Finally, to satisfy this specific TTP, students who chose a status-quo alternative without any transformation at all when profits were increasing in general must hold to this alternative when profits become exceptionally high (*proposition 6*).

In the TTP firm actors will not make serious efforts to upgrade their growth strategy until after an unexpected decrease in actual profits (*proposition 7*). Furthermore the TTP is verified if firms tend to choose a transformation alternative after an actual decline in profits (*proposition 8*). The TTP specifies that firms that had chosen a status-quo strategy without transformation in the previous period will meet a profit decline by transformation along the lines of a status-quo or a radical strategy (*proposition 9*). Furthermore the theory asserts that firms that have opted for a status-quo based transformation in the period of increasing profits will switch to a radical transformation in the subsequent period of dwindling profits (*proposition 10*).

The distinction between a “normal” profit increase and a profit boom is also crucial in this paper where the reaction to a profit decline is concerned. A plausible hypothesis is that total factor productivity growth will be higher in the recession if a given profit decline was preceded by a profit boom. According to a special version of the TTP, firms react more quickly by transformation to a decline in profits if the decline was preceded by a profit boom. Firms that only chose a status-quo oriented transformation instead of a radical transformation when profits reached record levels are expected to react immediately to a profit decline by radical transformation (*proposition 11*). And firms that only preferred a status-quo option without transformation when the profit levels were extremely high are expected to react rapidly to a profit decline by transformation (*proposition 12*). These two sequences are here representing the specific TTP suggesting that more firms are involved in

transformation activities after a given decrease in profits if they have previously experienced a profit boom.

A possibility in the special version of the TTP is that firms choosing the same status-quo strategy (with or without transformation) in periods of a "normal" profit increase and a profit boom will only transform after a substantial decrease in profits. More precisely, firms that chose a status-quo strategy without transformation during a profit boom and also during a period of a "normal" profit increase shall only decide to follow a transformation strategy (possibly radical) after a substantial decrease in profits (*proposition 13*). And firms that chose a status-quo strategy with transformation during a profit boom and also during the period of a "normal" profit increase shall only radically transform after a substantial reduction in profits (*proposition 14*). However, in the special TTP, these sequential relationships cannot prevent that firms will respond instantaneously to a profit decline preceded by a profit boom.

3. The psychology of the theory of transformation pressure

3.1 A status-quo bias in recoveries

It is hardly controversial to claim that investment and strategy decisions by firm actors are formed by actual profits when the future is uncertain. It is more controversial to maintain that they are governed by current outcomes only. A sensible argument is that people make heuristic rather than rational decisions. Daniel Kahneman's peak-end rule states that people's evaluation of earlier experiences is based on two observations only, the last and the exceptional one (Kahneman, 2003; Doe & Wolford, 2008). This rule suggests that current profits have a strong impact on firms' investment and strategy decisions. Besides, high current profits will probably extend the use of heuristic decision-making principles *per se* (cf. the X-inefficiency theory). But the peak-end rule provides room for the possibility that firms are affected by exceptional events, for example a depression, in the past. Furthermore, by emphasizing exceptional events, the peak-end rule implies that firm decisions are particularly sensitive to profits approaching peak or trough levels. Thus, in the analysis of investments and strategy choices, the peak-end rule legitimates a stronger weight to high (and low) current profits.

The heuristic principle of the irrelevance of history (historical relativism) underlines that people are governed by current outcomes only (see Shiller, 2001: 1325-1328). Firm agents may argue that profit outcomes in the past reflected specific circumstances that are no longer prevailing. Thus, agents believe that they have nothing to learn from history. A reasonable assumption is that historical relativism is strengthened if the period of increasing profits will last over a couple of years or if it ends

with a profit boom. Naturally, the belief that history cannot provide any guidelines for investments and strategy decisions today may be correct. But historical relativism often reflects that people tend to explain their behavior by referring to calculation and not to automatic and affective forces (see Camerer et al., 2005: 37-38). The peak-end rule, historical relativism and other heuristic principles can be seen as (mostly unconscious) strategies to free people from time-consuming and unpleasant calculation activities (see Tversky & Kahneman, 1974, 1986 and Shah & Oppenheimer, 2008). Specifically, the peak-end rule and historical relativism reflect either a limited cognitive capacity (e.g., memory capacity) or an emotional state that can be characterized as a propensity to live in the present.

In the TTP, firm actors governed by historical determinism and the peak-end rule will overreact to an increase in current profits. They will also overreact to a profit increase by overconfidence. More exactly, a short-run increase in profits is supposed to create or strengthen an overconfident attitude among firm actors.⁴ Psychologists and behavior economists claim that overconfidence is common and will not even be corrected by learning or experts when predictability is low as in the financial market and also in the non-financial business sector (Rabin, 1998: 31-32; Nelson et al., 2001: 172-190; Önkal et al, 2003: 182-183; Hilton, 2003: 274-285, 289-291; Galasso & Simcoe, 2010: 3-4).⁵

In behavioral economics overconfidence is mostly defined in terms of Bayesian statistics. However, the difficulties in obtaining (more) accurate probabilities when the future is genuinely uncertain compel us to define overconfidence (and underconfidence) by firm actors in terms of a specific mental state. In this perspective, overconfidence may lead to a departure from (expected) profit maximization but it is conceptually unrelated to the choice of an optimal alternative. We will define three types of overconfidence in connection with an increase in current profits. The associated mental states may all lead to underestimates of the risk of unfavorable outcomes and omissions to take necessary actions today to meet challenges in the future.

The first type of overconfidence emphasizes that firm agents will be *intoxicated by success* and therefore lose their sense of proportions when evaluating the profit potential of a certain growth

⁴ Higher profits make actors (more) overconfident both directly, provided that current outcomes matter, and indirectly through the *extended* use of heuristic decision rules focusing on current outcomes.

⁵ Behavior economists, statisticians and psychologists often emphasize that people's estimation of probabilities is governed by the exceptional outcomes of small samples (see, for example, Tversky & Kahneman, 1974 and 1986 and Nelson et al., 2001). According to a Bayesian observer, people pay too much attention to the strength of evidence at the expense of the weight of evidence (the statistical reliability). However, this literature provides no explanation for why, for example, firm actors are focusing on current outcomes only.

strategy or of the firm itself. Thus, feelings of success will distort the calculations of expected profits. For example, the estimates may be biased by a growing conviction among CEOs that they are actors in a “new” economy immune to recessions and crises. The second type of overconfidence after a profit increase is the result of *haughtiness*. A temporary profit boost may create an exaggerated belief among firm agents in their own superiority and invulnerability. For example, managers become too confident in their capability, or in the ability of principles and peers, to achieve the firm’s profit potential and ward off future challenges to the firm. They may also automatically credit themselves (or their colleagues) for a profit increase that was actually caused by an external demand shock or an expansionary economic policy. The third form of overconfidence after an increase in current profits is developed through the *suppression of risk*. An increase in actual profits may induce firm actors to hide the potential risks of large losses and even of bankruptcy in a subconscious mental department, thus overconfidence is described in psychoanalytical terms (cf. Tuckett, 2009: 4-6). A general tendency by firm actors to put negative information in a subconscious mental department may also explain the judgment fallacies and self-overrating attitudes associated with the two other forms of overconfidence.

