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# **J-Economy, J-Corporation and J-Power since 1990**

## From Mutual Gain to Neoliberal Redistribution

Enno Berndt



**Edizioni**  
Ca' Foscari





J-Economy, J-Corporation and J-Power since 1990

## **Ca' Foscari Japanese Studies** History and Society

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Enno Berndt

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## **J-Economy, J-Corporation and J-Power since 1990**

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### **Abstract**

Although still big, Japan's economy and the management system of its corporations are not regarded as a model anymore in recent economic discourse. If addressed at all, they are taken as a negative example, a once hailed economic superpower and strategic benchmark of Post-Fordist management that has been in continuous decline since the early '90s due to insufficient compliance to Neoliberal structural policies. Against such wide-spread perception, this monograph demonstrates that the problems of Japan's economy and corporations are of a universal nature, that is, how to accomplish the transition from industrial mass production and consumption to a postindustrial, knowledge-centred economic system that leans on permanent innovation and consequently necessitates decentralisation and bottom-up participation. Contrasting the discourse of global standards with the historically formed local particularities of Japan's management system, this book approaches the allegedly negative example in three different ways: (1) a macro-economic account of the changes since '90 in order to contextualize the transformation of the traditional Japanese management system; (2) a micro-economic analysis of the changes in corporate governance and management system; and (3) a case study about Japan's electric power industry in due consideration of the 'nuclear complex'. The book takes a comprehensive and interdisciplinary approach, interrelating the perspectives of political economy, management and corporate culture; juxtaposing mainstream English-language theories with Japanese-language research; and examining theoretical propositions in view of extensive empirical data derived from officially available and critically analysed statistics. Postulating basic knowledge in economics and business administration, the book presents the example of Japan as worthy of continued attention.

**Keywords** Political economy. Corporate governance. Management system. Corporate culture. Electric power industry. Nuclear power in Japan.



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### **Foreword**

The crisis consists precisely in the fact that the old is dying and the new cannot be born; in this interregnum a great variety of morbid symptoms appear.

(Antonio Gramsci, *Prison Notebooks*, [1930] 2011, 34)

One term often used to describe perceived particularities of Japan or related phenomena in its society and economy is 'hybrid'. Japan is characterised as inhabiting both tradition and modernity, old and new, East and West, nature and culture. In this discourse, Toyota's Hybrid Electric Vehicle (HEV) does not appear. But combining a gasoline-fueled combustion engine with an electric motor and mass producing, this propulsion system has helped Japan's leading company, Toyota Motors, to gain a green image while expanding its production and sales of cars and ascending to the rank of the largest automotive manufacturer in the 2000s. Obviously, hybrids bridge things that are supposed to stay discrete or even replace each other as an outcome of transition. By joining supposedly contradictory elements, advantages of both sides are made to complement each other and disadvantages are minimised. One could call this by another buzzword, that is, synergy, which is used in business to justify extremely high transaction prices of acquiring corporations or their business and technologies. But rather than generating something new, hybrids serve to smooth, bolster and absorb the destructive energies of fundamental transition. Therefore, incumbents are inclined to give preference to them in order to maintain the status quo, when responding to transitional pressures or challenges by new players. As such, hybrids appear as a conservative technique of defence, obstructing and slowing down transition, but finally being overrun by it (Suarez et al. 2018).

Notoriously, in both specialised and popular international discourse, Japan's economy and the management system of its corporations are not regarded as vital anymore. Yet, this book seeks to track the evolving state of Japan's economy, corporate organisations and electric power industry since the early '90s. Normally, sketches of states have shorter half-lives than developmental histories or conceptualizations that provide a consistent narrative, not limited to a single subject or particular situation, but generally applicable to several subjects and situations. However, sketches

of states may highlight energies and the potential directions in which they may be released. Such states are a consequence of how actors – entangled in contradictions – perform and think, thereby mutually dissolving the very state that holds them together. This book sets out to trace some of these contradictions in Japan's economy and large corporations. It is based on empirical material and theoretical models that the author has used in his work as an academic teacher, researcher and consultant in Japan since the early '90s. Leaning on official statistics as empirical reference, as this book does, means to work with sets of data that are intentionally created, defined by the power relations and interests of those involved in their creation (Velleman 2008). But such systematic interest-driven filtering is not without its own consistency. It allows to discover trends in the data without constantly identifying the subjective factor or, to the contrary, naïvely believing that data objectively represent an exterior reality. The intention is to provide neither another empirical case for reconfirming general assumptions nor another comprehensive description; it is rather to look for critical configurations and a meaningful pattern of interpretation that would benefit both interested observers and those involved in the very processes and discourses (Flyvberg 2006).

Theories are sense-making frames, tools to generate meaning and to justify knowledge through reasoning back and forth between deduction, induction and abduction (Mantere, Ketokivi 2013). Actually, they cast more shadow than light when employed to describe organised action in economies and business merely as purpose-rational or socially indifferent (Pettigrew et al. 2002, 11-5). How organisations as well as their individual and collective constituents act can only be observed retrospectively in view of patterns and consequences, and these consequences are to be interpreted as a contradictory process rather than the result of deductively anticipated and empirically verified action. Action is to be conceived as entangled in conflicting interests, patterns of behaviour and structures (Pettigrew et al. 2002, 15-6). Only then variables of corporate strategies – i.e. governance and cultural models – become apparent and zones of social intervention can be determined. In other words, any theoretical representation falls short when faced with practice, unless the values and orientations of the actors are exposed and questioned (Nooteboom 2000). How contradictions unfold depends on the behaviour of organised subjects and their interaction in concrete circumstances. These subjects react to their environment neither in a blind and mechanical nor in an exclusively purpose-rational way. They create their circumstances by justifying their thoughts and actions against others as well as themselves. It takes a look at the concrete historical situation to understand the inner contradictions of the actors themselves, the coexistence and opposition of old and new thinking and acting. There are, of course, different ideas on how the future may look like and should be designed. But the question arises whether organised

actors such as corporations are able to create the new by transforming themselves, as they are imprisoned in the iron cage of structures and powerful interests, reproducing incremental optimisation and hierarchical cooperation. There are exceptions to the supposed rule, i.e. single examples of creating futures. Such actors may prompt others to cooperate and pave the way for a non-linear dynamic of innovation (van de Ven, Garud 1989), through bootstrapping (Sabel 1995), rule violation and mimesis (Ortmann 2003). But conservative corporations and efforts to protect their interest under the label of neoliberal reform are predominating. Consequently, the guiding questions for a critical inquiry are: what are the costs of maintaining structures that protect the incumbents and their dominant positions, and where do alternatives arise?

Even after more than two decades of deflationary stagnation, Japan's economy is still big. About one tenth of the world's largest companies have their headquarter in Japan. But, Japan's economy and the management system of its corporations are rarely discussed and if so, then often as a once hailed economic superpower and strategic benchmark of Post-Fordist management, that has been in continuous decline since the early '90s, and as an example of insufficient compliance to neoliberalist structural policies. Against such stereotypical perception, this book demonstrates that the problems of Japan's economy and corporations are more of a universal nature, that is, a kind of forefront experience that provides important lessons for actors inside and outside of Japan. Countering the discourse of lost decades, this book argues for a sustained institutional engagement with the study of Japan's economy and management system. Methodologically, it takes a comprehensive and interdisciplinary approach, interrelating primarily the perspectives of political economy, management and corporate culture; juxtaposing mainstream English-language theories with Japanese-language research and local particularities of Japan's management system with so-called global standards; contrasting theoretical propositions with rich empirical data and exemplifying this in a case study on the business model and governance system in the Japanese electric power industry.

The book addresses three aspects: J-Economy, J-Corporation and J-Power. Accordingly, chapter 1 draws a macro-scale picture of economic change since 1990, which provides the framework for the transformation of Japan's traditional management system. Chapter 2 takes a closer look at changes in corporate governance and management system; and chapter 3 consists of a case study on Japan's electric power industry. The first chapter proceeds from a review of influential macro-analyses with a special focus on proponents who are critical about the current course of Japan (Werner 2005; Koo 2003, 2009, 2015; Vogel 2006; Aoki 2000, 2007) - based on mainstream concepts of supply (Lincoln 2001) and demand-side economics (Krugman 2013; Posen 1998). These proponents often utilise the Japanese case to confirm their own theoretical model,

sometimes even against empirical evidence. In this book, Olson's political economy (1965, 1982, 1985, 1993) and other propositions are augmented with recent accounts and empirical evidence generated by Japanese researchers such as Miyazaki (1992, 1995), Mizuno (2014, 2016), Takahashi (2015) and Iwai (2005, 2009) as well as the Author drawing attention to the limits of the traditional (industrial) growth regime in Japan and to the challenges that arise from the importance of knowledge production and social inequality. The second chapter links the macro-perspective to a micro-level perspective and provides empirical evidence in support of the Author's central argument that large corporations and their stakeholders deserve more attention as actors than government and central bank, whose role has often been overrated in Japan-related political and academic discourse. As an alternative to the alleged global standard in corporate governance and corporate culture, this book emphasises the importance of a balanced stakeholder system and a participative corporate culture, that is, to go beyond the prevailing concept of corporate social responsibility (CSR) and enhance innovation by promoting participation inside and a future-orientated mission outside the corporation. Conjoining arguments of chapters 1 and 2, chapter 3 consists of a comprehensive investigation of the Japanese electric power industry. After an analysis of the power relations between the main players and the consequences of the current centralised system, including the causes and costs of the Fukushima nuclear disaster, chances for a shift towards a decentralised system based on renewable energies are discussed.

## Conventions

In contrast to Japanese publications, Japanese personal names are indicated in accordance with Western custom, that is, with the surname following the first name. The transcription of Japanese words is based on the revised English Hepburn system. In line with the manuscript style of the publisher, macrons are used throughout also for familiar place names. The titles of Japanese references are indicated in Romanised form only, due to space constraints. Full names of ministries, organisations and others are mentioned the first time they appear and in abbreviation in subsequent appearances. Unless otherwise indicated, the cited daily newspapers refer to the national morning or daily editions. Data are given for either the calendar year (CY) or the fiscal year (FY). The latter begins on 1 April and ends on 31 March of the following calendar year (CY).

## **J-Economy, J-Corporation and J-Power since 1990**

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# **1 J-Economy: Caught Between Lack of Structural Congruence and Mistaken Policies**

**Summary** 1.1 Introduction. – 1.2 Bubble, Bubble How Much Trouble: Liberalisation, Asset Inflation and Deflation. – 1.3 Public Deficit Spending: Avoiding the Worst, but Inefficiently. – 1.4 Replacing Fiscal Expansion by Structural Reform after 1998: Deflating Labour Cost. – 1.5 'Distributional Coalition' Between State and Large Corporations.

The appeal to national character is generally a mere confession of ignorance.

(Max Weber, *The Protestant Ethic and the Spirit of Capitalism*, [1905] 1958, 56)

If I want to imagine a fictive nation, I can give it an invented name, treat it declaratively as a novelistic object, create a new Garabagne, so as to compromise no real country by my fantasy (though it is then that fantasy itself I compromise by the signs of literature). I can also – though in no way claiming to represent or to analyse reality itself (these being the major gestures of Western discourse) – isolate somewhere in the world (faraway) a certain number of features (a term employed in linguistics), and out of these features deliberately form a system. It is this system which I shall call: Japan.

(Roland Barthes, *Empire of Signs*, [1970] 1982, 2)

## **1.1 Introduction**

Any subject of academic research and teaching is strongly influenced by the interests of those who decide what resources will be granted to which extent and how they can be used. Representatives are executing this power through institutionalised procedures. This tends to produce issue selection and resource distribution, both driven by fashion: changes in what issues are chosen as being worthy of resources often replicate waves of public attention. These waves are generated by mass media, initiated by mighty actors and swinging between the extremes of positive and negative perception.

One might say, that this is the very nature of change: a former synthesis becomes a dominating thesis by selection due to its superiority in fitting new conditions, and it is retained as such until an antithesis appears and becomes strong enough to challenge the thesis – unless external change undermines the match between the retained mainstream position and its

environment. If internal opponents do not appear and grow, change will be enforced externally. Meanwhile, the mainstream is resisted only by those, who still believe that academic research and teaching are provided with resources not exclusively to reconfirm the mainstream, but to question it, to raise issues, to explore related connections, to identify driving forces, consequences and alternatives, which influence the thinking and acting of collective subjects in societies and organisations but are being overlooked or ignored.

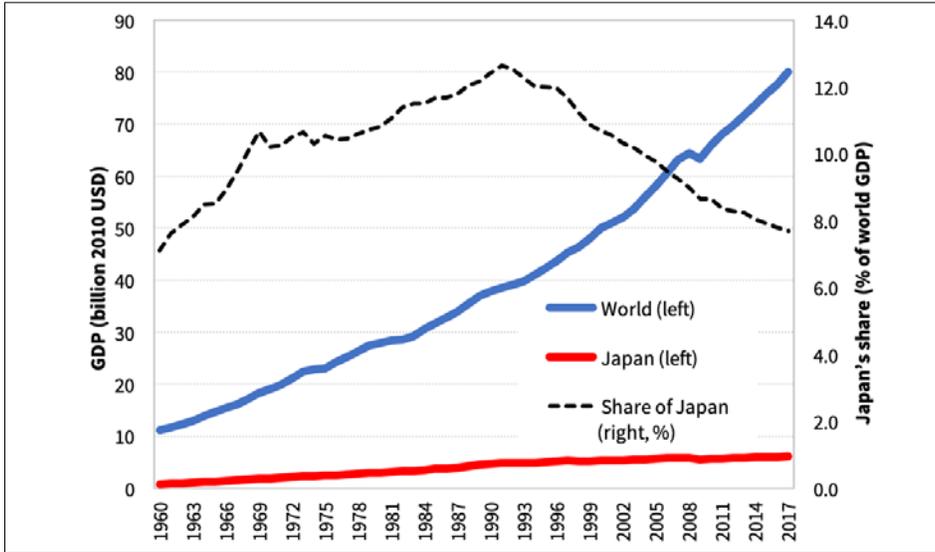
Japan is a case in point. Its post-war development is mainly told as the story of rising from the ashes of World War 2 towards an economic superpower (Vogel 1979) and a prototype of Post-Fordism in the '80s (Kenney, Florida 1993), then falling into stagnation after inflated real estate and stock markets crashed in the early '90s and having failed to break out of deflation since then. In view of signs of deflation somewhere in the world, Japan is often a synonym for the worst case: 'Is xxx (not) the next Japan?'.<sup>1</sup> Indeed, long-term statistics suggest Japan to be an example for the rise and fall of national economies (chart 1.1).

But even after two decades of stagnation, Japan's economy is still too big to be considered negligible: as of 2017, it had the 3rd largest nominal Gross Domestic Product (GDP; 4.9 trillion USD), the 4th largest export volume (0.698 trillion USD), the 2nd largest Foreign Direct Investment (FDI) outflow (160.4 billion USD) and FDI outwards stock (1.52 trillion USD), the 2nd largest Foreign Currency Reserves (1.264 trillion USD) and the 4th largest Official Development Aid (ODA) budget (11.9 billion USD) in the world (UNCTAD 2018; IMF 2018; World Bank 2018a, 2018b). Ranked in terms of the total revenue in 2017, 52 companies or 10.4% among the Fortune Global 500 (Fortune 2018) and 228 companies or 11.4% among the Forbes Global 2000 (Forbes 2018) had their headquarters in Japan.

However, in terms of labour productivity (measured as GDP output per hours worked), Japan's performance is lower than that of other G7 countries, and lower than the OECD average (chart 1.2). Japan's rank in terms of other outputs per capita is also considerably lower than that of absolute output volumes: in 2017 it was 23th in nominal GDP per capita (38,440 USD), 28th in GDP per capita based on purchasing power parity (PPP) (42,659 USD) and 40th in export per capita (5,496 USD). Japan's rank in terms of GDP per capita based on PPP has fallen from its peak of 17th in 1996 to its preliminary bottom of 34th in 2009 (IMF 2017).

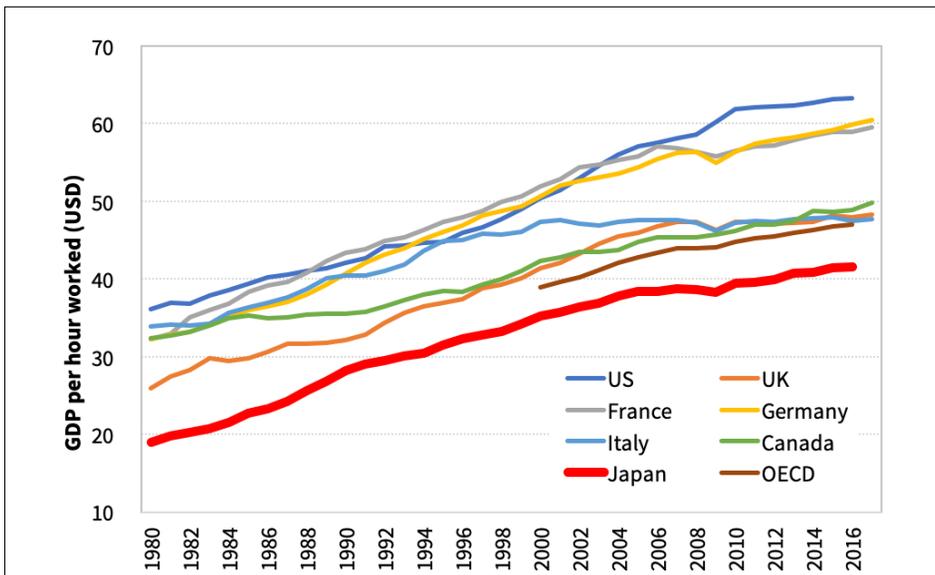
1 See Elyatt 2014; Klingholz, Slupina 2017, 35; Keyu Jin 2016; Summers 2016, 4. Karabell is doubting this common perception. His argument is that GDP growth does not necessarily reflect increasing prosperity and well-being, rather that both can be increased without GDP growth. Indeed, Japan has achieved a relatively high average life expectancy and level of public security. But he is mistaken when he states that "there is nothing really wrong with Japan" (Karabell 2016, 50).

Chart 1.1 Real GDP of the world and Japan (in 2010 USD)



Source: Author, based on World Bank 2018a, 2018b

Chart 1.2 Labour productivity as GDP per hour worked (in USD)



Source: Author, based on OECD 2018

Rapidly increasing capital expenditures, production capacity and a slightly growing workforce with long working hours on the supply side (Yoshikawa 2016, 78-85), and an expanding number of households and domestic purchasing power on the demand side have been driving Japan's economic growth until the early '90s.<sup>2</sup> In line with Japan's relatively low level of labour productivity, its national competitiveness has been globally ranked lower by the International Institute for Management Development (IMD) since the late '90s<sup>3</sup> (chart 1.3).