In the TTP overconfidence and the heuristic impact of current outcomes in itself will induce owners and managers to overinvest in periods of increasing profits in the short run (*proposition A*). But the TTP also suggests that overconfidence, the peak-end rule and historical relativism will favor a status-quo oriented growth strategy (cf. Charness and Levin, 2005) (*proposition B*). Thus, decision makers in firms experiencing a profit recovery are supposed to largely ignore future threats to a status-quo strategy and also information about outcomes in the past that are critical to this strategy. Furthermore, firm actors will then disregard that the firm might have been radically transformed on several occasions in the past.

In the TTP a status-quo bias may be particularly strong if firms are experiencing exceptionally high profits. Firm actors following the peak-end rule put a strong weight on record-high profits strengthening a status-quo bias in the TTP. Moreover, the adherences to historical thinking and the peak-end rule *per se* may be exceptionally strong, as is thus the status-quo bias, in a profit boom. Overconfidence may also be particularly common in a profit boom (in terms of Bayes’s rule or a mental diagnosis) regardless of the extended use of heuristic decision rules focusing on current outcomes.

The psychological literature supports a hypothesis about a fundamental status-quo bias (see e.g. Karlsson et al., 2002 and Verplanken & Orbell, 2003). A status-quo bias may reflect hyperbolic discounting. Firm actors might hesitate to pursue a transformation associated with a positive net present value if they are overwhelmed by the short-term sacrifices and displeasures when approaching

the day of action.⁶ The psychological literature also posits that the preference for status quo can emanate from habitual behavior. Habits are possibly developed through repetitive behavior, but they can be seen as a specific mental state (Verplanken and Orbell, 2003) or as a propensity to adapt in a particular way in a particular class of situations (Hodgson, 2004). In both perspectives, people's choice of status quo is not necessarily irrational. For example, firms might have developed industry-specific competences on basis of learning by doing. But the choice of the status quo on habitual grounds may reflect the use of heuristic decision rules or pure conservatism. In these cases, repetition has molded a psychological state where a resistance to change is automatic and emotional, i.e. not the result of intentional calculation free from strong passions.

A status-quo bias can also be explained by indecisiveness. A postponement of transformation and also of investments *per se* to obtain more information may be rational (Dixit & Pindyck, 1994). However, to meet inevitable threats in the future, firms should eventually, notwithstanding the lack of complete knowledge about the extent and nature of possible challenges (and their probabilities), abandon a status-quo position. Keynes referred to Buridan's ass. The animal starved to death since it was unable to make a choice between two stacks of hay on "rational" grounds. Keynes maintained that people must, and will indeed, make decisions despite a low weight of evidence, decisions that are based on habit, instinct and affection (Keynes, 1979 [1938]: 294); see also Keynes, 1936: 161-163). By referring to habits, Keynes provided arguments for a status-quo bias in investment decisions. But indecisiveness can explain *per se* why firms have a tendency to make investments along the lines of a status-quo preserving strategy. Indecisiveness may reflect a major affective deficit in rational calculation (Camerer et al., 2005: 29) or a stalemate between parallel decision processes (Spiegler, 2008: 518).

The TTP supports the idea in the psychological literature that people have a *confirmatory bias* (myside bias). They will collect, process and interpret information in a way that confirms a prior choice or opinion. People (including experts) are often too confident in their initial option in the eyes of a Bayesian statistical observer. They will overreact to information verifying the chosen alternative and underreact to data rejecting it. A few encouraging observations on profits may lead to overconfidence in a chosen strategy among firm agents given a confirmatory bias (cf. Rabin & Schrag, 1999; Suen, 2004; Stanovich & West, 2006). In the TTP a status-quo bias is fundamental for a confirmatory bias.

⁶ Hyperbolic discounting challenges the axiom of time-consistent preferences in the maximization-utility model (see, for example, O'Donogue & Rabin, 1999 and Angeletos et al., 2001).

But the theory emphasizes that a preference for status quo might actually have been *created* by an increase in profits in the short run. Furthermore, the TTP maintains that even a weak signal, for example a profit decline of an indefinite character, may induce firms to abandon a status-quo alternative.

3.2 Abandoning the status quo in a recession

A sudden decrease in actual profits will probably weaken the support to a status-quo strategy given a confirmatory bias, thus overconfidence in this strategy is reduced, for example in the light of Bayesian statistics. But the TTP emphasizes that a profit decline will reduce actors' loyalty to status quo by impelling them to become more rational. They will e.g. meet an actual fall in profits by making more systematic studies of profits in the past and a stronger effort to foresee challenges in the future. A decrease in profits after a period with a steady increase in profits serves as an alarm clock for firm actors fearing a substantial reduction in profits and also that the survival of the firm is at stake.

We will focus on three aspects of the increase in rational behavior after a reduction in current profits. First, a profit fall may cure indecisiveness and weaken a present-biased preference among decision makers. Second, it may reduce the influence of heuristic decision-making principles and conservative thinking. Thus, the support to status quo will no longer, or to a lesser degree, be based on the peak-end rule, historical relativism and bad habits. Third, a profit fall may weaken or eliminate the overconfidence favoring a status-quo option in the TTP. Firm agents will then take a more sober view of the firms' future prospect and cease to overestimate their own competence and invulnerability. Overconfidence can also disappear after a decline in actual profits, uncovering those doubts about risk taking that firm agents had put in a subconscious mental department during the previous recovery.

Thus, the TTP maintains that firm agents become (more) rational after an actual decline in profits and that the associated weakening or disappearance of present-biased preferences, indecisiveness, overconfidence and heuristic behavior will reduce the support to a status-quo option. (It *is* possible that more rational actors would still prefer a status-quo option.) However, the TTP comprises the possibility that firm actors will underreact to an actual decline in profits. The profit fall may not be sufficiently strong to eliminate overconfidence in the eyes of a Bayesian observer (see Rabin & Schrag, 1999) or in terms of a mental distortion (intoxication, haughtiness or repression of risk). What is more, firms may have to face a substantial or long-lasting external challenge to combat the destructive influence of bad habits, indecisiveness and present-biased preferences. However, in the TTP, the departure from status quo after a decline in actual profits can reflect that agents are

overreacting (cf. Massey & Wu, 2005). Managers and owners still governed by the peak-end rule and historical relativism are too anxious to quit a status-quo position after a profit fall. For example, they will confuse a (temporary) recession with a long-run challenge to the firm. A profit decline may also change the attitudes to status quo from overconfidence to underconfidence. Agents who earlier had been self-deceptive about their own judgments and capabilities will not become more sober and self-knowing but instead be seized with panic and feelings of inferiority (suffering from lower self-esteem), leading to too weak a confidence in “business as usual”. Thus, our psychological explanation for the upgrading of firm strategies in a profit recession includes the possibility of both enforced rationality and overreaction (*proposition C*).