From this perspective, the outlook for Japan's economy with an ageing population, shrinking workforce and domestic demand appears bleak (chart 1.4) – unless Japan achieves higher productivity by eliminating structural obstacles on the supply side enabling innovation of products, processes and business models (Hayashi, Prescott 2002, 206-35). But over the last 25 years Japan has been caught in economic stagnation. For the neoliberal mainstream, this is evidence enough, that Japan has not been consequently transforming towards a liberal market economy.<sup>4</sup>

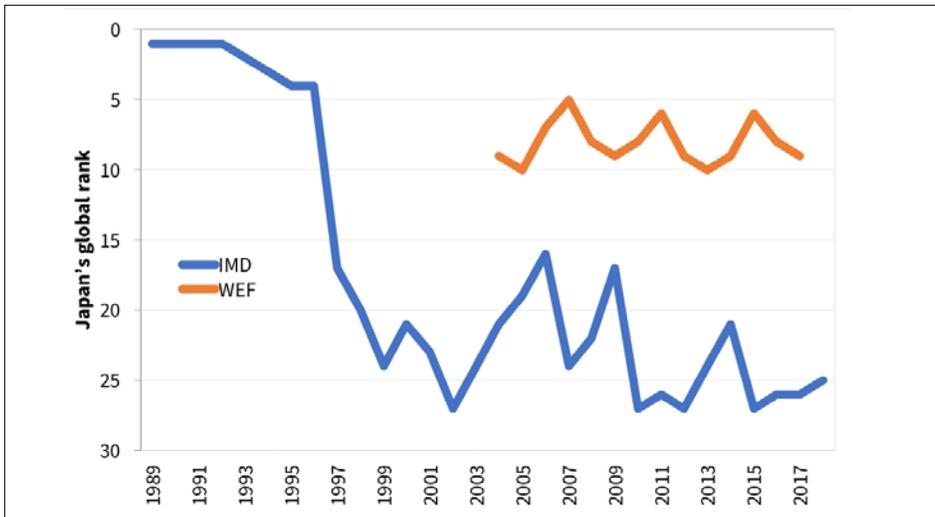
Thus, Japan is perceived as an example of failing to unleash the power of the markets as well as competition and creative destruction through structural reforms, doing too late and too little to strengthen the supply side by deregulating, privatising and liberalising (Lincoln 2001). But has Japan not changed from its traditional system towards what was declared by the neoliberal mainstream as global standard? And what if stagnation is not an evidence for the absence of such change, but, on the contrary, an outcome of it or the attempt to implement it?

2 Such macro (average) data represent various sectors, industries, regions, forms and sizes of corporations. Japan's economy has been characterised by several dual structures: the contrasting existence of a few large corporations vs. many small firms (often dependent suppliers or traditional retailers); private vs. public sector; domestic (service) vs. exporting (manufacturing) industries; modern industry vs. traditional wholesale, retail sector and agriculture; urban centres vs. rural areas, etc. Much of Japan's Total Factor Productivity (TPF) growth was due to economy-of-scale effects and the related increase of capital expenditures in large manufacturing corporations. Since the '80s, the majority of Japan's workforce has been absorbed by an expanding service sector, which consists of traditional and dispersed structures lacking productivity. Recent research measuring productivity as operating profits per employee from 2000-2015 and comparing large corporations from the first division of the Tōkyō Stock Exchange with their peer corporations among the Fortune 500 ranking shows that large corporations in Japan are improving their productivity, which is still lower than that of their foreign peers mainly due to lower output performance (Nagayama 2017, 71-86).

3 The consistently higher ranking of Japan by the World Economic Forum (WEF) might reflect the relatively high average life expectancy and level of public security in Japan (WEF 2017).

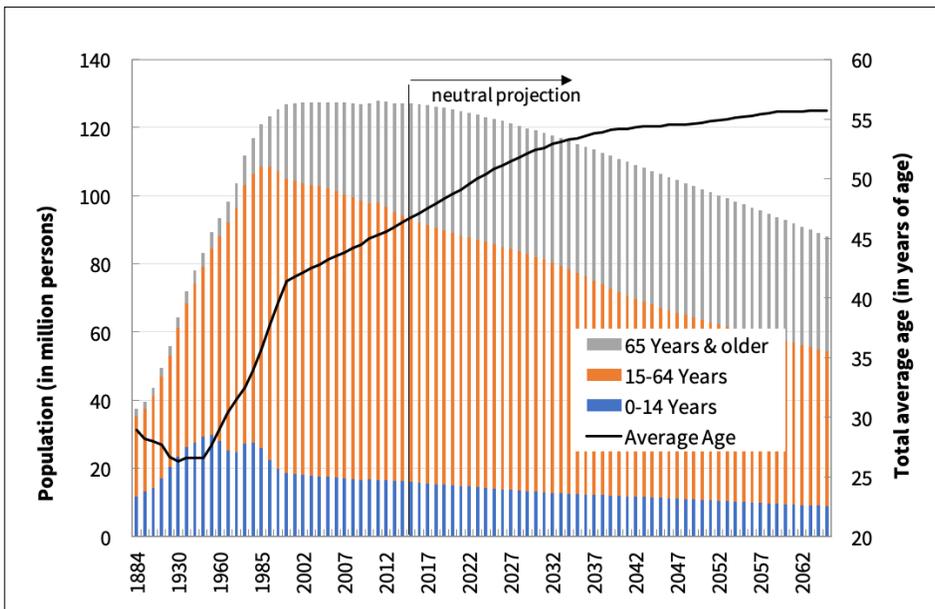
4 Vogel, taking the position of institutional economics, indicates an active external labour market, a market for corporate control (corporate governance induced by capital markets) and free market entry and exit (free competition) as the central sub-systems, urged to be established by neoliberals and the US government through structural reforms for a shift towards an US-like liberal market economy (Vogel 2006, 6-7).

Chart 1.3 WEF- and IMD-World competitiveness rank of Japan



Source: Author, based on IMD 2018, WEF 2017

Chart 1.4 Population of Japan by age groups and average age (CY)



Source: Author, based on NIPSSR 2017

Rejecting the popular view, that not only corporations, but also nations are competing,<sup>5</sup> Krugman (2013) has seen Japan as a challenge for applied economics: here the neoliberal mainstream dogma of strengthening supply power by lowering interest and increasing money supply as well as deregulation has proved ineffective. According to him, the core problem of Japan's stagnation lies in a lack of demand. This should be solved rigorously by fiscal and monetary expansion (Krugman 1997). In 2015, Krugman stated, that productivity (measured as real GDP per employed person) has grown faster in Japan than in the US and Europe since 2000. Japan's productive (i.e. income-earning and consuming) population is shrinking though. Thus, demand growth remains dependent on fiscal stimulus, despite public spending not being expandable faster than economic growth. The zero-interest-level monetary policy, too, has lost impact and cannot replace fiscal expansion either. Hence, fiscal stimulus should be continued along with monetary expansion, until future expectations have raised to a level, where higher prices are generally accepted without reducing consumption (Krugman 2015).

For Keynesians like Krugman Japan is not an exceptional case that exhibits the consequences of not complying with or converging to a perceived global standard. To them, this economy is more a learning case to apply their models of how to cope with stagnation, the relation between business cycle and structural evolution and other limits to economic expansion (Krugman 2014a, 2014b). In their view, the critical state of Japan's economy results from a misperception of causes, mistaken policies and wrong choices made by government and central bank (Posen 1998, 143-57). Similar to their neoliberal opponents, the Keynesians respond to discrepancies between their theoretical models and empirical data by urging government and central bank to do what they have recommended and to do more of it: just try harder, which explains why they support the policy measures taken by Japan's government under Shinzō Abe und the Bank of Japan (BOJ) under Haruhiko Kuroda. But why have they been ignored so long, despite the fact that the outcomes of policies proposed by their neoliberal opponents have been obviously unsatisfying in terms of economic performance? Have their own recipes not been applied (at least partly and temporarily) and resulted in what they expected? Have Keynesian recipes simply not worked?

5 Krugman's argument is threefold: (a) nations do not go out of business, if failing to meet external competitive benchmarks; (b) instead, their primary goal is to improve the standard of living for their citizens. The ability to achieve this goal in economies like the US and Japan, where the exposure to external markets through exports is relatively low (10-15% of GDP), is driven mainly by domestic productivity. (c) International trade between nations is not a zero-sum game, as it generates mutual benefits based on comparative advantages, allowing each to focus on sophisticating their own advantages (Krugman 1994, 1996).

Werner (2005) criticises both standard theory positions for not reflecting the limitations of their unrealistic model assumptions, for ignoring empirical evidence and being unable to explain long-term developments, such as the rise and fall of Japan's economy. All policy measures proposed or legitimised by mainstream proponents of both economic theories – such as fiscal expansion (public deficit spending), monetary expansion (lowering interest rate, increasing money supply) and structural reform (deregulation, liberalisation and privatisation) – have failed to ignite sustainable growth in Japan. Instead of following deductively generated conclusions, Werner calls for an inductive approach in the form of pattern finding and testing of theoretical explanations to understand reality. For him, not interest rate level and public deficit spending, but the quantity and quality of credit money creation is critical: creating credit money enables modern economies to allocate capital (purchasing power) towards demand for investment or consumption without being limited by the amount of prior (i.e. available) savings. For what purpose (consumptive, speculative or reproductive) and to whom banks are lending to are crucial questions and can explain the economic performance also in the case of Japan. How effective credit creation in stimulating or depressing economic activity is depends on decisions to invest into productive assets for increasing productivity and generating utility or economic value or non-productive assets for pure asset price speculation beyond the level of past internal streams of earnings and the related demand for funding.

Koo (2003, 2009, 2015) shows empirically that the classical approach (e.g. economic textbooks') of stimulating an ailing economy by lowering interest rates, increasing money supply and pushing for structural reform has not worked in response to Japan's asset bubble burst, and then he explains why no substantial funding demand occurred in the private corporate sector. Heavily overleveraged balance sheets of the private corporate sector rendered monetary stimulation ineffective: in view of imploding asset prices, corporations that had financed their asset purchases through borrowing were confronted with huge write-downs on their assets value, while liabilities remained unchanged.

If a decrease in assets value cannot be absorbed by reducing the capital (or equity) base, liabilities exceed assets. To prevent insolvency corporations have to shift from profit maximisation to debt minimization (preferring the latter over reinvesting cash flows into business). Output and demand for funding in the private corporate sector declines, and so does the aggregate demand. Consequently, deflation occurs. The deflationary downwards spiral continues until general deleveraging and the value of remaining assets reach a level, where new corporate investments and the related impacts on the balance sheet can be justified in the name of future incomes, and when the related funding demand recovers. But if corporations generally deleverage (that is, reduce borrowing and pay-

ing down debts), the general demand is affected negatively. Therefore, it was inevitable in '90s to avoid to avoid an overall contraction of Japan's economy by means of fiscal expansion. But under which conditions will private corporations see their balance sheet as sufficiently recovered to start investing and stop cutting the prices?

Vogel (2006) reflects on the current change of the Japanese economic system. This system was regarded by Aoki (1990, 1998) as horizontal coordination, that is, integrating the long-term interest of government, companies, employees, banks and suppliers by balancing competition and collaboration. For his own analysis, Vogel applies a model where the macro level (government policy) constraints the micro level (corporate behaviour) through legal and regulative limits. At the micro level, actors are aggregating their interest in response to incentives and constraints set up at the macro level. This induces patterns of policy demands and corporate adjustments, which are transmitted back to the macro level through political institutions. Accordingly, institutional change evolves in the form of interaction between macro and micro levels as policy reform modifies the conditions for corporate adjustment, which in turn modifies preferences towards further policy reforms. Although demands and interests, aggregated on the micro level, are influential, the macro level appears to be the strategically initiating side. Enlarging his model of change by means of social and political factors, Vogel (2006, 16-21) concludes that the Japanese system with its pillars - internal labour markets, main bank credit-based financing and corporate control, horizontal and vertical corporate networks through cross holdings and *keiretsu* (conglomerates) - has changed, following its own institutional incentives and constraints, but that the system has not simply and totally converged into a liberal market. This raises the question of what characterises such an economic system, if it is neither converging to US style nor remaining a variation of its own past.

In this chapter, several reasons will be provided why Japan is far from being a positive case for a post-growth society. The focus is not exclusively on the perceived macro-level players, government and central bank. Undoubtedly, they both do hold big power and exert strong influence on all other actors through fiscal, monetary and structural policy (Grimes 2001). But they are not the only systemically relevant subject nor do corporations and private households just passively respond to policy measures by government and central bank. Corporations and private households do have a strong influence on which priorities are set on the macro level, which political measures are taken and what the final outcomes are. Therefore, a wide view needs to be taken on how crucial players of Japan's economy have interacted: What interests have driven their actions? Who has gained and who has suffered from economic developments since 1990? What are implications and alternatives for Japan's economy and society in the future? Based on analyses of macro-economic statistics, Japan's economy

is described as the accumulated outcome of the action and interest of relevant players, particularly corporations and their stakeholders. Due to their systemic, economic and political importance, corporations and their stakeholders are taken again into focus in the second chapter of this book, but then from a micro-level perspective.

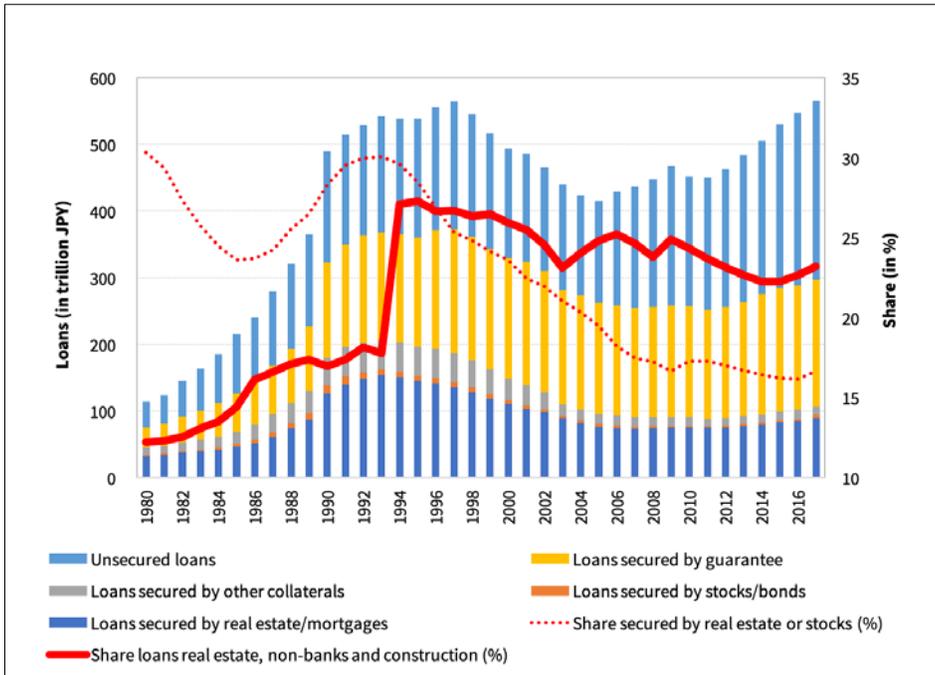
## 1.2 Bubble, Bubble How Much Trouble: Liberalisation, Asset Inflation and Deflation

Since the early '80s, Japan's financial industry has been deregulated – following demands by the US government to grant foreign banks and investors access to the Japanese market and Japanese investors access to foreign financial markets and to promote a shift from bank funding to capital market funding (stocks, bonds, derivatives). Restrictions were relaxed or removed to make Japan attractive as an off-shore capital market (Miyazaki 1992, 109-48; 1995, 59, 164-5). Simultaneously, the Japanese government shifted its economic policy from promoting export to stimulating domestic demand. The BOJ lowered interest rates – in response to an unprecedented appreciation of the Japanese Yen (JPY) (from 250 JPY/USD to 120 JPY/USD) as well as shrinking exports and an economic downturn after the Plaza Agreement (1985), which was initiated by the US government to curb trade imbalances with Japan and get its own economy recovered. Big corporations shifted their financing towards capital markets. In need of alternatives for lending, banks started to focus on the asset markets (land and stocks) as well as small to medium enterprises (SME). Consequently, capital funds flowed into Japan's asset markets, where speculative demand was ignited by liberalisation and the purchased assets could be treated as loan collaterals (Miyazaki 1992, 149-70; Werner 2005, 232-7) (chart 1.5). Most of these asset purchases were heavily leveraged.

The speculative demand called for further speculative demand: many market players were not only generating, but assuming a continued rise of assets prices and returns higher than their financing cost. This boosted capital gains for borrowers, collateral value for lenders and demand for purchasing more assets, related borrowing and lending. Commercial banks competed over market share in lending, while assuming that their credit risk was sufficiently covered by the increasing value of asset collaterals. Fuelled by rising asset prices and capital gains, consumption and capital expenditures expanded faster than incomes or earnings.<sup>6</sup> This resulted in

6 Morinaga emphasises that the bubble economy of the late '80s should be understood as the final stage or reappearance of the high growth economy in the '60s and '70s and that it was not limited to the asset markets, but it also affected common lifestyle and social spheres such as family, education and mobility (Morinaga 1998, 107-42).

Chart 1.5 Loans of banks by collateral and borrowers in Japan (CY)



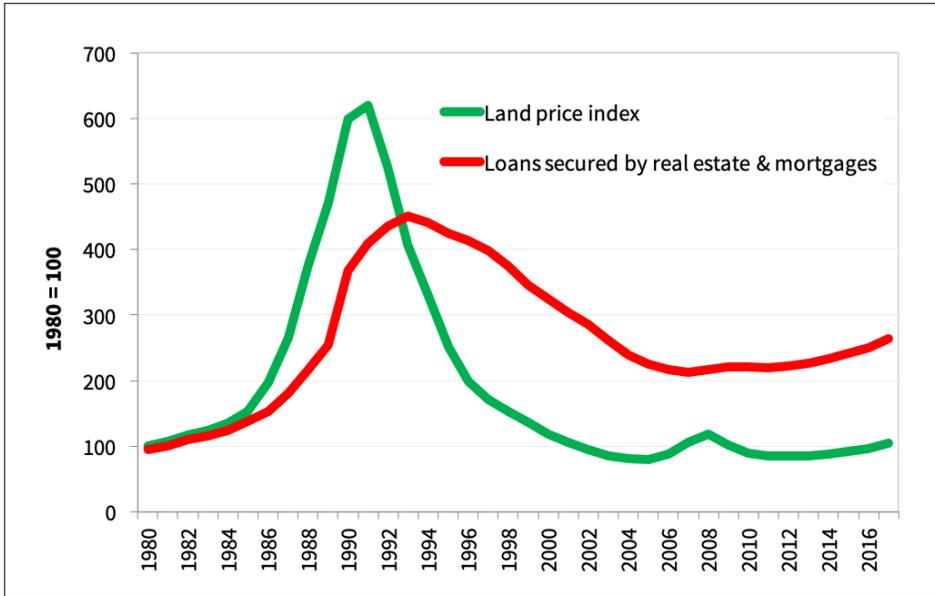
Source: Author, based on BOJ 2018

average prices for land and stocks increasing by about six times within '80s to 1990-1991. But demand and asset prices could only increase as lending was extended. Thus, the upwards spiral turned downwards after interest rates had been raised several times, lending restrictions had been applied, banks had started to reduce lending for asset purchases, and finally purchasing demand for assets had shrunken while selling supply had surged (charts 1.6a-b).

What happened then is described by Werner (2005) as a vicious circle of credit crunch recession: bad loans increase, banks become more risk-averse, lending shrinks, corporations fail to secure funding, bankruptcies surge, wages decline, jobs get lost, demand contracts and bad debts rise (229-30). However, the amount of extended loans decreased only twice, namely 1998-2004 and 2009-2010, when banks faced contracting value of their capital base (chart 1.7).