A special version of the TTP states that firms react more quickly to a profit decline by abandoning a status-quo alternative if the profits have previously approached record levels. First, firms that will only choose a status-quo alternative (with or without transformation) in a profit boom have probably a weaker confirmatory bias towards this alternative than other firms. The specific TTP assumes that firms will be less overconfident in a status-quo option chosen only in a boom. Second, exceptionally strong overconfidence in status quo through intoxication, haughtiness and suppression of risk during a profit boom may turn to its opposite in the following recession. Third, firms’ overreaction to a decrease in profits may be exceptionally strong after a profit boom through the lingering influence of pronounced ahistorical thinking. It *may* be argued that firms in general are more overconfident about a status-quo option after a profit boom (according to either Bayes’s rule or a mental diagnosis) resulting in serious underreaction to a fall in actual profits. The TTP does not rule out that firms must experience a strong decline in profits to abandon a status-quo option (with or without transformation) if they had already made this choice before the profit recovery turned to a profit boom. However, this tendency towards underreaction is not supposed to be sufficiently strong to be decisive. The specific TTP infers that firms will generally react more rapidly by transformation if a profit decline was preceded by a profit boom.

4. The experimental role play

4.1 The general design

The students in the role play were asked to complete an anonymous questionnaire with nine questions about their investments and strategy choices under different profit conditions and about the underlying motives and psychological processes (see Appendix 1). The prime aim of the role play was to examine the validity of the hypotheses about investments, strategies and psychological biases representing the TTP in this paper (see propositions 1-14 in chap. 2 and A, B and C in chap. 3). The set of possible answers also provided room for investment theories in basic macroeconomics and for rational behavior.

Figure 1 summarizes the chosen strategies in the TTP when the firms are first experiencing an increase in profits for a couple of years and then a sudden decline in profits. Figure 2 presents the strategy choices in the special cases of the TTP; it is here possible to draw a decision tree reproducing the choices in a profit recovery, profit boom and in the periods of a modest and substantial decrease in actual profits (where the previous increase in profits is used as a standard).

Figure 1: Strategy choices in the theory of transformation pressure – the general case

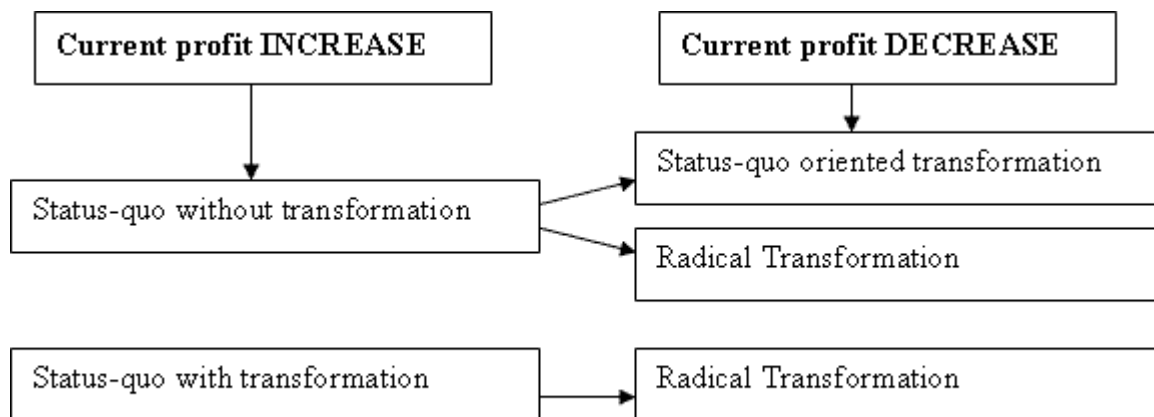
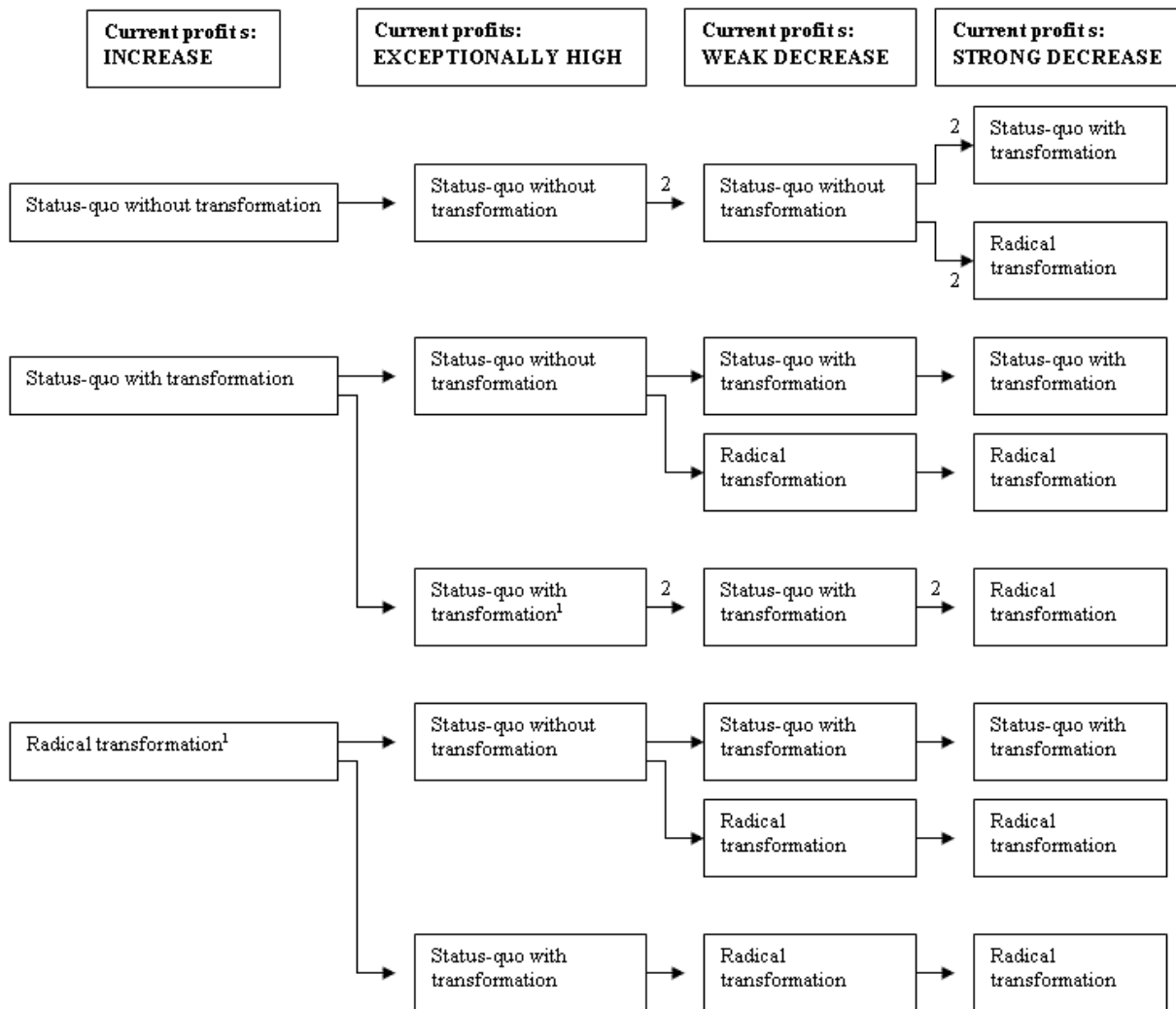


Figure 2: Strategy choices in the theory of transformation pressure – the special cases



¹ The TTP permits that a minority of the firms choose radical transformation in periods of increasing profits and hold on to a status-quo oriented transformation also in a profit boom.

² The need for a substantial decrease in profits to induce firms that have chosen the same status-quo strategy during a normal increase in profits and a profit boom to transform is a possibility, but not a decisive mechanism, in the specific TTP.