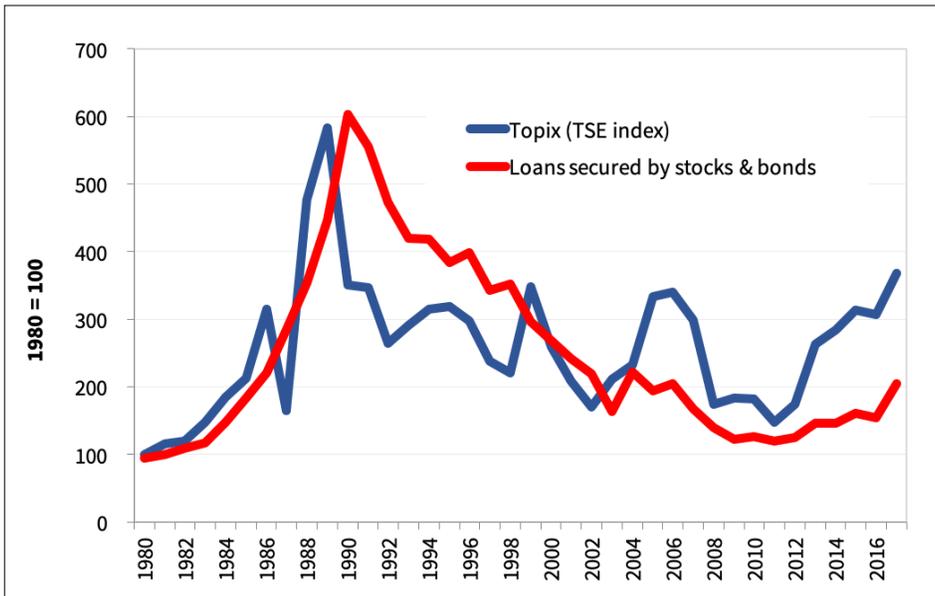
SME (representing 99% of all corporations, 70% of the workforce and more than 40% of all sales in Japan) suffered from credit crunch heavier and longer but not earlier than large corporations (which had expanded the capital base by equity or bond financing). Most of new corporate loans

Chart 1.6a Land price average and related lending in Japan (CY)



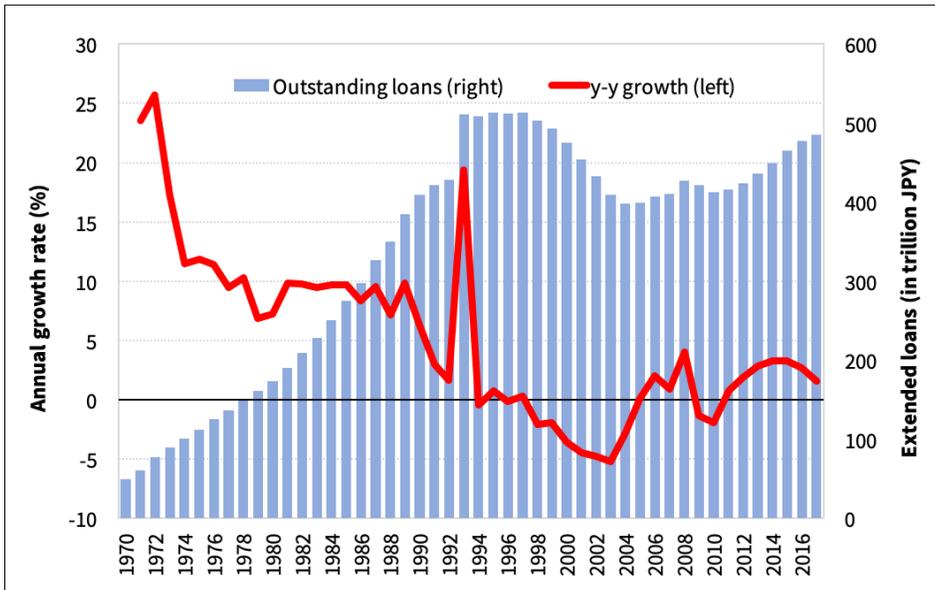
Source: Author, based on BOJ 2018; JREI 2018

Chart 1.6b Stock price average and related lending in Japan (CY)



Source: Author, based on BOJ 2018; JPX 2018

Chart 1.7 Outstanding bank loans and annual growth rate (CY)

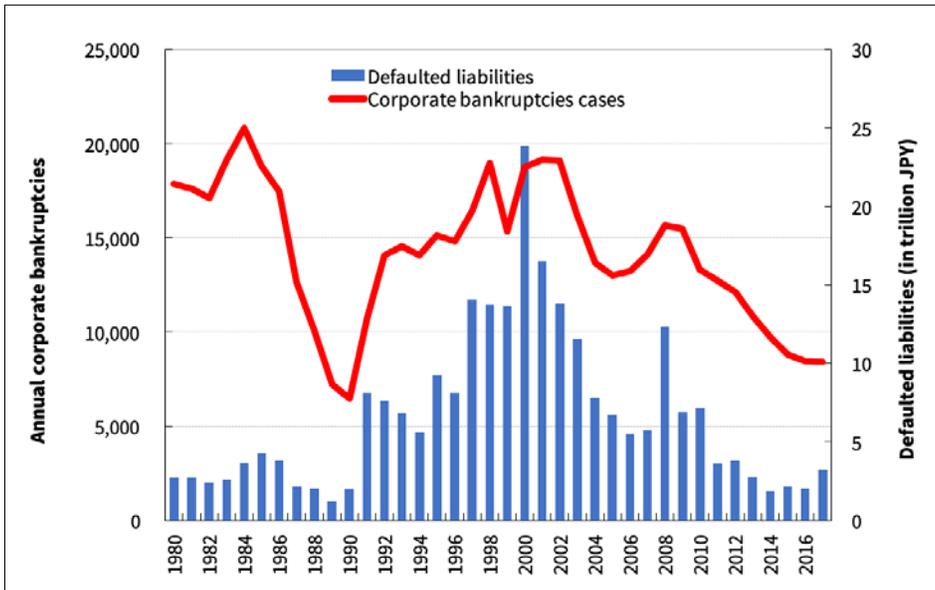


Source: Author, based on BOJ 2018

given to real estate, construction and non-banks between 1986 and 1991, were secured by real estates, mortgages or stocks and became ‘non-performing’. Their total volume can be estimated at 80-100 trillion JPY (16-20% of all loans). The total of defaulted corporate liabilities between 1991 and 2003 amounted to 152 trillion JPY. They included debt, which was not directly related to speculative asset purchases, but affected by the burst of the bubble, the cyclical downturn and the financial crisis of 1997-1998 and the related credit crunches (chart 1.8).

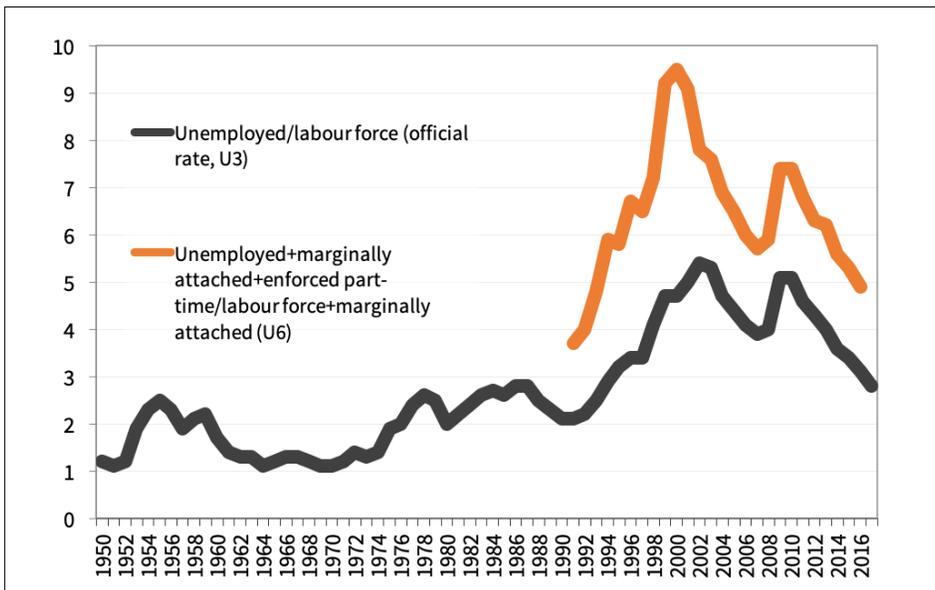
Unemployment increased to an unprecedentedly high level (chart 1.9a). A rising number of persons committed suicide, often hoping that life insurance companies would pay the death benefit to their families (chart 1.9b). Many were owners of small enterprises, affected by the credit crunch and unable to pay their debt, or so-called regular employees, who lost managerial positions or their job when non-regular employment became abundant.

Chart 1.8 Corporate bankruptcies and defaulted liabilities in Japan (CY)



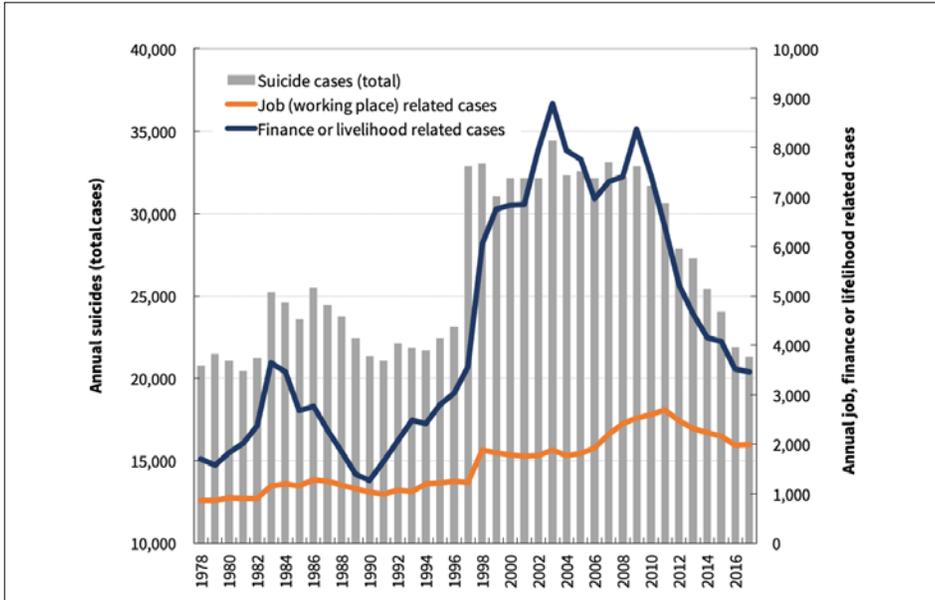
Source: Author, based on TSR 2018

Chart 1.9a Unemployment rate in Japan (% , CY)



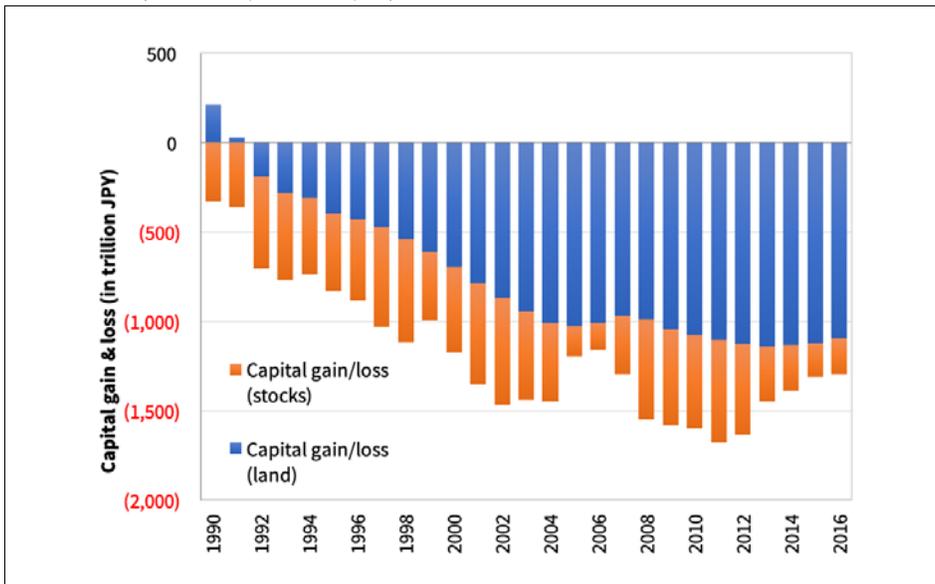
Source: Author, based on MIC 2018a, JILPT 2018

Chart 1.9b Suicides in Japan (CY)



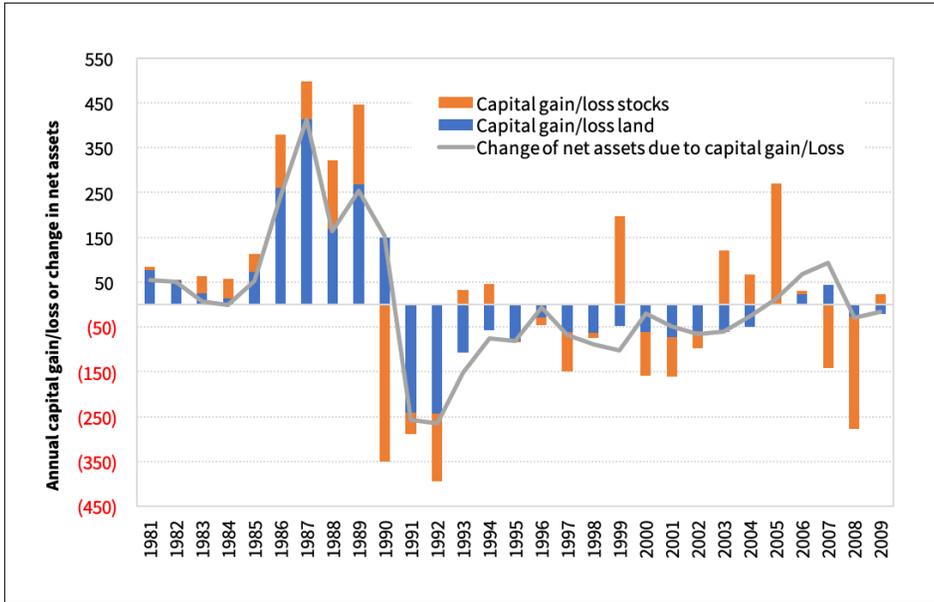
Source: Author, based on NPA 2018

Chart 1.10a Total capital gain/loss on stocks and land in Japan vs. 1989 (2011 Base, 2008 SNA, CY)



Source: Author, based on CAO 2018a (CY)

Chart 1.10b Annual capital gains or loss on holdings of land and stocks in Japan (in trillion JPY)



Source: Author, based on CAO 2018a

Instead of a typical credit crunch, which in Japan was an outcome rather than the root cause, Koo points to the impact of falling asset prices on the balance sheets of the private corporate sector and the related absence of demand for borrowing as genuinely most important (Koo 2009, 45-7). To illustrate how huge the asset price fall and its impact were, he refers to the Cabinet Office’s National Account Statistics: assuming that the total difference between peak and bottom of the asset market price within the period chosen was impaired as capital loss into the balance sheets, he estimates that asset value, amounting to more than three times of Japan’s GDP, evaporated due to the decline of land and stock prices (chart 1.10a). Subsequently, Japan’s economy suffered from a “balance sheet recession” (Koo 2009, 16-7).

Already in 1992, Miyazaki pointed to the relation between accumulated wealth (stock) and GDP growth (flow): he described the aftermath of the asset bubble as ‘combined recession’ (*fukugō fukyō*) triggered by the contracting value of financial assets and resulting in an unprecedented cyclical downturn. For his analysis, he used the Adjustment Account Section 2b of National Accounts (Miyazaki 1992, ii/iii; 1995, 42-58, 158-9). Based

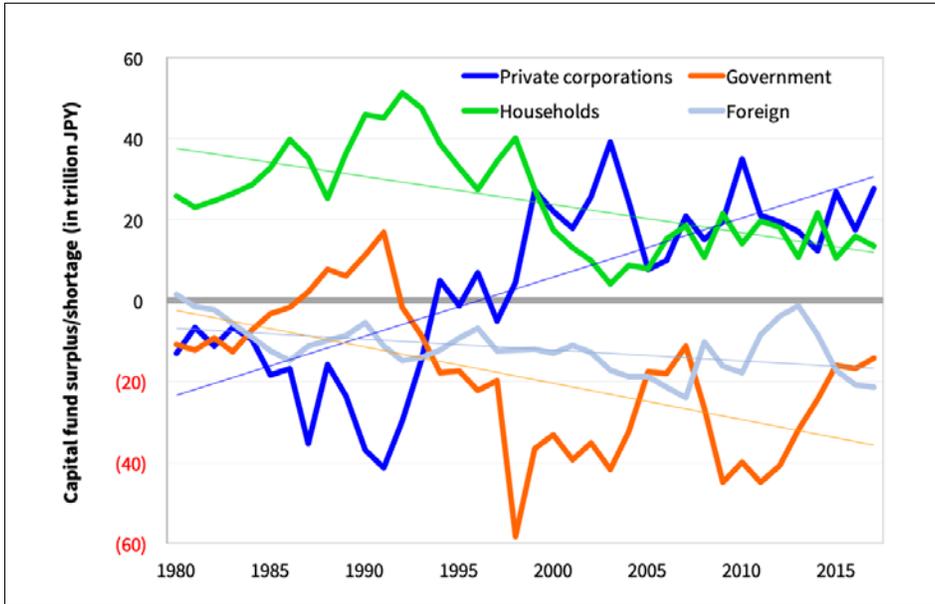
on these data for capital gains or losses on land and stocks holdings from 1980 to 2009 (93 SNA, prices of 2000), capital gains during the bubble (1986-1989) amounted to 1,644 trillion JPY, while capital losses in the post-bubble period (1990-2002) accounted for 1,588 trillion JPY (chart 1.10b).

Capital gains of the non-financial sector (private and public corporations) on land holdings in the period of 1986-1989 were estimated at 266 trillion JPY (14% of total assets 1989) and those of stock holdings at 119 trillion JPY (10% of total assets 1989). From 1990 to 2002 capital losses on land holdings amounted to 308 trillion JPY (16% of total assets 1990) and those on stock holdings to 228 trillion JPY (12% of total assets).<sup>7</sup>

Under these conditions, many corporations, which had taken loans to finance asset purchases but lacked cash income to repay their loans and which were refused by their borrower to postpone or temporarily reduce their loan repayment, went bankrupt (chart 1.8). Corporations, staying in business had to keep operations running and pay off their debts instead of investing and procuring external funding. BOJ statistics about the flow of capital funds between private households, private corporations, government and foreigners in Japan during 1980-2016 indicate how large the scale of corporate deleveraging was and how long this trend persisted (chart 1.11).

7 In the financial corporate sector capital gains on land holdings from 1986 to 1989 amounted to 47 trillion JPY (2% of total assets 1989) and to 172 trillion JPY (7% of total assets 1989) on stock holdings. From 1990 to 2002 this sector suffered from capital losses of 76 trillion JPY (3% of total assets 1990) on land holdings and of 208 trillion JPY (8% of total assets 1990) on stock holdings. How big the actual impact of the asset price changes on the quality of balance sheets in the private non-financial corporate sector was can be estimated by comparing the trends of liabilities, net assets (total assets minus liabilities) and net worth ratio (net assets divided by liabilities): during the bubble period (1985-1990) these corporations increased their net assets by 590 trillion JPY or 141 trillion JPY above the historical average growth (1970-1985). Meanwhile, liabilities rose by 293 trillion JPY or 91 trillion JPY less than the historical average growth. From 1970 to 1985 liabilities increased by an annual average of 11%, while net assets have risen by 13% per year. The net value ratio averaged at 0.93. These data can be compared with those of the bubble period (1985-1990) and the post-bubble period (1990-1997): in the bubble period (1985-1990) net assets rose by an annual average rate of 16% in the private non-financial corporate sector, and liabilities increased by 9% per year. In the post-bubble period (1990-1997) net assets decreased by 4% per year, while liabilities increased by an annual average of 2%. This means that during the bubble period (1985-1990) net worth improved by 298 trillion JPY (equivalent to 15% of total assets in 1990) and 232 trillion JPY (equivalent to 12% of total assets in 1990) above the historical average growth (1970-1985). The net worth ratio rose from 0.93 (average 1970-1985) to 1.31 in 1990. From 1990 to 1997, liabilities increased by 136 trillion JPY, 1,012 trillion JPY less than the historical average growth. Simultaneously, net assets contracted by 282 trillion JPY and were short by 1,329 trillion JPY versus the historical average growth. Therefore, net worth shrunk during the post bubble period (1990-1997) by 418 trillion JPY (equivalent to 23% of total assets in 1997) and by 317 trillion JPY (equivalent to 17% of total assets in 1997) versus the historical average growth. The net worth ratio declined to 0.85 in 1997. Thus, net worth gains from the bubble period were completely erased. In the post-bubble period the balance sheet quality of the private non-financial corporate sector deteriorated generally towards a level worse than that of the pre-bubble period.