The role play took place at two occasions, in October 2009 and October 2010. The participants were students in introductory macroeconomics at Stockholm University, 85 students in the Autumn Semester 2009 and 51 new students in the Autumn Semester 2010. Before playing the role of CEOs for an

established company, all students had attended lectures, participated in exercises and conducted an examination on the basic IS-LM model. In this model, private investments are determined by the rate of interest and GDP (the accelerator). Before enrolled in the role play in October 2009, the students had also attended lectures on how investments are determined outside the basic IS-LM model. Private investment is here a function of the gross present value – primarily determined by expected profits and interest rates – and the investment costs. The present-value approach is only theoretically exclusive if combined with an assumption of how expectations are formed. For example, firm actors are forward-looking in the theory of rational expectations and governed by current profits in the TTP. The students were informed at lectures before the role play in October 2009 that investments are predominantly determined by profits in the future but also that high actual profits may stimulate investments by leading to “overoptimism”.

Our role play was based on the perception that the reaction by established firms to variations in profits is influenced by some fundamental biological traits and social conventions also shared or easily imagined by university students in economics. The students were instructed, both verbally and in the questionnaire, to use their imagination and make endeavors to identify themselves with the CEO of an established company (a company older than 20 years). The participants in the role play were asked *not* to be governed by their guesses about what they were expected to reply according to the macroeconomic textbook *or* the experimenter. The students should only try to imagine which choices they would have made as managers and depict their view of why they acted in the way they did. They were not under any time pressure when completing the questionnaire. They participated in the experiment during a break for twenty minutes in the middle of a lecture.

The design of the questionnaire made it possible to reproduce a sequence of strategy choices for each student formed by his or her reaction to variations in actual profits. (The students could only give one answer to each question.) When asked about their strategy decisions, participants could choose among a status-quo strategy without transformation, a status-quo option with transformation and a radical transformation. When describing the underlying incentives and psychological mechanisms, the students could choose between a large number of options. What is more our sequential approach and separate questions about investment and strategies and the underlying incentives and psychologies made it possible to disentangle whether the students’ choices fulfilled the criteria of consistency.

4.2 The questionnaire

The students acting as CEOs for an established company were first asked to reveal their investment decisions in a situation with increasing actual profits (the rate of return on equity) in the short run, i.e. during the current year and the previous two-three years (Question 1). One of the alternatives confirmed the TTP – an increase in current profits would stimulate investments by having a positive effect on the expectations of future profits (*proposition 1*). Other alternatives were compatible with the basic macroeconomic model or with a general version of the rational theory of forward-looking expectations. Two alternatives were meant to cover specific versions of the theory of forward-looking expectations.⁷ Furthermore, the students had the opportunity of selecting answers in accordance with the rational theories of adaptive learning and investment under uncertainty. In these theories, investments are not necessarily stimulated by higher profits for a couple of years – investments are here a function of profits for a long historical period or postponed to distinguish whether the profit increase is temporary or sustainable. When asked about the effects on investments of an increase in profits in the short run, the participants were informed that a similar increase in profits for other companies was not excluded. In the theory of rational expectations, firms will not expand if they know that the increase in profits is general.

Question 2 was only directed to students who had replied that increasing profits in the short run, by having a positive effect on expectations, made them inclined to increase investments (see Question 1). The students had the chance of replying that the profit boost made them ahistorical, see historical relativism, or overconfident in terms of losses of judgment ability, haughtiness and suppression of risk (*proposition A*). Furthermore, the students could proclaim that they were influenced by the optimism flourishing among firms in an economy with increasing profits, a social-psychological mechanism falling outside the TTP.

Questions 3-5 focused on the students' strategy choices in a period of increasing profits. The students were first asked about their strategy choices in a period of increasing actual profits (Question 3). The TTP was confirmed if the majority of students preferred one of the status-quo alternatives (*proposition 2*). The subsequent question was only addressed to students who had declared that they would follow a status-quo strategy in times of increasing profits in the short run (Question 4). Playing the role of CEOs, the students were asked to describe the motives and mental states underlying their

⁷ By assuming that investments are stimulated by an expected increase in the degree of competition, alternative c) seems to be compatible with the TTP. However, a possible positive relationship between harder competitive pressure and R&D investments in the TTP assumes that pressure is real, thus manifested by an actual decline in profits.

choice of a status-quo option. Four of the five alternatives were meant to represent the psychological explanations of the TTP – increasing profits will reinforce historical relativism or lead to overconfidence through intoxication, haughtiness and suppression of doubts about being too risky (*proposition B*). The fifth alternative was compatible with a theory of enforced rationality – the increase in profits induced firm agents to abandon a state of underconfidence developed during an earlier period of falling profits. The TTP theory does not exclude the working of a similar psychological mechanism in periods of increasing profits. But the theory assumes that this mechanism will be superseded by a tendency to overconfidence over a period ranging from three to four years. The students were also asked about their strategy choices in a situation where short-run profits approached record levels (Question 5). A special case of the TTP maintains that firms' reluctance to transformation is particularly strong if the profit soars to record levels (see *propositions 3, 4, 5 and 6*).

Questions 6-9 concerned the strategy decisions by managers when the period of increasing actual profits had come to an end. The students were asked about their reaction to news that their firm was facing a *risk* of a substantial decline in future profits (Question 6). One of the three alternatives conformed to the TTP – the managers and owners would postpone a strategy change until the firm really experienced an actual decline in profits (*proposition 7*). The next question (Question 7) should only be answered by students who had declared that they would not change strategies until the firm experienced an actual decline in profits. The students had the opportunity to answer that a decline in actual profits was necessary to persuade them to abandon their heuristic propensity to only consider current outcomes; see historical relativism and the peak-end rule. They also had the chance of replying that the actual decline in profits made them less overconfident about a certain strategy in terms of intoxication, haughtiness or repression of risk. Alternatively, the students could unveil a propensity to overreact to an actual decline in profits. The choice of any of the options of enforced rational behavior and overreaction was compatible with the TTP (*proposition C*). We excluded the possibility that an actual decline in profits would lead to higher rationality by reducing indecisiveness, the impact of bad habits and the reluctance to make immediate sacrifices for later rewards (see hyperbolic discounting). But the students had the opportunity to choose an alternative in line with the option theory of investment under risk. The "rational" student could answer that he or she would postpone transformation until the profit decline was real in order to increase the weight of evidence; observations of real outcomes would increase his or her knowledge about the true character and scope of external threats.

The students were also asked about their strategy response as CEOs to a decline in actual profits in one year after a period with an increase in profits (see Question 8). The ambition behind this formulation of the question was to make it clear that the firms are hit by a negative shock. Thus, all students should answer the question whatever their reply to the previous question about their reaction to information that there is a risk of a substantial decline in profits in the future (see Question 6). The TTP was verified if the majority of students reacted to the sudden decline in profits by choosing a transformation option and by upgrading their strategy (see *propositions 8, 9 and 10*).