Chart 1.11 Flow of funds in Japan by main sectors (FY1980-2017)

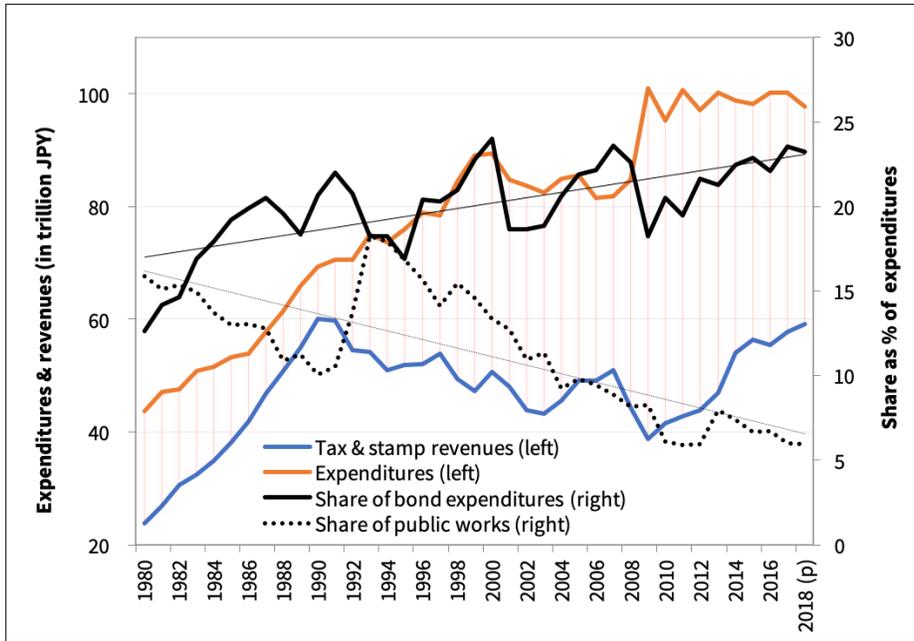


Source: Author, based on BOJ 2018

### 1.3 Public Deficit Spending: Avoiding the Worst, but Inefficiently

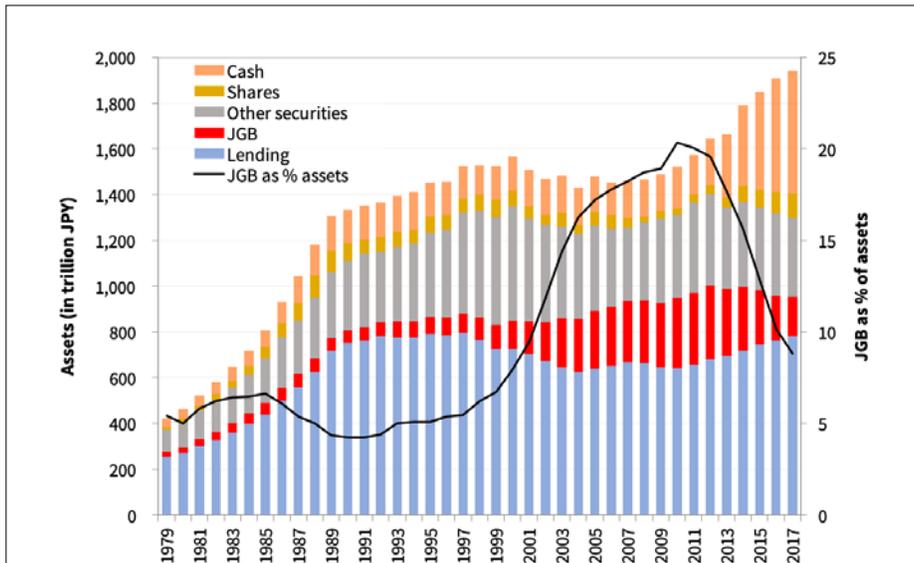
Normally, private households spend less than their earned incomes on current consumption to save for eventualities that will exceed the regular income flow, or to prepare for periods with less or no income. Private corporations are supposed to invest in new business or the expansion of existing business using internal and external funds, i.e. savings of others. In times of cyclical downturn, the government is expected to stimulate demand by deficit spending and absorbing otherwise unused savings. Foreign investors provide or procure funds depending on interest rate differentials and currency rates. Financial institutions are supposed to intermediate flows of capital between all parties. But from 1998 to 2016 the corporate sector saved 22 trillion JPY per year or 412 trillion JPY in total, while private households saved 15 trillion JPY per year. The government filled the

Chart 1.12 Government budget general account in Japan (FY)



Source: Author, based on MOF 2018c

Chart 1.13 Assets of saving banks (FY, excluding derivatives, foreign investments, non-performing assets)



Source: Author, based on BOJ 2018

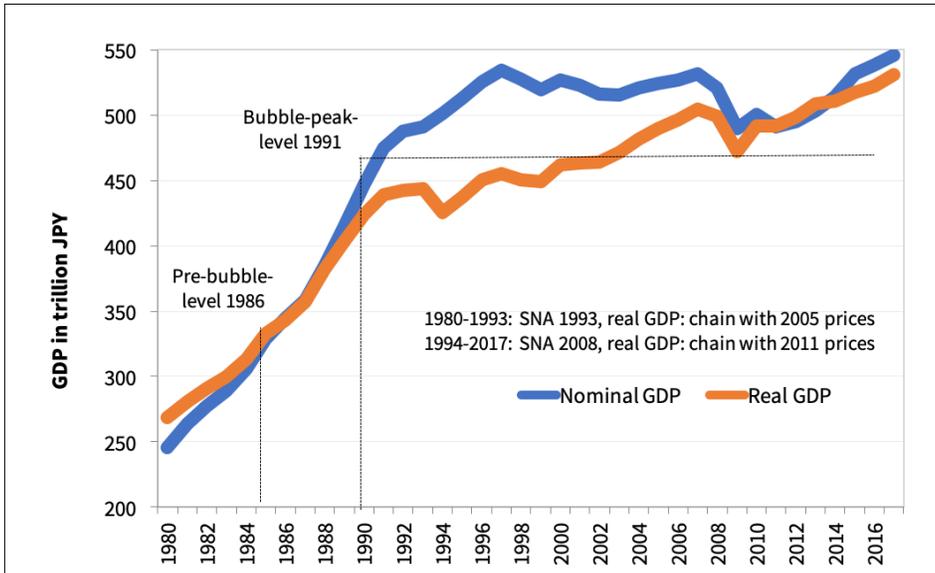
gap<sup>8</sup> left by deleveraging private corporations: from 1991 to 2016 it spent through its general account a deficit of 37 trillion JPY per year or 968 trillion JPY (equivalent to 182% of GDP FY2015) in total. About 232 trillion JPY were spent 1992-2016 on public investment programmes (chart 1.12). Using also other financing sources and investment budgets, from 1994 to 2002 the government invested an annual equivalent to 6% of GDP into the public capital stock, i.e. infrastructure.

The claim that public deficit spending works efficiently to stimulate economic growth in cyclical downturns has been contested, politically by neo-liberal proponents of structural reforms and also academically. In their view, public deficit spending is inefficient, because it crowds out private investment and fails to stimulate private consumption due to protective saving by private households against future tax raises. In Japan, public spending programmes were focused on large scale infrastructure projects such as road building and nuclear power generation, favouring established corporations in construction and heavy industries with close ties to politicians. Often, these projects ended up to be barely productive assets, huge empty boxes made of steel and concrete without budgets for content-wise activities or productive operating. However, Werner (2005, 37-48) does not generally reject fiscal expansion as an important instrument of macro-economic policy. Implying that borrowing (investment) demand existed in the private sector but was not sufficiently served by risk-averse banks, he criticises how fiscal expansion in Japan was financed, namely by issuing government bonds (JGB) and thereby crowding out private lending (chart 1.13).

Funds were allocated from corporate lending to JGBs and returned from the government to the private sector without generating new purchasing power through credit creation, making the economic effect of public deficit spending totally dependent on the accelerator effect of public expenditures. Due to Werner (2005), fiscal expansion should have been combined with quantitative monetary easing (QE) by BOJ or bank lending to the government: Credit money generates new purchasing power, because lenders' assets increase by the amount of lending to the borrower, while the borrower's bank account is credited with the same amount as deposit. These deposits remain in the banking sector and stimulate demand by providing new purchasing power, even when the borrower withdraws deposits, because the receivers of these funds will put the money into their bank accounts (246-60; see also Iida 2017, 134-5). Werner assumes again that demand existed and could have been realised, if only credits would have been provided by private banks, or measures would have been taken by the government and the central bank to stimulate private banks to do so. As

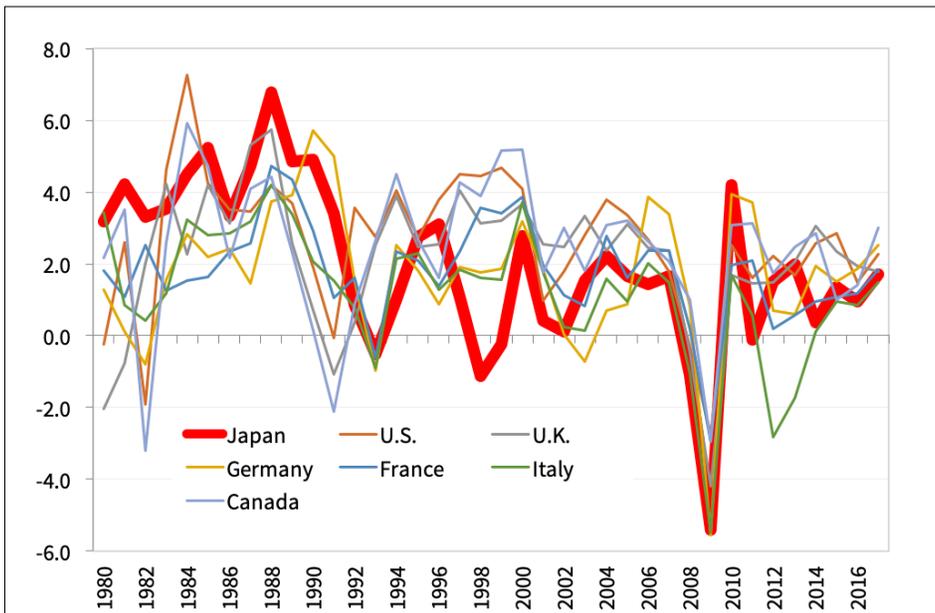
8 Foreigners were also borrowers: between 1998-2016 foreign financial institutions borrowed 14 trillion JPY per year or 265 trillion JPY in total at low interest rates in Japan, mainly to invest these funds into higher yielding foreign bonds ('Yen Carry Trades').

Chart 1.14a Real and nominal GDP of Japan (CY)



Source: Author, based on CAO 2018a

Chart 1.14b Real GDP annual growth rates of G7 (% vs. previous year)



Source: Author, based on IMF 2018

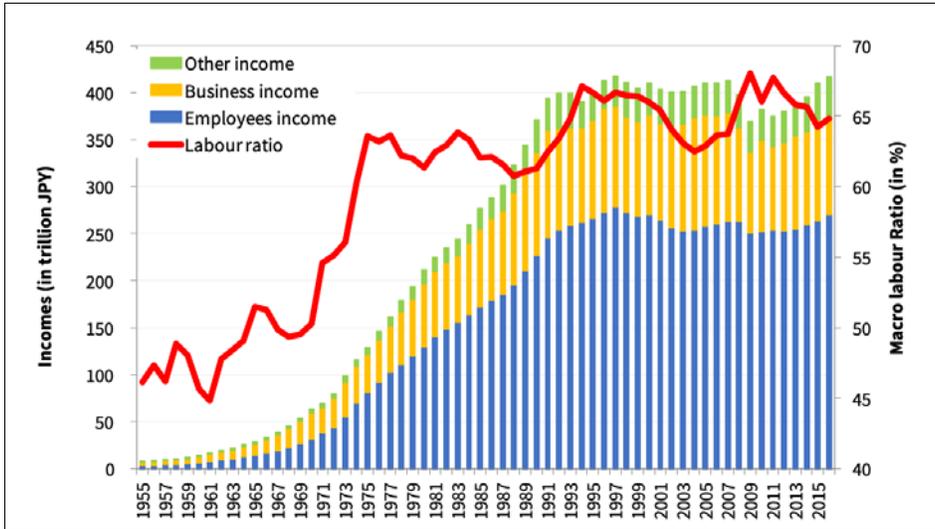
inefficient as public deficit spending might have become due to bond-based refinancing, i.e. without credit creation, delayed or restrictive implementation and unsustainable projects, at least, Japan's economy measured as flow was kept above the peak level of the Bubble Economy (chart 1.14a).

Except for 1997 and 1998, Japan's GDP growth rate was not significantly lower than those of other developed economies (chart 1.14b).

This is remarkable if one recalls what happened elsewhere after the asset bubble bursts of 1929-1932, 2000-2003 and 2008-2009. At least in the '90s, Japan's economy was spared from further deterioration. Deterioration could have been the case during the downturn in 1998, when the government shifted to fiscal consolidation (raising the consumption tax from 3% to 5%) and banks deleveraged in response to the critical accumulation of bad loans and the declining equity capital base. The latter were caused by falling stock prices in the wake of the Asian financial crisis and the subsequent bankruptcy of financial institutions (e.g. Yamaichi Securities, Hokkaidō Takushoku Bank, Nissan Life Insurance, Long-Term Credit Bank). However, the main cause for deflation remained: public spending only allowed private corporations to continue deleveraging and re-strengthening their equity capital base, while not encouraging investments. Fiscal stimulation stabilised not only the GDP level, but also prevented the share of employment income within national income from falling drastically until 1998 (chart 1.15). Normally, an increase of unemployment results, with a time lag, in a declining income share of labour. Short-lived cyclical recoveries in 1995 and 1999 could have had the opposite effect, but here, too, public deficit spending prevented the worst, at least temporarily.

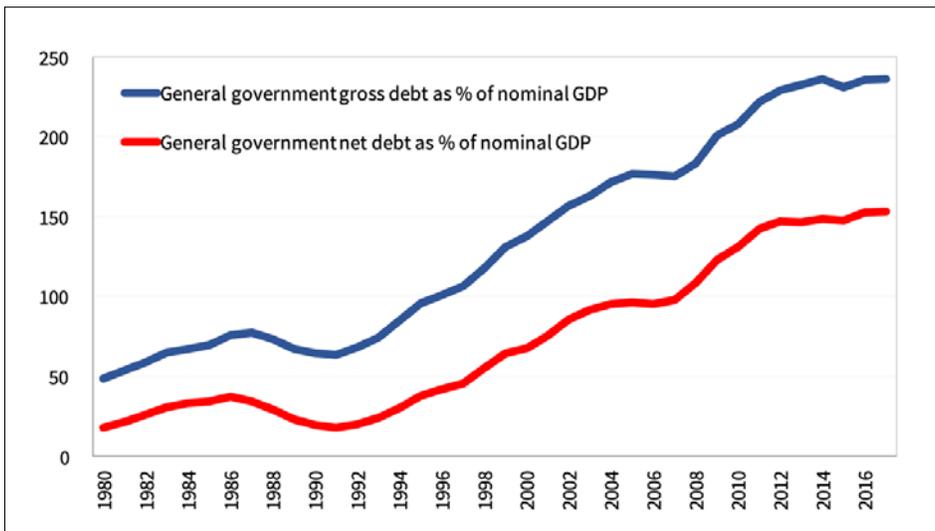
One consequence of avoiding the drastic elimination of over-supply capacities and bad debt and, thus, economic turmoil and social hardship was the increase of public debt to a level only seen in wartimes, that is, amounting to 236% of the GDP, including all debts of the central government and local municipalities (chart 1.16a). In general, public debts are income-bearing assets for lenders, and they are not problematic, as long as the government can refinance without crowding out private funds but utilising them to fill the lack of demand by investing into meaningful economic activities, maintaining precious resources and infrastructures and improving the conditions for economic recovery (Ono 1998, 91-111, 172-98). And, indeed, Japan's central government had no problems to sell JGBs to domestic public and private banks and to raise funds for its expansive fiscal policy at low interest rates (chart 1.16b). But expenditures paid by the central government for JGBs have been accounting for 18-26% of the total general account since the late '90s. Including all other investment and social insurance accounts these costs amounted to 38% of all expenditures in FY2017. For the banks, investing into JGBs was attractive as far as spreads between interest to be paid to saving account holders and

Chart 1.15 Macro labour ratio in Japan (FY)



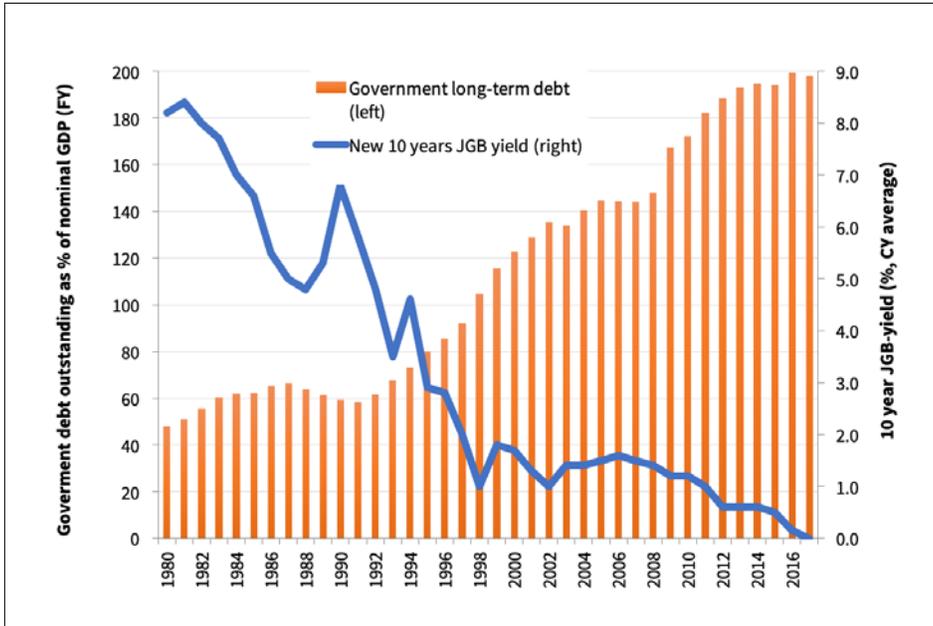
Source: Author, based on CAO 2018a (1955-1979: 1968 SNA, 2000 Prices, 1980-1993: 1993 SNA, 2000 Prices, 1994-2016: 2008 SNA, 2011 Prices)

Chart 1.16a Total general government gross and net debt of Japan as % of nominal GDP (FY)



Source: Author, based on IMF 2018

Chart 1.16b Central and local government long-term debt (FY) and 10 year-JGB-yield (CY)



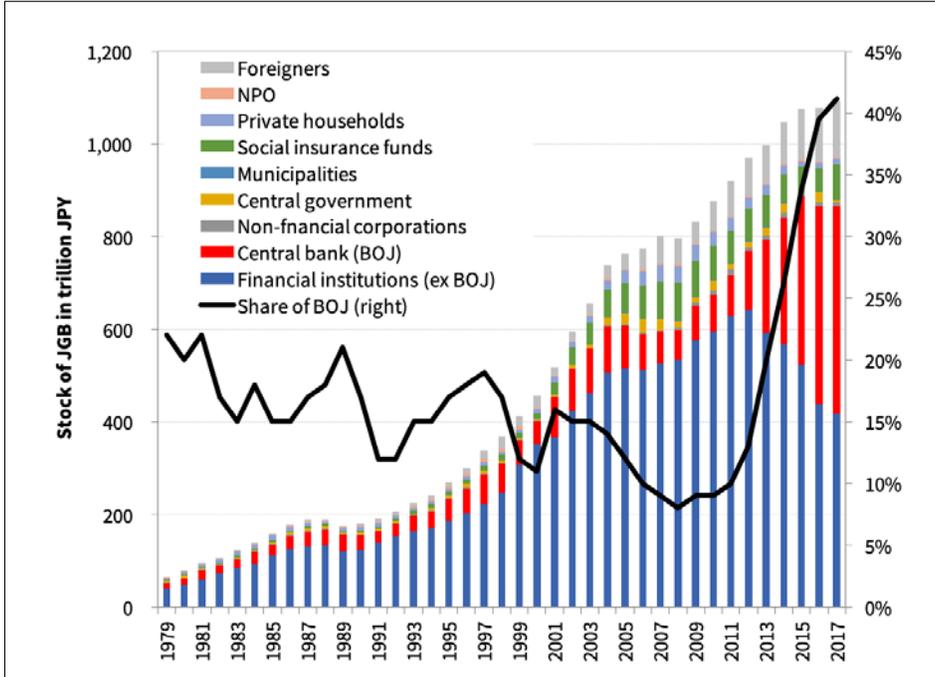
Source: Author, based on MOF 2018c; CAO 2018a; BOJ 2018

interest to be received from JGB holdings were big enough to cover operating costs. These costs were relatively lower than those for lending to SME or private households and allowed a sufficient profit margin, under the condition that the JGB prices did not fall during the holding period to a degree, that enforced a write-down of these assets.

In response to concerns by private banks about the JGB price (falling as a result of the future rise of interest rates) and as part of an expansive monetary policy through quantitative easing, from 2010 onwards the BOJ expanded its buying of JGBs from financial institutions in order to lower short-term interest. These purchases were aimed at expanding money supply, promoting credit creation and depreciating the JPY vs. the USD to push exports and inflationary pressure through increased import prices. As of late 2017, the BOJ has boosted its balance sheet towards an unprecedented volume of nearly 100% of Japan’s GDP, holding 41% of all outstanding JGBs (charts 1.17a-b).

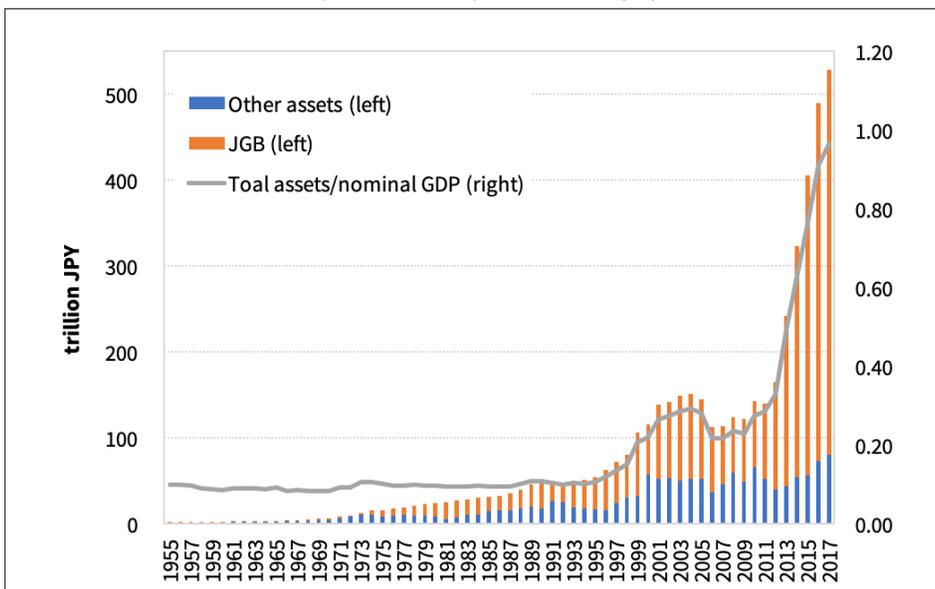
Pushing the JPY downwards supports those manufacturing corporations, especially in the car manufacturing and electronic industries, that are still exporting directly from Japan. And, indeed, the JPY-nominated volume of exports from Japan nearly doubled from 1992 to 2007. But after the financial

Chart 1.17a Stock of Japan government bonds (JGB) by holders (FY)



Source: Author, based on BOJ 2018

Chart 1.17b BOJ asset volume, JGB and asset/nominal GDP (CY)



Source: Author, based on BOJ 2018; CAO 2018a

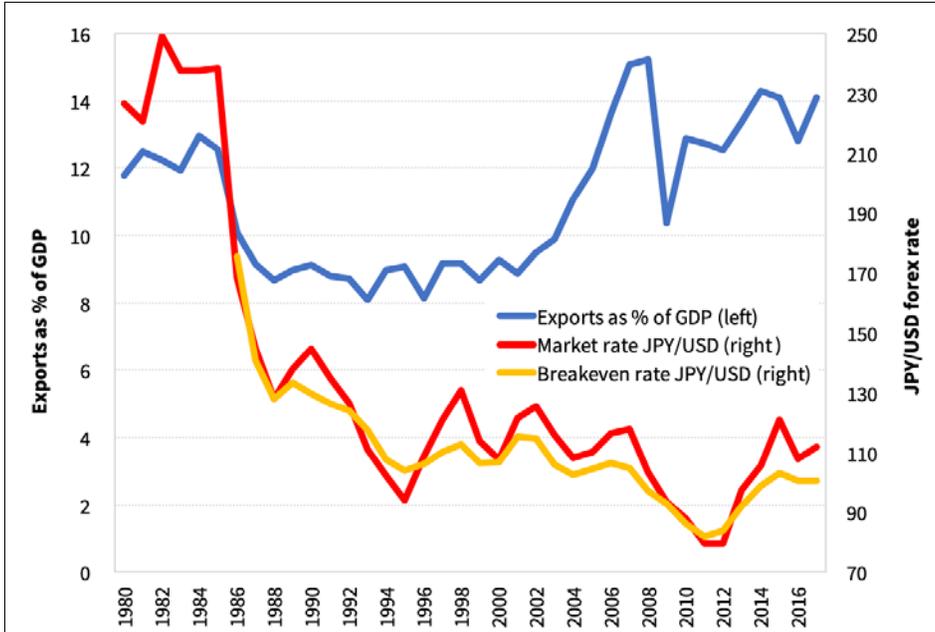
of crisis of 2008 Japanese exports did not return to this peak level until 2014. Many of the big manufacturing corporations, including their Tier-1 and Tier-2 suppliers, had already built up new production capacities in foreign markets, mainly the US, as a preventive response towards former JPY appreciations and trade frictions. Thus, a cheaper JPY translated into higher JPY-nominated profits from foreign subsidiaries, higher share prices of Japanese parent companies and foreign investment into shares of Japanese exporting corporations. But the effect of expanding exports and related domestic demand on the whole economy of Japan has been limited, as is evident from the fact that exports are equivalent to not more than 15% of the GDP (charts 1.18a-b).

Japan's payment balance, too, indicates, that the connection of its economy to the world economy is not anymore trade, but investment centred.<sup>9</sup> Instead of investing domestically, large corporations have been expanding foreign direct investment, often spending huge funds on Mergers & Acquisition (M&A). Thus, policy aimed at boosting export cannot be justified by claiming to be beneficial to all. Rather, such policy favours a handful of large corporations at the expense of all others: Depreciating JPY means higher prices and increasing costs for USD-nominated imports of food and energy resources. These import-cost rises are shifted by oligopolistic corporations (general trading houses, gas, electric power and food processing firms) towards the domestic consumer: Finally, private households pay the bill for the extra profits of big corporations. The worsened terms of trades for Japan (dividing export by import prices) indicate a decline in competitive pricing power of Japan's export. This has resulted in a loss in domestic purchasing power for almost all private households to an extent that exceeds the income gains of those who are working for exports (chart 1.18c).

By increasing inflationary pressure and raising import prices, government and BOJ try to make the private households spend more on consumption. In theory, inflation can push capital expenditures and related borrowing, as it decreases real interest or funding cost (Īda 2017, 229-34). In practice, decisions for capital expenditure or investment into productive assets are more complex. Besides core issues like product configuration, demand projections and price setting, such decisions reflect assessments of the future, that is, risks and potentials related to stakeholder response and the corporate environment (including politics, economy, society and technology).

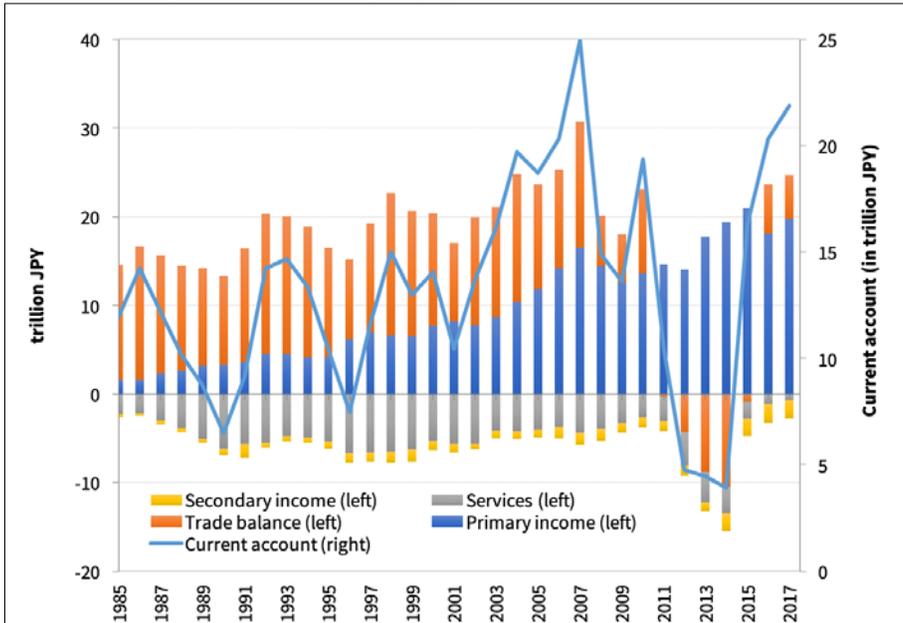
<sup>9</sup> The sudden decline in Japan's trade balance and current account from 2012 to 2014 were caused by increased imports of gas and oil at market-price peaks and the weakening of the JPY by 33% (from 80 JPY/USD to 106 JPY/USD), related to the aftermath of the meltdown of four nuclear reactors in Fukushima in March 2011 when thermal power plants replaced nuclear power plants.

Chart 1.18a Japanese exports and JPY exchange rates (CY)



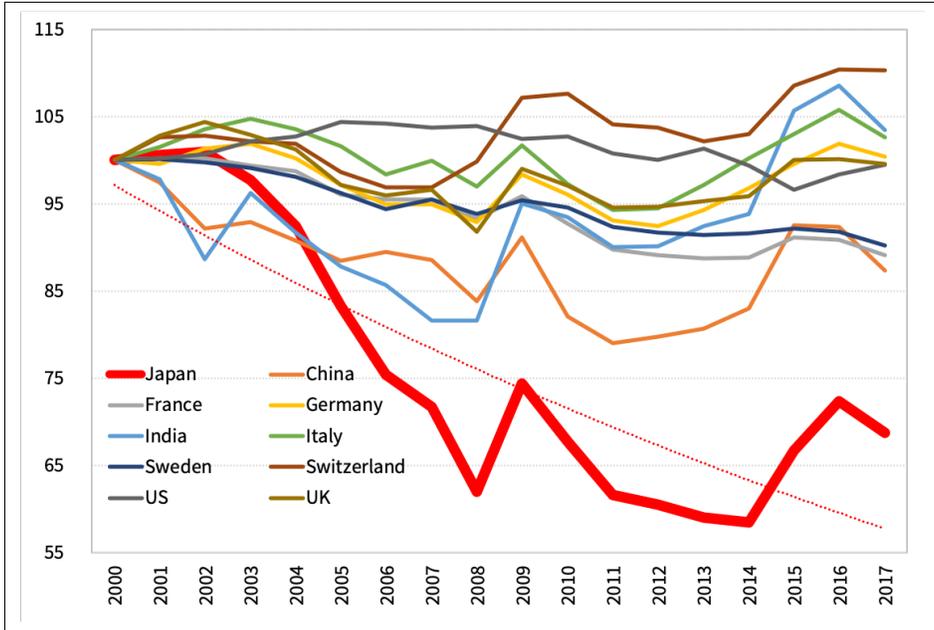
Source: Author, based on MOF 2018a; CAO 2018a; BOJ 2018

Chart 1.18b Payment balance of Japan (CY)



Source: Author, based on MOF 2018a

Chart 1.18c Terms of trade (export/import prices, 2000=100)



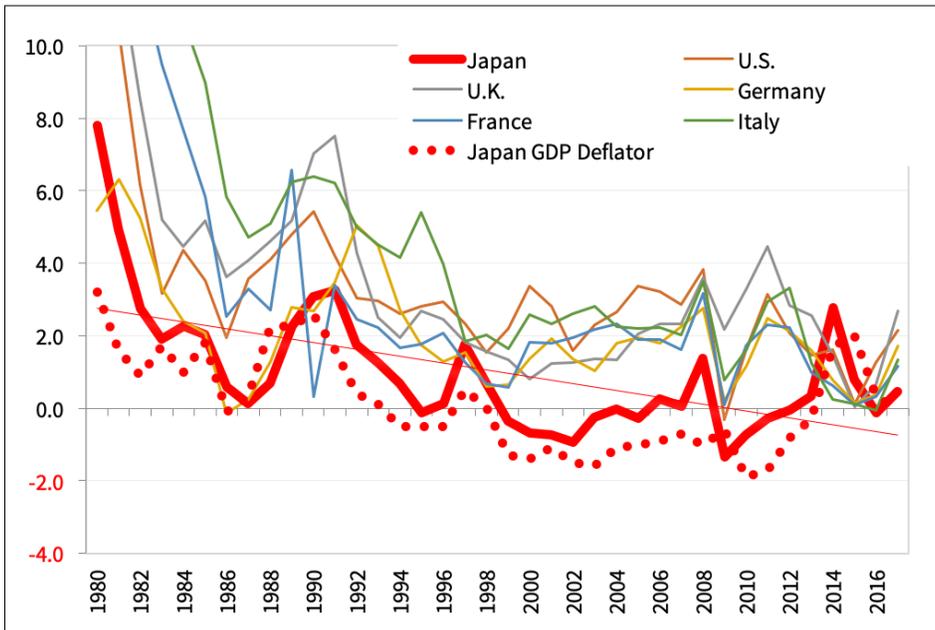
Source: Author, based on UNCTAD 2018

### 1.4 Replacing Fiscal Expansion by Structural Reform after 1998: Deflating Labour Cost

To what degree has deflation really occurred in Japan? How much progress in repairing their damaged balance sheets have corporations made, being granted the time to do so by an expansive fiscal policy? Has monetary policy accomplished its goals of (a) price inflation to push private households to spend incomes and savings on consumption, of (b) securing and improving the availability of capital funds and of (c) igniting economic expansion? And how much have the stakeholder relationships between main banks and their corporate clients, corporations and their employees been affected?

Japan’s inflation rate has been consistently lower than in other economies of developed countries (chart 1.19). This indicates intense competition, overcapacities due to expansive capital expenditure in the past as well as to current efforts to utilise existent capacities, generate cash and pay down debts. After the asset bubble burst, deflation - measured as year-to-year change of the consumer price index - occurred clearly from 1999 to 2003 and from 2009 to 2011. Inflation, measured the same way, occurred shortly in 1997, 2008 and 2014. Precisely at that time the consumption tax was raised (1997: 3% to 5%, 2014: 5% to 8%), and commodity prices

Chart 1.19 Consumer price change and GDP deflator (y-y %)



Source: Author, based on IMF 2018, CAO 2018a

hiked in 2008. Overall, neither a strong deflation nor inflation persisted. Shirai (2017, 3) called this a mild deflation as, in her view, it did not result in a severe deflationary spiral, but prevented private corporations from taking an optimistic view on business opportunities and investing in new products, production capacities and technologies. Morinaga (2001, 86-91) argues that deflation should be measured as GDP deflator. After all, actual deflation had occurred already since 1994 and by 1-2% higher than officially indicated in the consumer price index (chart 1.19).<sup>10</sup>

However, for private households that have kept jobs and incomes, deflation means that the purchasing power of their incomes and savings is stable or slightly increasing. At the same time, deflation creates pressure on their income, and on small and medium sized corporations with

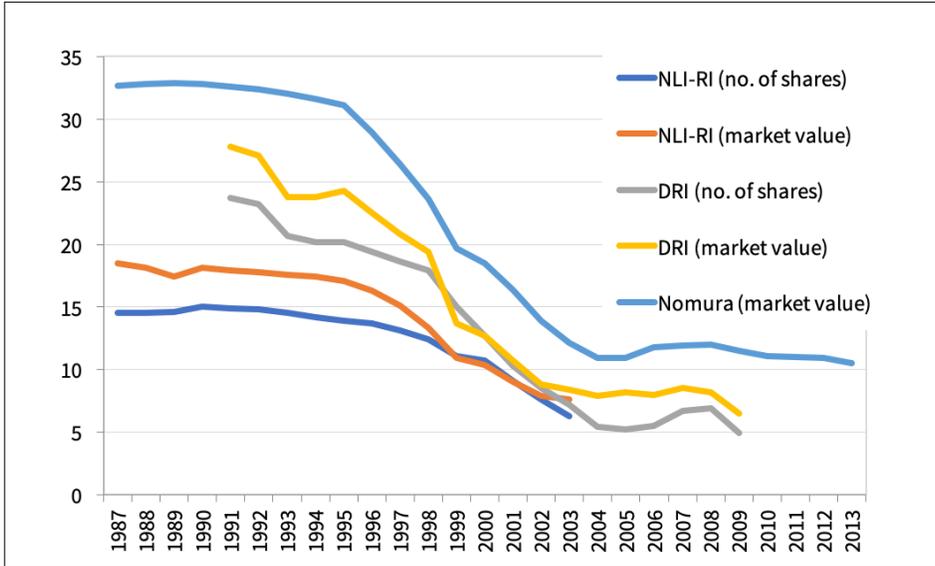
<sup>10</sup> Morinaga refers to the Laspeyeres bias, which occurs because the consumer price index, based on Laspeyeres, measures what a certain good, bought in the previous base year, would cost if bought  $\times$  years later (cf. also Īda 2017, 27-31). This bias overlooks that real consumers often shift their purchasing choice towards other (cheaper) goods, if they encounter an increased price for a formerly chosen good (Morinaga 2001, 86-91).