Question 9 was only posed to students who chose a transformation alternative after a sudden decline in profits. The students were asked to specify whether the profit decline must be of equal size as the previous increase in profits during a period of the same length (here one year) or if it could be small in relation to the previous increase in profits. The prime aim of this question was to test the hypothesis in the special TTP that firms will react faster by transformation if the profit decline was preceded by a profit boom (see also Questions 3, 5 and 8). Firm actors choosing a certain status-quo option only in a profit boom are assumed to upgrade their strategy already after a modest decline in profits (see *propositions 11 and 12*). The underlying psychological hypothesis is that decision makers are less confident in a status-quo alternative chosen only when profits are exceptionally high. Another objective of the last question was to find out whether the students reacted *slowly* to a profit decline if they had chosen the same status-quo alternative in a profit boom and during a period of a "normal" profit increase (see *propositions 13 and 14*). By following this sequence of loyalty and sluggishness students were supposed to be exceptionally overconfident in status quo. However, the special TTP does not assume that this psychological mechanism is sufficiently strong to offset the tendency to a quick response by firms experiencing a profit decline after a boom.

4.3 The test of inconsistency

A central idea in the TTP is that firm agents who are generally governed by heuristic rules and strong emotions will not become (more) rational until after an actual decline in profits. From an opposite viewpoint, agents are rational all the time; a postponement of transformation until the day of an actual reduction in profits is here explained without any reference to a new mental state or behavioral rule. But the answer to one question indicating a consistent rational behavior by the students may be contradicted by their answers to another question. We tested a hypothesis of inconsistent rational behavior by comparing the answers from each student. Our ambition was to find out whether we can answer the following six questions in the affirmative:

1. Did the students declare that they have chosen a status-quo strategy in a profit recovery on rational grounds (Question 4, alternative e) despite the fact that they had made investments on basis of a small number of observations in a recovery (Question 1, alternative a)?
2. Did the students refer to irrational motives for their choice of a status-quo strategy in a profit recovery (Question 4, alternative a, b, c or d) despite the fact that they had made investments on rational grounds in a recovery (Question 1, alternative e, f or g)?
3. Did the students declare that they did not transform the firm until after an actual decline in profits on consistently rational grounds (Question 7, alternative a) despite the fact that they had referred to irrational driving forces behind their decision not to transform the firm in the recovery (Question 4, alternative a, b, c or d)?
4. Did the students reply that they had not transformed the firm until after an actual decline in profits on consistently rational grounds (Question 7, alternative a) despite the fact that they had made investments on basis of a small number of observations in a recovery (Question 1, alternative a)?
5. Did the students' propensity not to transform the firm until after an actual decline in profits reflect that they had become more rational (Question 7, alternative b, c, d or e) despite the fact that they have chosen a status-quo strategy in a profit recovery on rational grounds (Question 4, alternative e)?
6. Did the students' propensity not to transform the firm until after an actual decline in profits reflect that they had become more rational (Question 7, alternative b, c, d or e) despite the fact that they had invested on rational grounds in a recovery (Question 1, alternative e, f or g)?

Our test of inconsistent behavior had e.g. the ambition of revealing a possible "hindsight bias" at the experiment, thus whether the participants' ex post explanations for their behavior had a rational bias (Koellinger et al., 2007, p. 503). The students' rational motivation for a certain strategy may be contradicted by their previous choices and motivations (see question 1,3 and 4 above).

5. The results

The results from the two role plays were almost identical and are therefore presented together (see Appendix 2).⁸ The statistical tests confirmed to a great extent the TTP hypothesis that firms will overreact to a short-run increase in profits (see *proposition 1*). 27 % of the students answered that, by having a positive effect on expectations, the profit increase would induce them to increase investments. In fact, the frequency of this answer was higher than for all other answers. We employed a simple binomial test of the frequency of overinvestment against a null hypothesis that the observed frequency was a random draw. With seven alternatives, the probability of choosing the overinvestment hypothesis by chance was 14 % (1/7) given the independence between the alternatives. The proportion of overinvesting students was significant at the 1 % level (these statistics are not presented in Appendix 2). The significance of the overinvestment alternative is noteworthy, considering that the students had the opportunity to choose between several textbook and rational alternatives. When lumped together the rational alternatives of forward-looking expectations, adaptive learning and investment under waiting were more popular than the overinvestment alternative. But with the expected proportion of 20 % (five alternatives) the overinvestment option is significant at the 5 % level. What is more the higher frequency of rational answers in total is not harmful for the overinvestment hypothesis *per se*. Overinvestment is a possible reinforcing business-cycle phenomenon in the TTP, allowing the dominance of rational responses to a short-run increase in profits.

The students who had chosen the overinvestment option should then describe the underlying psychological mechanism. A proposition that the profit increase made them ahistorical was the most common answer without being significant. The proportion of students who had selected any of the psychological mechanisms in the TTP (28 of 41 students) was, given the interdependence between the alternatives (and thus the expected proportion of 50 %), significantly larger at the 5 % level than the share of students who chose the psychological alternative *not* associated with the TTP – higher short-run profits will create euphoric feelings in the economy (see *proposition A*).

The students approved the TTP by demonstrating a strong propensity to choose a status-quo option in periods of rising profits (see *proposition 2*). The total share for the status-quo options – 79 % (107 out of 136 students) – is significant at the 1 % level. On the other hand, more students opted for radical transformation than for a status-quo position without transformation (29 and 12 students,

⁸ There were stronger indications in the second role play that the students preferred options with more transformation in a profit boom than in a period with a profit increase in general.

respectively). The weak preference for a pure status-quo strategy is certainly unfavorable, though not a blow, to the TTP.

A relatively low number of those students who chose a status-quo strategy in times of increasing profits declared that they had been governed by the psychological mechanisms emphasized in the TTP (see *proposition B*). The proportion of these answers was not even significant after rejecting the assumption of independence between the alternatives. In this case, the frequencies of historical relativism, intoxication, haughtiness and repression of risk were added (39 students) and then compared to the frequency of the remaining alternative – the increase in profits induced the students to switch from underconfidence to rationality (67 students).

Our role play indicated that firms are exceptionally status-quo minded in a profit boom as suggested in the specific version of the TTP. If the firms were experiencing record levels of profits instead of a general profit increase (see *proposition 3*) the proportion of students choosing a status-quo option instead of a radical transformation was significantly larger at the 5 % level though the difference was small (these statistics are not shown in Appendix 2). A minor share of the students (9 out of 95 students) changed from a status-quo option with transformation to a pure status-quo alternative when the profits approached record levels (see *proposition 4*). But the number of students who switched to a status-quo option in a profit boom (19 students) was higher than the number of students who continued with radical transformation (10 students) – the difference was significant at the 1 % level (see *proposition 5*). Furthermore, the students were relatively loyal to a status-quo option without transformation (see *proposition 6*). 7 of 12 students maintained this strategy when a profit increase turned to a profit boom – this share was significant at the 10 % level. With the caveat that the low number of observations does not allow us to make more confident statements (see *proposition 5* in particular), we draw the conclusion that the students are more status-quo oriented in a boom than in a period of increasing profits in general.

The majority of students declared that they would react to information about a *risk* of a substantial decrease in profits in the future by changing to either a status-quo oriented or a radical transformation. 36 % of the students (49 students) chose the alternative representing the TTP – firms will not react until the profit decline manifests itself. This share is significantly less than the expected 50 %. Thus, the role play was unable to confirm the TTP hypothesis that firms will first react by transformation after an actual decline in profits (see *proposition 7*). But the risk for a rational bias is obvious in this case. The small number of alternatives made it easy to distinguish the “correct” answers. Furthermore, the number of students who behaved in line with the TTP (49 students) was

approximately equal to the number of students who answered that they would react to expected threats in the future by switching from a status-quo strategy without transformation to one with transformation (43 students).

The psychological explanations for why firms will only react to an actual decline in profits were not confirmed by our role play (see *proposition C*). 10 of the 47 students (two missing values) who had declared that they would first react to an actual reduction in profits favored one of the psychological alternatives. 37 students answered in line with the option theory of investment under risk that they did not react until the profit fall was real to get a clearer picture of the character and scope of the decline. The “rational” answer was significantly large on the 1 % significance level with an expected proportion of 50 % by chance.

The role play confirmed that firms will choose transformation in a period of an actual decline in profits (see *proposition 8*). In fact, 127 of the 135 students (one missing value) preferred one of the transformation alternatives. This result is significant if the choice was between transformation and no transformation at all (with an expected proportion of 50 %). It is also significant with the assumption that the transformation alternatives were randomly distributed (implying an expected probability of 2/3). The fact that only 37 students chose radical transformation after an actual decline in profits does not reject the TTP. But the arguments for the TTP would definitely have been stronger with a higher share for this radical alternative. In fact, the confirmation of the hypothesis that most students chose a status-quo option in a profit recovery and transformation after a subsequent profit decline reflected the popularity of transformation along status-quo lines.

A significantly large proportion of the students who preferred a pure status-quo strategy in the profit recovery (91 %) decided to transform when facing a decrease in profits; the expected proportion was 50 % (see *proposition 9*). Fair to say, however, the number of students who had chosen a status-quo position without any transformation at all during the profit recovery was small (11 students). Moreover, the role play did not endorse the pertinent hypothesis in the TTP that firms that had chosen a status-quo oriented transformation during the upswing in profits turned to a radical transformation in the subsequent period of falling profits (see *proposition 10*). Only 22 out of 95 students made this change of strategy. We conclude that the role play did only partly confirm the hypothesis in the TTP that firms will switch to more advanced strategies when actual profits fall.

The role play did not unambiguously support the argument in the specified TTP that firms would react even to a minor decline by transformation if they had first switched to a status-quo alternative in a profit boom. All students who had only chosen a status-quo oriented transformation

(instead of a radical transformation) in a profit boom did actually answer that they would react to even a small reduction in profits by radical transformation (see *proposition 11*). But it is difficult to draw any definite conclusions in this case due to the very low number of students who had changed strategy in the profit recovery (5 students). Besides, an insignificant proportion of students who had only opted for a pure status-quo alternative in a profit boom declared that they would respond even to a small decrease in profits by transformation, namely 3 out of 10 students (see *proposition 12*).

Furthermore, the role play was unable to demonstrate that a strong decrease in profits was needed to enforce firms to transform when they had chosen a status-quo strategy both during a general profit increase and during a profit boom. An insignificant proportion of the students who preferred a pure status-quo strategy in both cases needed a substantial decrease in profits to transform (see *proposition 13*). And an insignificant proportion of the students who chose a status-quo oriented transformation during both a "normal" profit increase and a profit boom answered that they would first make a radical transformation after a substantial decrease in profits (see *proposition 14*). Definitive conclusions are difficult to draw especially because of the small number of students who chose a pure status-quo strategy in both periods (7 students). In any case, the difficulties in providing any argument for the hypothesis that a substantial decline in profits is required to overcome too strong a confidence in status quo in periods of exceptionally high profits are not critical for the special TTP. After all the theory emphasizes that a profit boom makes firms more eager to abandon a status-quo position in the subsequent recession.

Let us finally present the results from the test of inconsistency.⁹ The students made an obvious inconsistent choice in one of the six cases, namely case 4 (see section 4.3). 12 of the 13 students who had made investments on basis of a small number of observations in a recovery and then did not transform until there was an actual decline in profits declared that their late reaction reflected a rational wish to obtain more information. This proportion was statistically significant at the 1 % level abandoning the assumption of independent alternatives, thus with an expected proportion of 50 %. There were no indications of inconsistent behavior in the other five cases, especially not in cases 5 and 6. Thus, our study provides weak support for a hypothesis that those students who expressed a consistent rational attitude when answering one question contradicted themselves when answering other questions. The lack of evidence of inconsistent behavior in five of the six cases is striking.

⁹ Complete information about results from the test of inconsistency can be obtained from the authors upon request.

6. Conclusions and comments

Today, psychological concepts are common in financial economics but not in the analysis of the business cycle and economic growth. This paper has focused on firm behavior and the underlying psychological mechanisms in the theory of transformation pressure (TTP). By emphasizing the pivotal role of negative driving forces, the theory suggests that productivity growth within firms is obstructed by increasing actual profits and accordingly moves countercyclically. In Schumpeterian economics, positive driving forces are mostly decisive for innovation and productivity growth.

The TTP view of the relationship between profits and productivity has correspondences in the literature on bounded rationality. But the psychological approach of the TTP makes it possible to formulate and anchor a hypothesis that firm decisions on investments and strategies are based on current profits. People give priority to current outcomes in the (economic) psychological literature about heuristic decision making. The TTP emphasizes the impetus of the peak-end rule and historical relativism. It also posits that increasing profits make firm actors overconfident. Furthermore, in the TTP, a current increase in profits induces decision makers to opt for a status-quo oriented growth strategy. The psychological literature underlines that people have a status-quo bias, e.g., by following the heuristic principle of habits. When arguing for the hypothesis that more rational firms will escape a status-quo oriented strategy in periods of falling profits, the TTP primarily refers to the abandoning of overconfidence and heuristic decision making. The TTP also uses psychological concepts to explain why firms might either overreact or underreact to a profit decline.

Two classes of undergraduate students in macroeconomics at Stockholm University participated in a role play where they were asked to act as CEOs for an established company. The role play aimed at testing central hypotheses about investments, growth strategies and underlying psychological mechanisms in the TTP. The questionnaire also provided room for answers in accordance with neoclassical theories of rational behavior.

Without favoring any of the underlying psychological mechanisms, the role play supported the hypothesis in the TTP about overinvestment in periods of increasing profits. Most students did prefer a rational investment option when profits were increasing. But the students' inclination for rational behavior does not deny the TTP where overinvestment is a reinforcing cyclical phenomenon. Furthermore, the role play confirmed the hypothesis in the TTP that firms have a preference for a status-quo alternative in a profit recovery and for a transformation option after a profit decline. However, the students' preference for status-quo options in a profit recovery and transformation in a profit recession in line with the TTP reflected the popularity of a common denominator – a status-quo

oriented transformation. Furthermore, the experiment only partly verified the hypothesis in the TTP that firm actors will switch to a strategy with (more) transformation after a negative profit shock.

The role play indicated in alignment with the specific version of the TTP that firms' strategy choices are extremely status-quo oriented in a profit boom. There was also some evidence for the specific TTP that decision makers are particularly sensitive to a profit decline if they had first become more status-quo oriented when a profit recovery turned to a profit boom.