heavily leveraged balance sheets. Often external effects, caused by the worldwide financial crisis of 2001 (the so-called IT-stock market crash) and 2008 (the so-called subprime mortgages or asset-backed securities crash), were made responsible for the decline in economic performance and the occurrence of deflation in 1999-2003 and 2009-2011. But given the size of Japan's domestic market and the asserted importance of fiscal and monetary policy, internal factors must also be considered. And why has inflation not occurred until now? Werner (2005) sees BOJ as the power centre (without an election-based mandate) of promoting an agenda of structural reform – the trinity of privatisation, deregulation and liberalisation – under the slogan of 'being helpful by being not helpful', instead of contributing to overcome the credit crunch and deflation (307-20). BOJ had introduced a zero-interest rate in 1999 but resolved it already in 2000 and reduced money supply. With a de facto restrictive monetary policy, it resisted the introduction of an inflation target and the growing demand for monetary relaxation in the face of falling stock prices, a shrinking equity capital base of commercial banks and the subsequent credit crunch. BOJ saw deflation as a signal for a fundamental shift in the global economy towards information technologies and cost-competitive suppliers from China, both creating structural pressure on cost and prices of traditional products and services and indicating Japan's need to adapt towards open competition, lower cost and higher flexibility.<sup>11</sup>

One consequence was a fundamental change in the composition of equity capital owners, those who deserve to be treated as prime corporate stakeholders under the neoliberal paradigm of global shareholder capitalism. Rattled by bad loans, fallen stock prices and regulative pressure to clean up their balance sheets and reduce their leverage and asset volume, banks and other financial institutions accelerated the dissolving of share crossholdings (*mochiai*) between themselves and corporations from the non-financial sector (chart 1.20a). These crossholdings were built up in three phases: 1949-1965, when the former conglomerates (*zaibatsu*), once dismantled by the US General Head Quarter (GHQ), reorganised themselves and protected each other from corporate raiders, with banks buying

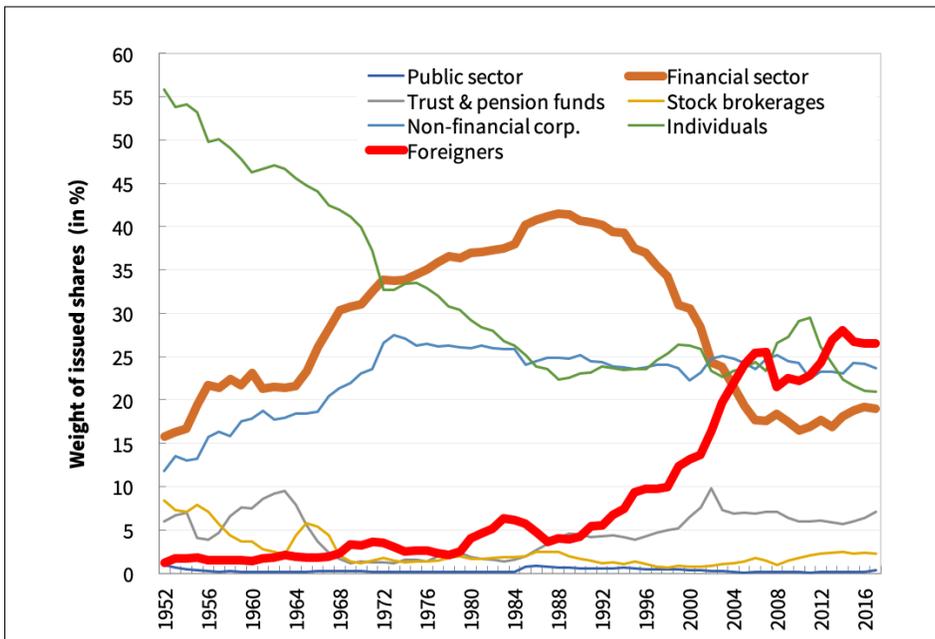
11 Besides a traditional anti-inflationary stance at BOJ, Morinaga points to an internal interest in protecting particularly regional banks from value losses on their expanded JGB holdings (caused by inflation), because regional banks were the preferred employers (*amakudari saki*) for BOJ cadres after retirement (Morinaga 2001, 84-119). Interestingly, BOJ corrected its stance later and initiated an expansionary monetary policy as quantitative easing, significantly increased in two other rounds 2010-2013 and 2013-2016 (following Werner's previous criticism). BOJ bought JGBs and other assets from commercial banks, providing liquidity to them in return. But the lately declared inflation target of 2% has not been accomplished. The increased liquidity went into the asset markets (stocks and real estate) and into financing large scale M&A activities abroad, rather than into increasing domestic capital expenditures (productive investment) and stimulating economic growth.

Chart 1.20a Estimations of cross-holding ratio of listed companies in Japan (% , end of FY)



Source: Author, compiled from market reports by Nomura Securities, Daiwa Securities, Nippon Life Insurance

Chart 1.20b Composition of stock holdings by investors in Japan (FY, issued shares in %)

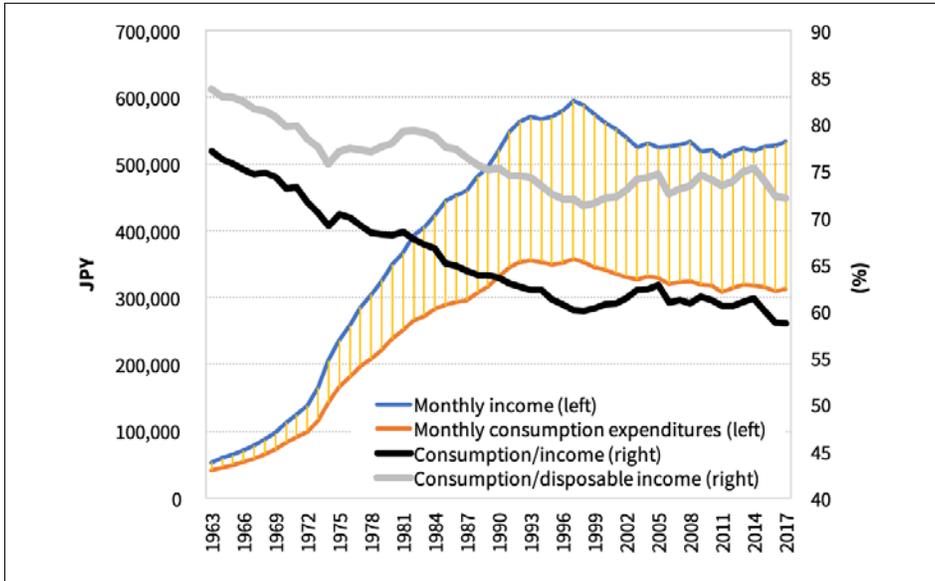


Source: Author, based on JPX 2018

shares of their conglomerate peer companies from individuals; 1965-1973, when during the stock market crisis of 1965 shares were bought from ailing investment funds and then sold to domestic financial institutions and related corporations in order to shield each other from takeover risks, which were expected to occur due to market liberalisation in the late '60s; 1973-1989, when mainly banks increased their corporate stock holdings to offset their declining influence caused by deregulation and shifted from lending to equity related finance. While domestic financial institutions reduced their corporate stockholdings, foreign institutional investors increased their shares in Japan's corporations (Itō 2011) (chart 1.20b).

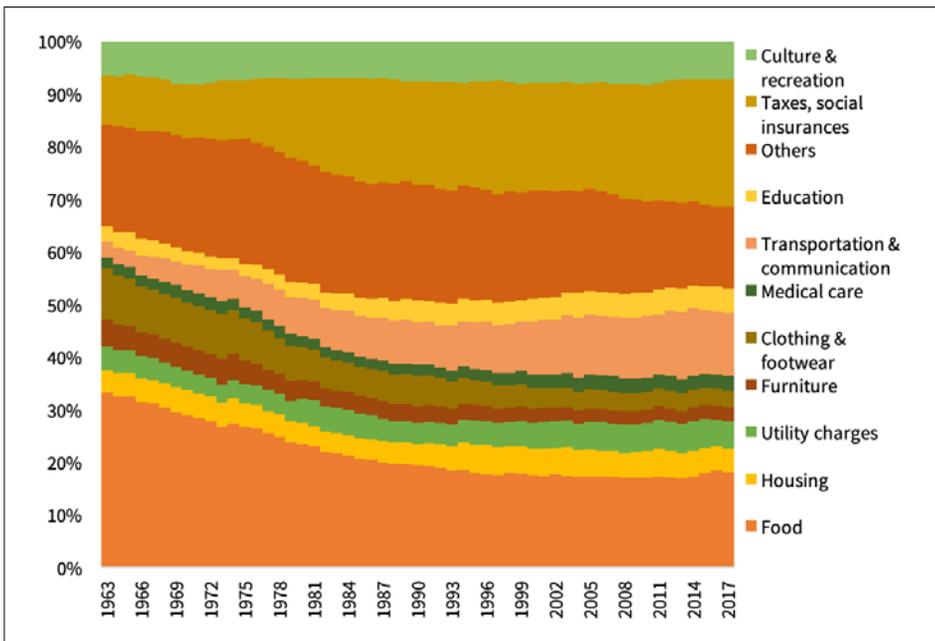
Continuous public deficit spending requires political legitimacy, especially if a government has already run deficits and accumulated huge debts as the Japanese did in the early '90s. The interest of governing politicians is mostly focused on getting reelected, and so they aim for short-term effects rather than mid- and long-term consistency. Apart from these political cycles, the volume of public work programmes, taken by the Japanese government under different prime ministers, reached its peak in 1993. Since then, it has been steadily shrinking from nearly 20% towards less than 5% of all general account expenditures or 1% of the nominal GDP (chart 1.12). Different reasons have been given, such as that short-term cyclical recovery made fiscal stimulus needless, or that policy shifted to austerity. But, most importantly, expansive fiscal policy was declared ineffective, not generating the expected outcome, but only protecting outdated structures and privileges, in short, becoming an obstacle to urgently needed structural reform of the capital and labour markets in Japan. Consequently, Koo has criticised the governments under prime ministers Ryūtarō Hashimoto (1996-1997) and Junichi Koizumi (2001-2006) for applying supply-side reforms as replacement for macro-economic policy, which resulted in economic and social destabilisation and even larger public deficits (Koo 2015, 51-2). Nevertheless, Koizumi's political popularity stemmed from a deep disappointment among voters with old elites unable or unwilling to overcome the crises and from high expectations to promoting entrepreneurial initiative, in particular a liberated market entrance for private corporations (through privatisation of public companies and postal savings), and reducing obstacles for new businesses such as legal restrictions and high cost, for example, by enlarging non-regular employment. Sawa (1994) agrees that deregulation reduces costs and increases corporate profits, but he also maintains that it does not necessarily translate into lower prices for goods and services at the same quality or new business opportunities for new entrants into commodity markets, because big corporations attempt to keep the prices high or defend their dominating market position by pricing new entrants out. For this reason, the growth stimulating effects of deregulation is extremely limited, if not negative in the first years (181-8). The consumption by private households represents 66% of the

Chart 1.21a Employee household income and consumption expenditures in Japan (CY)



Source: Author, based on MIC 2018d

Chart 1.21b Composition of employee household expenditures in Japan (CY)

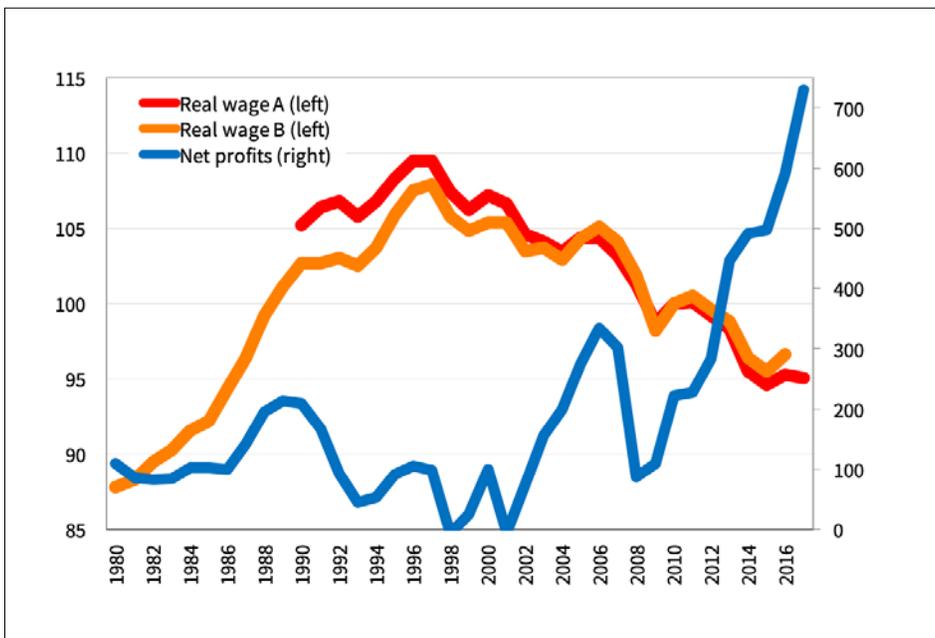


Source: Author, based on MIC 2018d

GDP (average 1994-2015). But private households do not expand consumption beyond fundamental needs, if working incomes continue to fall, job security or pension incomes deteriorate and capital income gains from savings shrink. Under such circumstances, private households postpone or avoid costly replacements and upgrades of goods. That applies all the more, if taxes and the costs for social insurance as well as for services necessary to participate in society (mobility, communication) steadily rise (charts 1.21a-b).

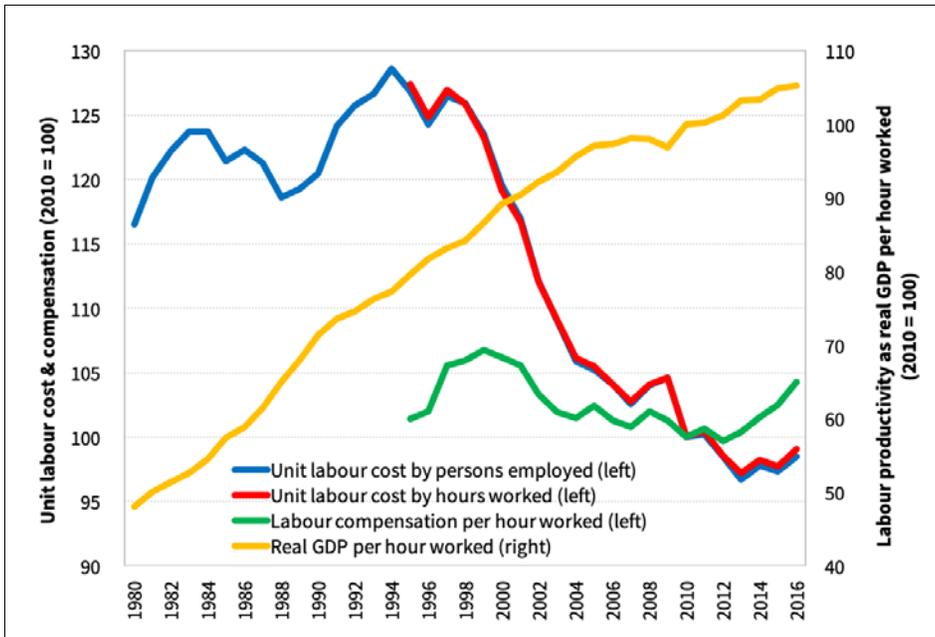
On the other hand, private corporations do not invest only because of lower cost of external financing or the need to meet regulations: they do invest in new production capacities or enlarge them if demand grows or demand growth can be expected to reach profit margins that exceed the cost of internal and external capital funds. Otherwise, private corporations keep supply capacities at the status quo, and secure cash flows by selling at or under market price and ensures profits by reducing input cost.

Chart 1.22a Real wages (CY) and net profits (FY) index in Japan (2010=100)



Source: Author, based on MLHW 2018a: real wage A = firms with 5 and more employees, B = firms 30 and more employees), MOF 2018b: net profits, all industries and sizes

Chart 1.22b Labour cost, compensation and productivity in Japan



Source: Author, based on OECD 2018

This explains why inflation is almost absent and why deregulation does not lead immediately and necessarily to productive investment: structural reforms, aimed at strengthening the supply side, enable corporations to regain and improve their profitability, often by reducing cost. Such behaviour might be rational for a single corporation but, on the whole, it diminishes the purchasing power of private households and aggregate demand. Japanese corporations have been doing exactly this, mainly deflating employees’ working income.<sup>12</sup> From 1997 to 2015, real wages fell to the level of 1986, while the net profits of corporations (of all industries and sizes) grew tremendously, particularly after 2000 (except 2007-2008) (chart 1.22a). This means that another central feature of the traditional stakeholder relationship, here between capital and labour, has vanished: employers have abandoned the post-war period golden rule of sharing productivity gains (chart 1.22b).

12 In the second chapter the implications for corporate strategy and culture will be examined in detail. This chapter focuses on the macro-economic repercussions.

Already in 1995, the former Japan Federation of Employers' Associations (Nikkeiren)<sup>13</sup> had released their vision of 'Japanese-Style Management in a New Age'. It emphasised the need for increasing flexibility and cost competitiveness, and adding 'Western rationality and market mechanisms' to the existing system through the implementation of a workforce portfolio consisting of three categories of employees: (a) a long-term type for managerial functions with promotion, capability-based payment and unlimited contracts, (b) a highly specialised type in planning, marketing, research and development (R&D), with performance-based compensation and contracts of limited duration, and (c) a flexible type for assisting or performing simple functions with time-based compensation and short-term contracts (Nikkeiren 1995, 7, 33). Top managers of corporations, supported by politicians, mass media and academics, urged the necessity of overhauling, if not overcoming, the traditional stakeholder relationship,<sup>14</sup> pointing to hidden bad loans, insufficient equity capital base and possible bankruptcy, the appearance of demanding foreign shareholders and the increasing competition from foreign companies.<sup>15</sup>

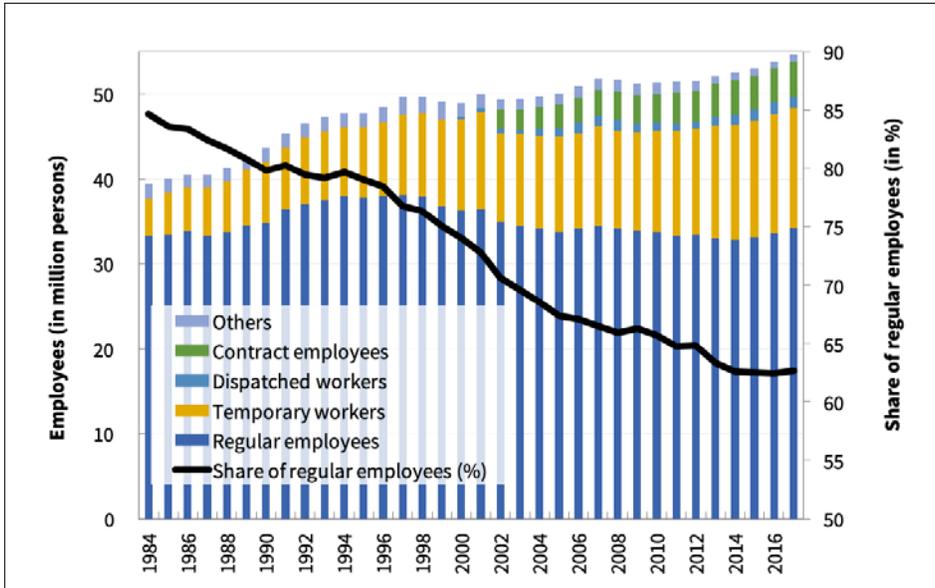
Practically, corporations and their managers have been doing what they are supposed to do, namely control and reduce the cost for procuring external supply and labour. For that, they utilised the growing fear of losing jobs and income to exert pressure on their counterparts (charts 1.8, 1.9). But this time the big cut was executed not only by means of (a) reducing 'non-regular' working force and working time, (b) cutting 'bonuses' (accounting for about 1/3 of an annual salary) on short notice by 5-20% of the annual salary, (c) freezing the employment of college graduates as regular employees, and (d) laying off senior employees through early retirement. Since 1998 corporations have covered their demand for new labour primarily through hiring non-regular employees (Kuroda, Yamamoto 2006, 121-51). These employees have limited work contracts ranging from one month to three years and are paid only 50% or less of regular employees with similar work tasks mainly due to the absence of bonuses and fringe benefits. As of 2017, they represented 37% of all employees in Japan (chart 1.23).