According to their own assessment, the students were mainly governed by rational concerns in their strategy decisions. The bulk of the students replied that the preference for status quo in a profit recovery reflected that they had become more rational, not that they were governed by the psychological anomalies of the TTP. Most students also reported that they would have transformed the firm already after an expected reduction in profits and almost all the remaining students that they first reacted to an actual decline to get more information. Moreover, in only one of six cases was an answer to one question inconsistent with an irrational answer to another question. Our study of investment and strategy choices by students acting as CEOs underpins the view that economics shall not throw the baby out with the bath water by abandoning the assumption of rational behavior. At the same time, the study confirms that "...the deviations of actual behaviour from the normative model are too widespread to be ignored..." (Tversky & Kahneman, 1986: 252). What is more the provision of "correct" textbook and rational alternatives and the obvious risk that the participants would act more rationally in their imagination than in reality suggests that our role play had a rational bias.

One obvious objection to our role play is that undergraduate students neither have the ability nor the incentives to enter into the role of CEOs for an established company. Instead, the answers by the students to the questionnaire might have been formed, notwithstanding the instructions, by their knowledge about macroeconomics and conjectures about the expectations of the experimenters. On the other hand, it is not certain that students would provide a less accurate picture of investments and strategy choices than real firm agents completing a similar questionnaire. Prestigious managers are probably unwilling, even anonymously, to reveal their true motives and less able to make a psychological self-diagnosis than students only pretending to be managers. The main limitation of our role game is probably that it cannot reproduce those experiences, learning processes and conventional beliefs that shape the decision-making process in the business sector. It is reasonable to expect that firms' reaction to shocks is industry-, country- and time-specific. Furthermore, the psychological literature does not unanimously support the TTP (Erixon, 2007: 339-342). In fact, a *qualified* TTP has been formulated providing psychological arguments for growth being stimulated by modest rather than

maximum transformation pressure or by variations between hard and weak pressure over time (ibid.: 342-344).

The completed role play has primarily shed light on some market conforming conventions vindicating the assumption that people are rational. It had difficulties in elucidating the human instincts and emotions determining firm strategies in the TTP. But the study confirmed, though not unambiguously, the hypotheses in the theory that decision makers will overinvest and prefer a status-quo alternative in the phase of increasing profits, especially if profits become exceptionally high, and then upgrade their strategy when profits fall.

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Appendix A. The Questionnaire (translation from Swedish)

A role play – acting as a manager for an established (old) company

Starting point:

Assume that you are a manager for a company that has existed for at least 20 years. You shall now make endeavors to imagine how you would have reacted to changes in the rate of return on equity (“profits”). Note that you must choose the answer that describes how you believe that you would have reacted in a real situation. You must only choose the alternative which seems to be the best for you and the company – the most rational – if you are really convinced that you would have chosen that alternative in a real situation. Use your ability to enter into the mind of a manager!

You should not choose the answer that you believe that the experimenter would have expected. Use your ability to enter into other people’s minds but not with the ambition of identifying the answers that you think that the experimenter wants!

Answer the questions in turn. You cannot return to earlier questions and correct the answers, once you have moved on to a new question.

You can only choose one answer to each question. Please encircle your answer.

The role play is anonymous.

Question 1

Your company has experienced increasing profits during this year and the previous two-three years. (Profits are recorded annually.) It is not excluded that other firms, for example your competitors, are also favored by a similar increase in profits. Which decision on investments will you make in this situation and which are your arguments for this decision? The decision is not about the character of the investments. Investments can be made in machinery, buildings, new organizations or in R&D.

The following assumption is made in all questions 1-9:

- The company has the opportunity to borrow cheaply to finance investments, thus the company has no problem in financing the investment.
- a) I will increase the investments since the profit increase in the firm has a positive effect on my expectations of profits in the future.
- b) I will increase the investments since the profit increase in my company is a signal that the company will suffer from capacity limitations in the future.
- c) I will increase the investments fearing that the competitors will react to an actual increase in profits by investments.
- d) I will increase the investments since investments by other companies will increase the demand for the products/services of my company.
- e) I will not necessarily increase the investments since my expectations about profits in the future are based on profits over a longer historical period, thus not only on profits this year and the previous years.
- f) I will not necessarily increase the investments since investments are only determined by expected events in the future, not by profits this year or earlier profits.
- g) I will postpone investments to get a clearer idea of to what extent the profit increase for the company is steady (and not temporary). The postponement makes it possible to make more detailed studies of the historical profit development and/or new observations of the profit development.

Question 2

You are only to answer this question if you have answered a) on question 1.

Try to describe the psychological mechanism explaining that your investment decision was based on the company's profit development during the very last years.

- a) Increasing profits for the company this year and the previous years induced me to ignore or give low weight to the earlier profit development. The actual profit development of the company made me ahistorical (myopic).
- b) Increasing optimism about the future through the firm's increase in profits made me injudicious. In other words, the actual profit development of the firm made me intoxicated.
- c) Due to the high profits I got an exaggerated belief in mine and the company's ability to e.g. meet threats in the future. The actual profit development of the firm made me haughty.
- d) Due to the high profits, I repressed the risks of an investment – I acted self-deceptively.
- e) I was carried away by the optimistic atmosphere in an economy characterized by a general increase in profits. My investment propensity expressed a general euphoria in the economy.

Question 3

Assume as above that your firm has experienced an increase in profits this year and the previous two-three years. Which firm strategy would you use in this situation?

- a) I will not take any efficiency-enhancing measures or rationalize and I will maintain the existing product composition, technology and organization since it appeared to be profitable – a status-quo strategy without transformation.
- b) To meet future threats, I take efficiency-enhancing measures or rationalize but I will not pursue a radical change in product composition, technology or organizations – a status-quo strategy with transformation.
- c) Increasing optimism and longer time perspectives because of the profit boost induced me to make a radical change in product composition, technology or organizations (for example through R&D investments) – a radical transformation.

Question 4

You are only to answer this question if you have answered a) or b) on question 3.

Try to describe your motives for or the psychological mechanism behind your decision not to transform the company at all or only pursue a status-quo oriented transformation when your company experienced increasing profits during this year and the previous two-three years.

- a) The increase in profits made me ignore that the firm must have pursued status-quo oriented transformation or even radical transformation during earlier periods.
- b) The higher optimism about the future through the company's increase in profits induced me to make an undiscerning choice of a firm strategy without any transformation at all or a strategy with a status-quo oriented transformation.
- c) Due to the high profits, I got an exaggerated belief in my ability and the company's ability to meet threats in the future which made me believe that there were real arguments for a firm strategy without any radical transformation or without any transformation at all in the current situation.
- d) Due to the high profits, I repressed the risks of a status-quo strategy without transformation or a status-quo strategy with transformation.
- e) The increase in profits made me realize that there are unique competencies in the firm explaining that a status-quo strategy (with or without transformation) really is profitable in the future.

Remember:

A status-quo strategy without transformation:

I will not take any efficiency-enhancing measures or rationalize and I will maintain the existing product composition, technology and organization.

A status-quo strategy with transformation:

I take efficiency-enhancing measures or rationalize but I will not pursue a radical change in product composition, technology or organizations.

A radical transformation:

I pursue a radical change in product composition, technology or organizations.

Question 5

Which firm strategy would you choose if the increase in profits this year and the previous two-three years was so strong that your company came to experience record-high profits in a historical perspective?

- a) I will choose a status-quo strategy without transformation.
- b) I will choose a status-quo strategy with transformation.
- c) I will pursue a radical transformation.

Remember:

A status-quo strategy without transformation:

I will not take any efficiency-enhancing measures or rationalize and I will maintain the existing product composition, technology and organization.