**13** In 2002, former Keidanren and Nikkeiren merged to the Japan Business Federation (Keidanren).

**14** Morinaga illustrates this new attitude among Japanese top managers through the example of how fast and radically Akio Morita, founder of Sony Corporation, changed his mind about the legitimacy of the Japanese-style management 1992-1993 from defending the traditional way towards accepting the market for corporate control and global competition without political interference (Morinaga 1998, 102-6).

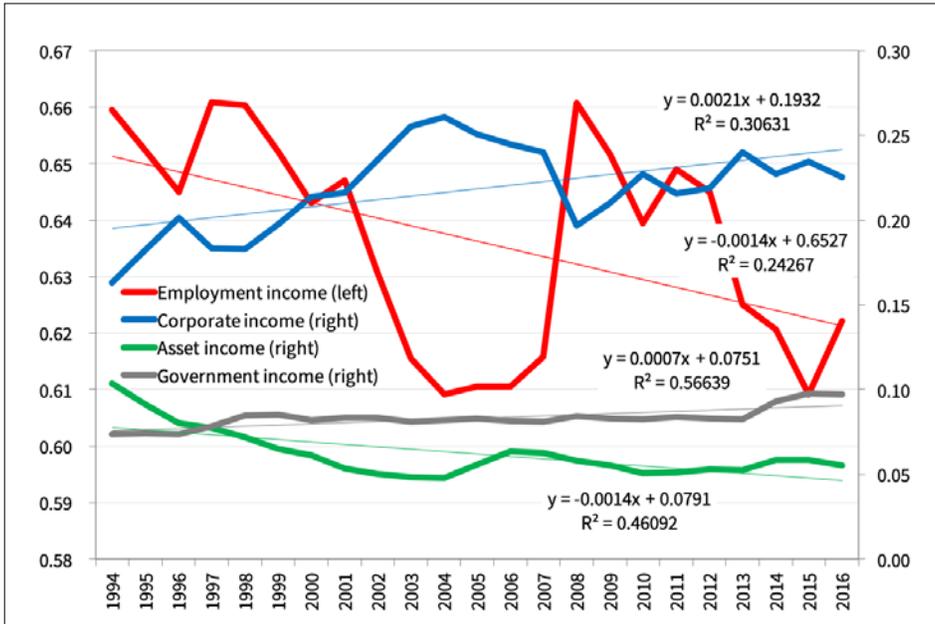
**15** Between the late '90s and the early 2000s, not only financial institutions mainly in the life insurance and real estate industry went bankrupt and restarted under the control of their former foreign competitors (AIG, Prudential, GE Finance), but also big car manufacturers (except Toyota and Honda) were taken over or had to accept controlling stakes by foreign competitors (Nissan, Mazda, Mitsubishi Motors, Suzuki, Isuzu).

Chart 1.23 Employees in Japan by types of employment



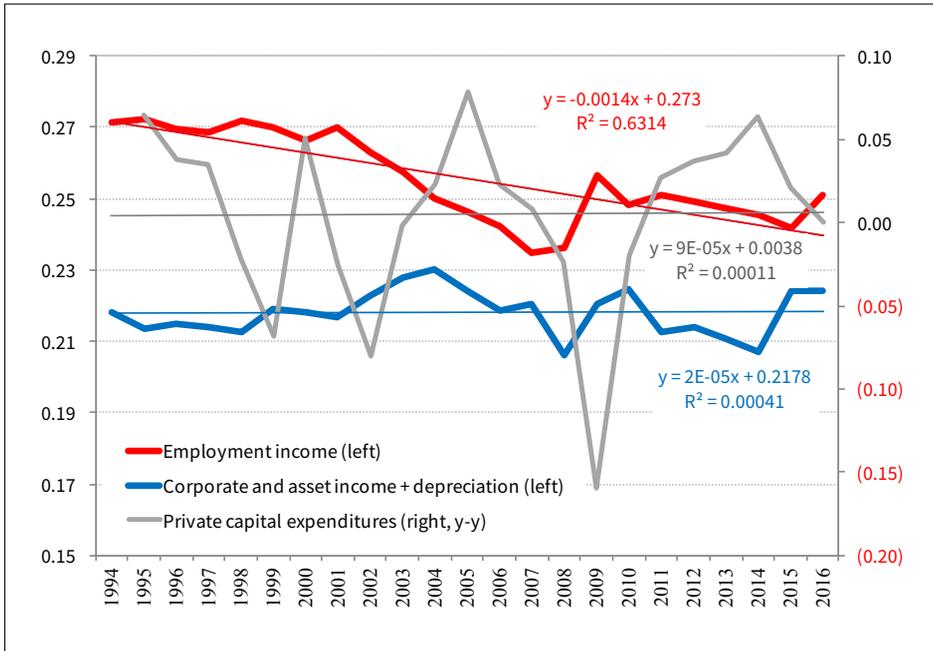
Source: Author, based on MIC 2018c

Chart 1.24a Macro income distribution in Japan (FY, SNA 2008)



Source: Author, based on MIC 2018c

Chart 1.24b Capital and employment income vs. production output and growth of private capital expenditures in Japan (CY)



Source: Author, based on CAO 2018a; Mizuno, Sakakibara 2015, 117

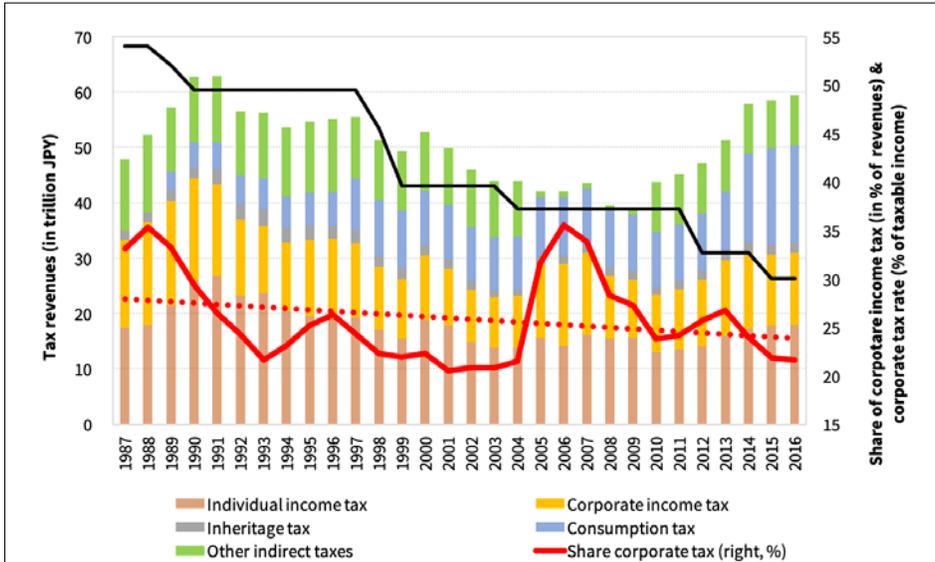
Some researchers explain that the tremendous increase in non-regular employees between 2002 and 2012 was caused by changes in the sector structure, i.e. the growth of the service sector, and in labour supply, i.e. the gender and age composition of the Japanese workforce, namely, the increased entrance of older and female workers into the labour market, particularly in health care, education, retail and the restaurant business. About 50% are seen as due to ‘changes in corporate policy (measures)’ (Ōhashi 2017, 69-83). But, in general, there are no reasons not to hire women or older people as regular employees in the service sector, besides a corporate interest in cost saving and flexibility and a lack of social service infrastructure (i.e. child or senior care facilities), which prevents women from entering the market for paid labour. Consequently, the labour ratio, indicating the share of employee income as % of the value added, has been declining, even under the consideration that the total number of employed persons has increased and that remunerations for directors are included in the employment income data (charts 1.24a-b).

If we measure employment income on the one side and corporate income, assets income and depreciation on the other side and both against the total production output from 1994 to 2015, the resulting trend indicates a steady decline of employment income weight, whereas corporate income, assets income and depreciation have moved in line with production output (Mizuno, Sakakibara 2015, 15). In the same period, capital expenditure fluctuated around zero. Labour was not replaced by investment in fixed assets (machinery), as the price of labour was sufficiently deflated (chart 1.24b). Thus, the profitability of corporations increased mostly by deflating working incomes and decoupling wages from productivity. Precisely for this reason – and not anymore because of stressed balance sheets, the related fighting for survival or a post-bubble trauma – corporations had no incentives to take the risk of investing. After all, improvement of corporate profitability has been achieved without it.

With respect to secondary income distribution, Japanese corporations have succeeded in lowering the taxation rate on corporate income by 24%, that is, from 54% in 1987 to 30% in 2016. Consequently, the share of corporate income tax revenues among all tax revenues has fallen from 33% to less than 22%. Meanwhile, relative share and absolute amount of indirect taxes, which are mostly paid by private households, have steadily risen (chart 1.25). Thus, private households have shouldered also increasing payments for taxes and social insurance, and they will have to shoulder more in the future. Further, private households have been paying the cost of the expansionist monetary policy: as permanent net savers, they hold most of their financial assets in bank saving accounts, not yielding a positive return.<sup>16</sup> Therefore, the strong correlation between the return on the financial assets of private households and the return on net assets of big corporations (shareholder capital plus retained profits) has not only just diminished, the gap between them has widened since 2001 (chart 1.26). Mizuno calls this the divorce between state and citizens. Most citizens have been excluded from economic and social gain sharing, but encountered higher risks of unemployment, further falling incomes and higher expenses with regard to taxes and social insurance (Mizuno 2016, 13-26).

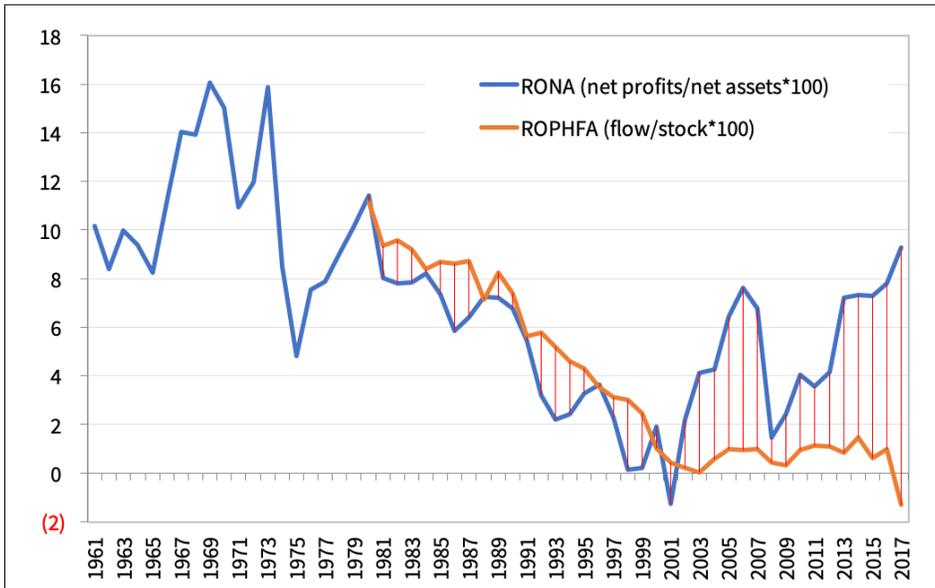
**16** There have been different explanations for the long-lived low interest rates: first, it is explained as a result of expansionist monetary policy. Second, responsibility is ascribed to rich or excessive supply of savings due to demographics (growth of high saving population groups), inequality (high-saving rich) and financial integration of developing countries (with fast rising income and savings). And third, falling prices of investment goods have allegedly lowered capital expenditures. Induced by low interest rates and reflecting the lower user cost of housing, house prices have risen by the same rate as household debts (Sajedi, Thwaites 2016, 636-7). Referring to low interest periods in history and connecting low interest to falling terms of trade as well as average profit rates, Mizuno qualifies the current low interest period as a sign of the death of capitalism (Mizuno 2014, 14-25). Whatever the explanation, if interest rates are the price of capital and their level remains low for over three decades, then capital is not scarce, but abundant and should not be treated as the most important resource, its maximisation as the ultimate prime goal of economic activities.

Chart 1.25 Tax revenue and corporate income tax in Japan (FY)



Source: Author, based on MOF 2018c

Chart 1.26 Return on net assets of big corporations with more than 1 billion JPY capital (RONA) and return on private households financial assets (ROPHFA) in Japan (FY, in %)



Source: Author, based on Mizuno 2016; BOJ 2018; MOF 2018b

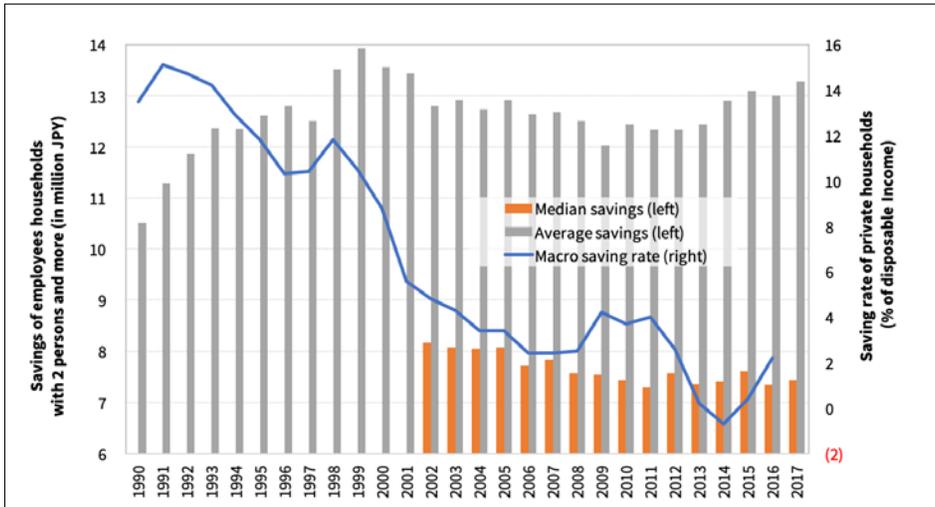
Besides demographic change an inevitable outcome of continuously falling working income is the decline of savings,<sup>17</sup> even if the total and average amount of financial assets of all private households might slightly increase or stay stable: apart from private households without any savings, the median saving amount of employee households with two persons and more has been declining since the beginning of data collection in 2001 (chart 1.27a).

Simultaneously, the debts of these households (mainly for housing) have steadily risen, resulting in growing net debt for more than half of all private households in Japan. By now, net debt is amounting to 81% of the average annual income of employee households (chart 1.27b). Reaching its peak in 2003, the number of individual insolvencies (natural persons) had been continuously declining. But in 2016, it started to rise again for the first time in twelve years, staying slightly, but clearly over the level of before 1996. This, too, may indicate, that an increasing number of employee households has reached their financial limits (chart 1.27c). At the same time, the number and share of private households, which hold no financial assets at all, is rising (chart 1.27d). Systemic compensation for falling working income cannot be sought in gainsharing or participating in asset value increases and receiving additional income from dividends through common stock ownership. One third to one half of all private households is affected, including the poorest, those who lack knowledge and cash funds to buy stocks, absorb volatility and hold stocks long-term. Of course, not all poverty is directly caused by private corporations that cut costs of labour and external supplies. In the decades after World War 2, the majority of Japan's population was focused on expanding the economy, the corporate sector and especially the single organisation they individually belonged to, which, in return, was expected to provide welfare and prosperity to its stakeholders and individual members.

Thus, interrupting the linkage between contribution and return has more severe implications in Japan than in those countries where public welfare is supposed to play a correcting role. In Japan corporate slashing of labour cost and working income decreases the potential of private households to cope individually with hardships and to support others, such as children and the elderly. Corporate cost cutting has also weakened public finances through reduced income and consumption tax receipts. Consequently, a rising poverty rate (i.e. the share of households with less than 50% of median disposable income per person) and a growing number of households that depend on social welfare have resulted from the corporate cutting of labour cost and the deterioration of working incomes (charts 1.28a-b).

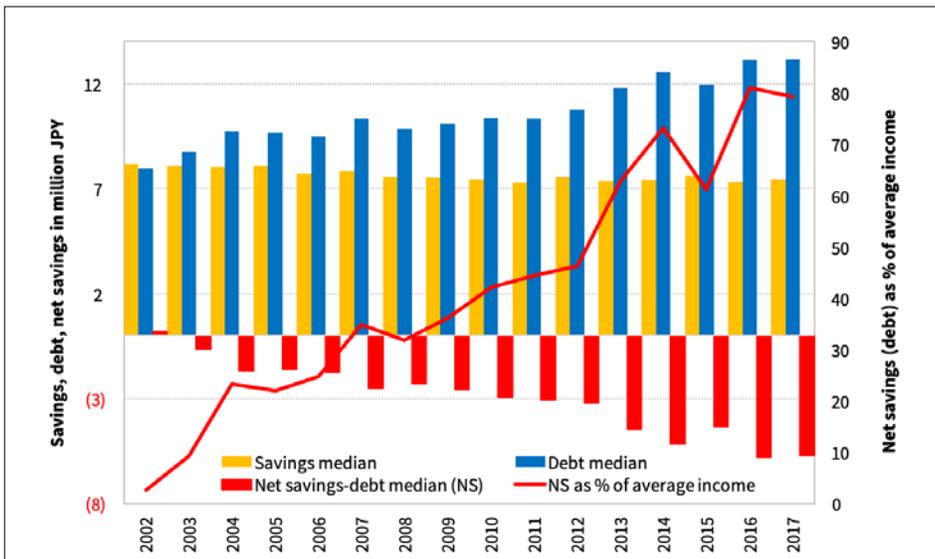
<sup>17</sup> The saving rate is measured as the remaining disposable income after subtraction of consumption expenditures, divided by disposable income.