A status-quo strategy with transformation:

I take efficiency-enhancing measures or rationalize but I will not pursue a radical change in product composition, technology or organizations.

A radical transformation:

I pursue a radical change in product composition, technology or organizations.

Question 6

How would you react to new information that your company faced the risk of a substantial decline in profits in the future? Note that the company has experienced three-four years with increasing profits.

a) I will switch from a status-quo strategy without transformation to a status-quo strategy with transformation.

b) I will switch to a radical transformation.

c) I will not change from a status-quo strategy without transformation to a status-quo strategy with transformation or pursue a radical transformation until the company is facing an actual decline in profits.

Remember:

A status-quo strategy without transformation:

I will not take any efficiency-enhancing measures or rationalize and I will maintain the existing product composition, technology and organization.

A status-quo strategy with transformation:

I take efficiency-enhancing measures or rationalize but I will not pursue a radical change in product composition, technology or organizations.

A radical transformation:

I pursue a radical change in product composition, technology or organizations.

Question 7

You are only to answer this question if you have answered c) on question 6.

Why will you first change to a status-quo strategy with transformation or pursue a radical transformation when the decline in profits is real?

- a) I postpone a reaction to get a clearer picture of the real character and scope of the profit decline, for example, to what extent the decline reflected external threats or internal firm conditions.
- b) I need an actual decline in profits to abandon my too optimistic view of the firm's prospect and to sober down after the period of increasing profits.
- c) I need an actual decline in profits to abandon the false feeling of invulnerability and superiority during the preceding period of increasing profits.
- d) I need an actual profit decline to abandon my myopia during the previous period of increasing profits and focus on the profit development during a longer historical period.
- e) I need an actual decline in profits to abandon my tendency during the period of increasing profits to repress the risks of a status-quo strategy without transformation or a status-quo strategy with transformation.
- f) I have a tendency to overreact to actual reductions in profits (though not necessarily to increasing profits), thus to believe that the actual fall in profits is permanent.

Remember:

A status-quo strategy without transformation:

I will not take any efficiency-enhancing measures or rationalize and I will maintain the existing product composition, technology and organization.

A status-quo strategy with transformation:

I take efficiency-enhancing measures or rationalize but I will not pursue a radical change in product composition, technology or organizations.

A radical transformation:

I pursue a radical change in product composition, technology or organizations.

Question 8

Which strategy would you choose if your company experienced an actual decline in profits during a year after three-four years of actual increases in profits?

- a) A status-quo strategy without transformation.
- b) A status-quo strategy with transformation.
- c) A radical transformation

Remember:

A status-quo strategy without transformation:

I will not take any efficiency-enhancing measures or rationalize and I will maintain the existing product composition, technology and organization.

A status-quo strategy with transformation:

I take efficiency-enhancing measures or rationalize but I will not pursue a radical change in product composition, technology or organizations.

A radical transformation:

I pursue a radical change in product composition, technology or organizations.

Question 9

You are only to answer this question if you answered b) or c) on question 8.

Did your decision to transform the company depend on the size of the actual decline in profits during the year?

a) Yes – the profit decline must at least be similar to the profit increase in the previous year to persuade me to transform the company.

b) No – even a small decline in profits compared to the profit increase in the previous year would persuade me to transform the company.

Remember:

A status-quo strategy without transformation:

I will not take any efficiency-enhancing measures or rationalize and I will maintain the existing product composition, technology and organization.

A status-quo strategy with transformation:

I take efficiency-enhancing measures or rationalize but I will not pursue a radical change in product composition, technology or organizations.

A radical transformation:

I pursue a radical change in product composition, technology or organizations.

Appendix B

The results from a role play in October 2009 and October 2010 with 136 undergraduate students in macroeconomics (Stockholm University) acting as CEOs for an established firm. The validity of the theory of transformation pressure (TTP) concerning investments, strategy choices and the underlying psychological mechanisms.

General version of the TTP: Current increase in profits	Q1: Decision on investment, N=136	(a) Overinvestment, n=37	p = 0.0413**
		Q2: Psychological mechanism, N=41	(a) Ahistorical, n=13 (b) Intoxicated, n=7 (c) Haughty, n=8 (e) General euphoria (≠ TTP), n=13 p = 0.029**
	Q3: Decision on strategy, N=136	(a) Status-quo w/o transformation, n=12 (b) Status-quo w transformation, n=95	p = 0.000***
		Q4: Psychological mechanism, n=106	(a,b,c,d) TTP Psychology, n=39 (e) Higher rationality (≠ TTP), n=67 p = 0.008
Special version of the TTP: Current increase in profits to record levels	Q5: Decision on strategy, N=136	(a) Status-quo w/o transformation, n=19 (b) Status-quo w transformation, n=100	p = 0.000***
		Change in strategy TTP :	Maintained Status-quo strategy w/o transformation (Q3a to Q5a), n=7 p = 0.050*
			Switched from Radical transformation to a Status-quo option (Q3c to Q5a,b), n=19 p = 0.000***
			Switched from Status-quo w transformation to Status-quo w/o transformation (Q3b to Q5a), n=9 p = 0.000
General version of the TTP: Expected and current decline in profits	Q6: Decision on strategy - Future decline in profits, N=136	(c) Firms will not react until an actual decline in profits (TTP), n=49	p = 0.466
		Q7: Incentives and psychologies N=47	(a) Option theory of investment under risk (rationality), n=37 (b,c,d,e,f,g) TTP Psychology, n=10 p = 0.000
	Q8: Decision on strategy - Current decline in profits, N=135	(b) Status-quo w transformation, n=90 (c) Radical transformation, n=37	p = 0.000***
		TTP strategy:	Q3 option: Status-quo w/o transformation, N=11 (a) Continued with pure status-quo, n=1 (b,c) Switched to transformation (Q3a to Q8b,c), n=10 p = 0.012** Q3 option: Status-quo w transformation, N=95 Switched to Radical transformation (Q3b to Q8c), n=22 p = 0.038

*** = 1%, ** = 5%, * = 10%

Special version of the TTP: Size of the current decline in profits	Q9: Decision on strategy, N=126	a) Large decline in profits, n=70 b) Small decline in profits, n=56	
		Change in strategy, TTP:	<p>Q5 but not Q3 option: Status-quo transformation instead of Radical Transformation, N = 5</p> <p>Switched to Radical transformation (Q3c and Q5b to Q8c) after a small decline in profits (Q9b) , n=5 p = 0.062*</p> <hr/> <p>Q5 but not Q3 option: Status-quo w/o transformation, N=10</p> <p>Switched to transformation (Q3b,c and Q5a to Q8b,c) after a small decline in profits (Q9b), n=3 p = 0.344</p> <hr/> <p>Change in strategy, TTP: (Not necessary condition)</p> <p>Both Q3 and Q5 options: Status-quo w/o transformation, N=7</p> <p>Switched to transformation (Q3a and Q5a to Q8b,c) after a large decline profits (Q9a) , n=5 p = 0.453</p> <hr/> <p>Both Q3 and Q5 options: Status-quo w transformation, N=18</p> <p>Switched to Radical transformation (Q3b and Q5b to Q8c) after a large decline in profits (Q9a) , n=9 p = 1.000</p>

*** = 1%, ** = 5%, * = 10%