Chart 1.27a Macro saving rate, average and median of savings of employee households with 2 persons and more in Japan



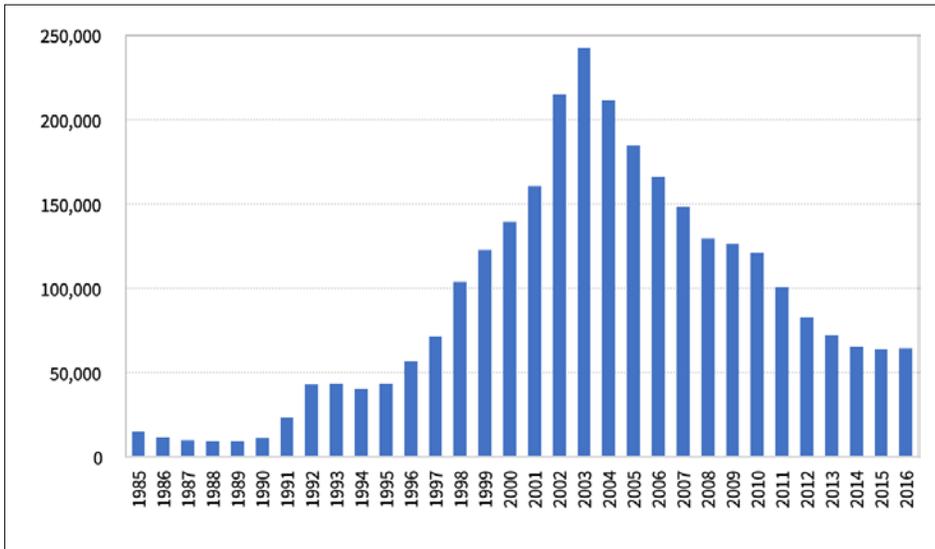
Source: Author, based on CAO 2018a; MIC 2018b

Chart 1.27b Median savings, debt, net savings (debt) as % of average income of employee households with 2 persons and more in Japan



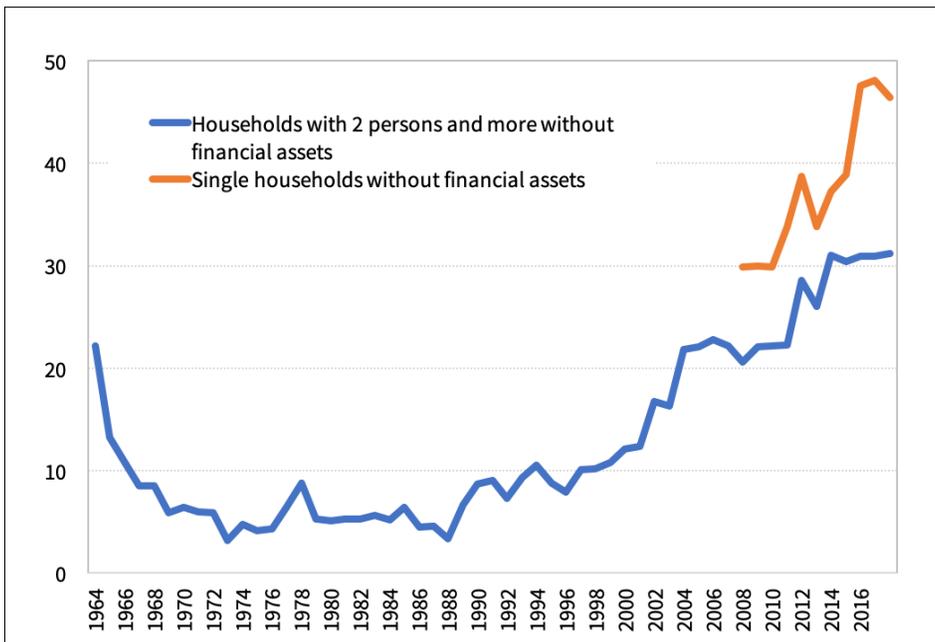
Source: Author, based on MIC 2018b

Chart 1.27c Insolvencies of natural persons in Japan (FY)



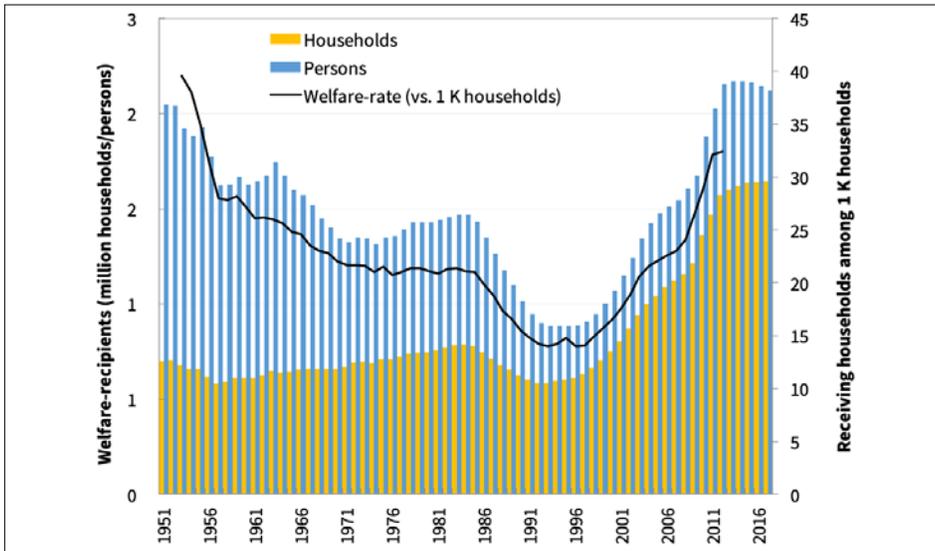
Source: Author, based on SCJ 2017

Chart 1.27d Share of households in Japan without financial assets (%)



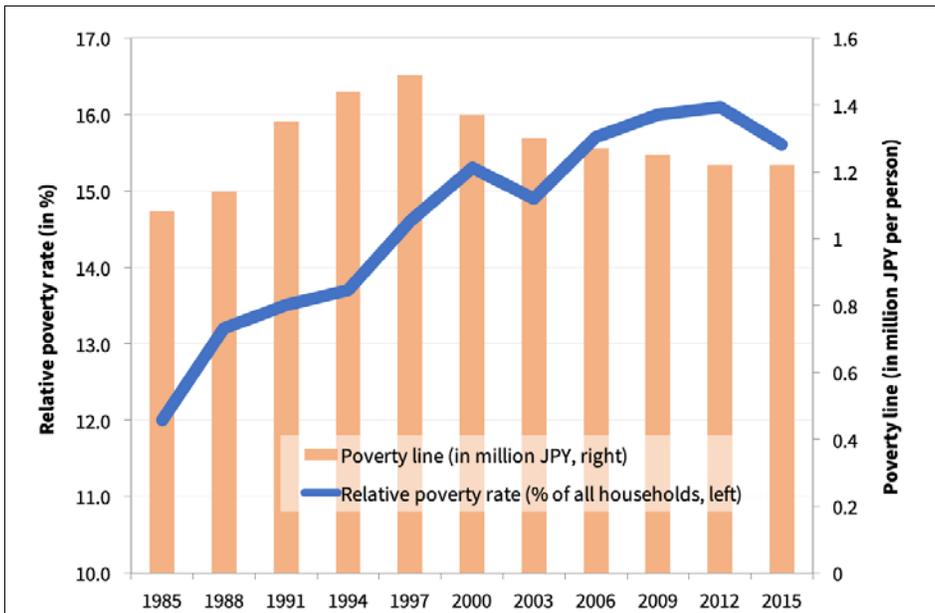
Source: Author, based on CFSI 2017

Chart 1.28a Recipients of social welfare in Japan (CY)



Source: Author, based on MHLW 2018b

Chart 1.28b Poverty rate in Japan (% of households with less than 50% of median disposable annual income per person)

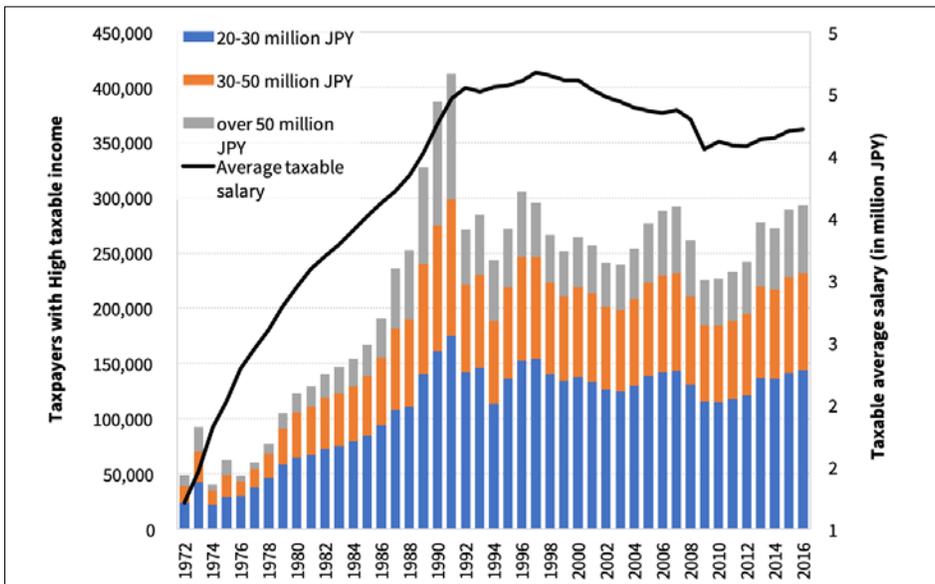


Source: Author, based on MHLW 2016

Not surprisingly, the long-term trend of the Gini coefficient for Japan shows that inequality in assets and total income distribution has been increasing. The number of taxpayers with high taxable income (i.e. an annual income of 20 million JPY and more) had grown until the early '90s. Afterwards it fluctuated, but it has not drastically risen anymore since the burst of the bubble (chart 1.28c).

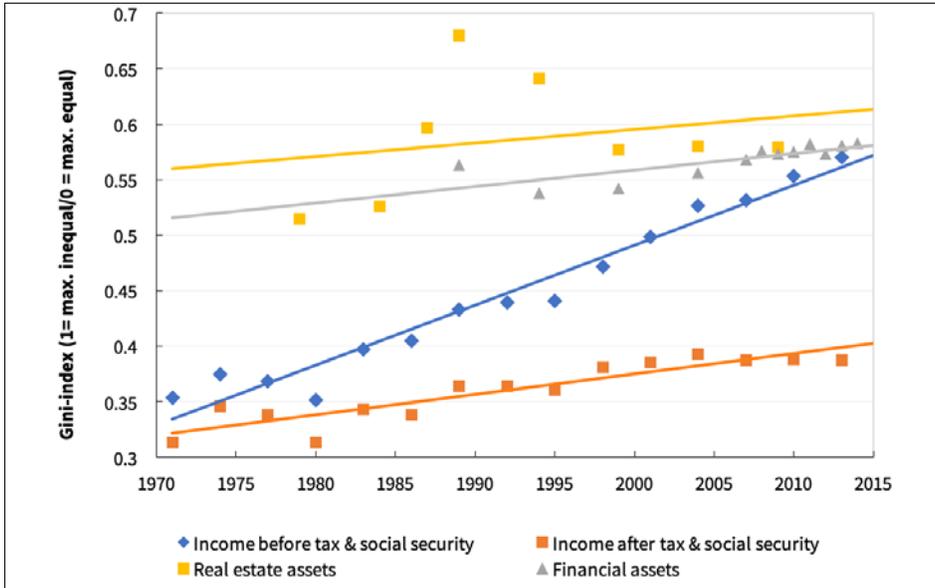
Therefore, the deflation of working income mainly through expanding non-regular employment has to be regarded as the main driver of the rising inequality in incomes since the late '90s (chart 1.28d). A general deflation of working incomes exerts a negative macro-economic impact: it reduces aggregate demand, spurs the deflationary spiral and increases inequality through lowering the bottom. But, obviously, labour cost cutting cannot be justified as a rational response by private corporations to their once damaged balance sheets. Since 1998 Corporate Japan has been a permanent net saver at an average amount of 20 trillion JPY per year (i.e. around 5% of the GDP) (chart 1.11), and its balance sheet is now stronger than ever: the equity ratio, indicating to what degree total assets are financed internally (through retaining profits), has doubled since 2000 from 20% to 42% (chart 1.29).

Chart 1.28c Number of taxpayers in Japan with high taxable income



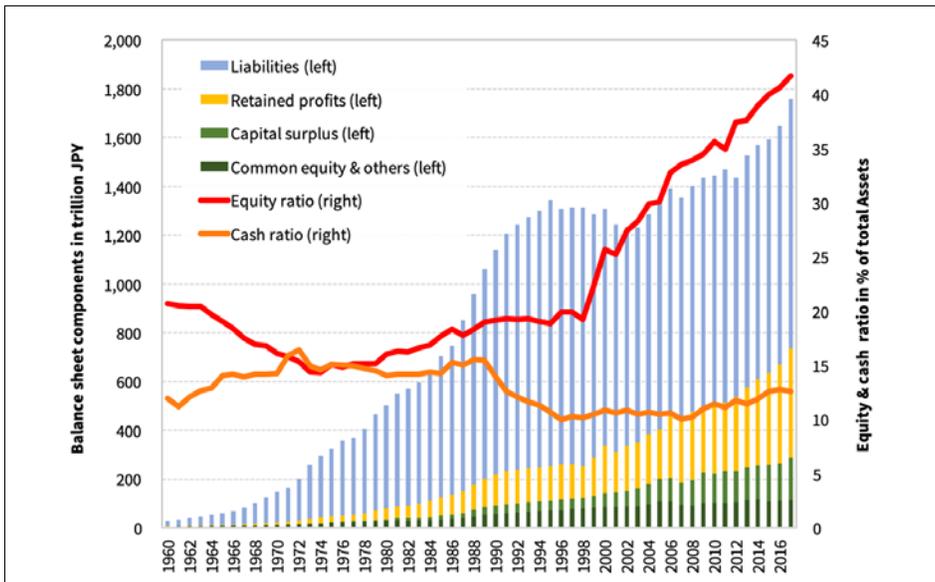
Source: Author, based on NTA 2016

Chart 1.28d Gini coefficient for income and assets in Japan



Source: Author, based on MHLW 2015. Assets until 1987: Takayama, cited in Ōtake 2005, 30, from 2007: CAO 2018a

Chart 1.29 Balance sheet composition of Japanese corporations (all sizes, excluding financials)



Source: Author, based on MOF 2018b

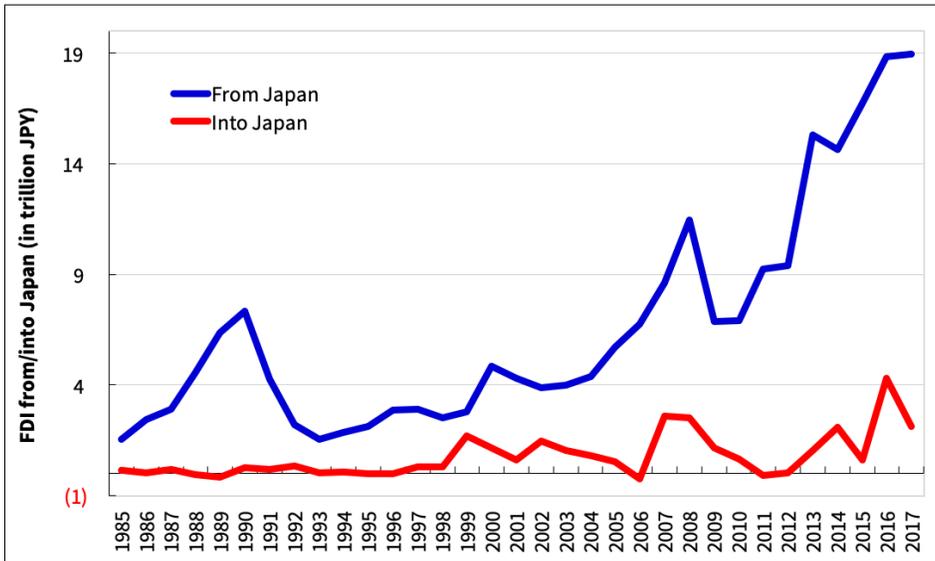
## 1.5 ‘Distributional Coalition’ Between State and Large Corporations

Expansionary fiscal policy has prevented Japan’s economy from collapsing in the ’90s: public investment programmes filled the demand gap that had been left by a debt repaying, cash hoarding and not investing private corporate sector. After the turn of the millennium, the government, shifting to ‘structural reform’, gave private corporations free hand to reduce their labour cost drastically in the main through increased non-regular employment. But despite reduced public investment programmes (now more or less confined to the reconstruction of disaster-hit regions like Fukushima and Kyūshū) public expenditures have exceeded tax receipts twice, and the total public debt has accumulated to unsustainable 250% of the GDP. Nevertheless, the government lowered the corporate income taxation rate as well as tax payments and introduced various new taxation privileges for private corporations (e.g. exempting dividends paid by foreign subsidiaries, and deducting R&D expenses), while continuing to subsidise them – even after corporate profitability had recovered significantly.

Instead of investing domestically into new business models, large corporations increased their equity capital and expanded foreign direct investment (spending the domestic surplus outside of Japan at an amount of 18.5 trillion JPY or around 3.5% of the GDP in 2016), often deploying huge funds for taking over foreign rivals with apparently better conditions for profitable growth (chart 1.30). Together with the central bank, interventions were taken to depreciate the JPY in favour of large exporting manufacturers and importing trade corporations. Private households, already hit by deflated working incomes, have been forced to shoulder both more than 2/3 of all tax burden and the increasing costs for imported fossil fuels and food.

During the period of high economic growth in the ’60s and ’70s, large corporations (organised as *keiretsu* or conglomerates), the majority of their small and medium sized suppliers (as part of a *keiretsu* network) and employee households (as ‘life-long’ regular employees) benefited from economic expansion. This time, however, facing a balance sheet crisis and stagnating demand, government and large corporation formed a “narrowly based distributional coalition” (Olson 1965, 3) excluding all others; they legitimised “the exploitation of the great by the small” (3) as a necessary precondition for overcoming deflationary stagnation or balance sheet recession, regaining global competitiveness and achieving general prosperity. But a balance sheet recession does not exist anymore. In the ’90s, reducing cost without reinvesting returns into business might have been inevitable for many corporations to avoid extinction. Beyond that, it means to give preference to exploiting over exploring. Exploration or investment is an entrepreneurial commitment to an uncertain future, while exploita-

Chart 1.30 Foreign direct investment into and from Japan (Flow, CY)



Source: Author, based on MOF 2018a

tion or cutting cost of existing business means to prolong the past, and this is justifiable only insofar as it generates surplus that can be invested. To aim for a balance between exploitation and exploration is what corporate strategy and decision making should be about (March 1991, 71-87). But, short-term profitability at the expense of employees, suppliers and the public without long-term gainsharing and investing is backward-looking. It carries heavy economic and social costs as it accelerates deflation, widens the gap between rich and poor, shifts the cost of private failures to the public or the weakest and undermines individual initiative as well as collective risk taking.

Labelled as structural reforms, chronic corporate cost cutting without investing is the opposite of it. It is structurally conservative: large and often oligopolistic corporations stick to their business models and defend their dominant positions in saturated industries such as utilities, car manufacturing, construction and trading, by utilising close connections to government and bureaucracy to receive political protection, access to subsidies, public funding and taxation privileges.<sup>18</sup> But nothing of this has

<sup>18</sup> Olson has convincingly explained, giving the example of an (auto)industry that the ability to obtain extraordinary profits and pay exceptionally high wages to a limited number of workers through cartelization or monopolisation forces similarly skilled labour and

prevented the loss of global market share in electronics, heavy industries and car manufacturing (chart 1.31). In these industries, South Korean or Chinese corporations have caught up their Japanese rivals based on the same conventional business models of scaling up and improving efficiency. At the same time, new rivals, mainly from the US, with IT-based business models have started to rewrite the rules, turning towards innovation-driven postindustrial competition. Japanese self-assertions of becoming the gainer from Asia's economic growth, prime provider of industrial infrastructure and central role model for Asia have been maintained even after the nuclear disaster of Fukushima in March 2011. In view of increased industrial competition from inside Asia and lacking innovation strategies, these Japanese hopes appear illusionary.

Striking examples are the shortcomings in the combat against global warming (chart 1.32) and the response to the nuclear disaster of Fukushima. Japan's government is still privileging domestic monopolies in the electric power industry, their outdated nuclear and fossil fuel power generation and their vendors in the heavy industry, instead of enforcing and promoting a consequent shift towards a decentralised network and energy system, based mainly on renewable power.<sup>19</sup>

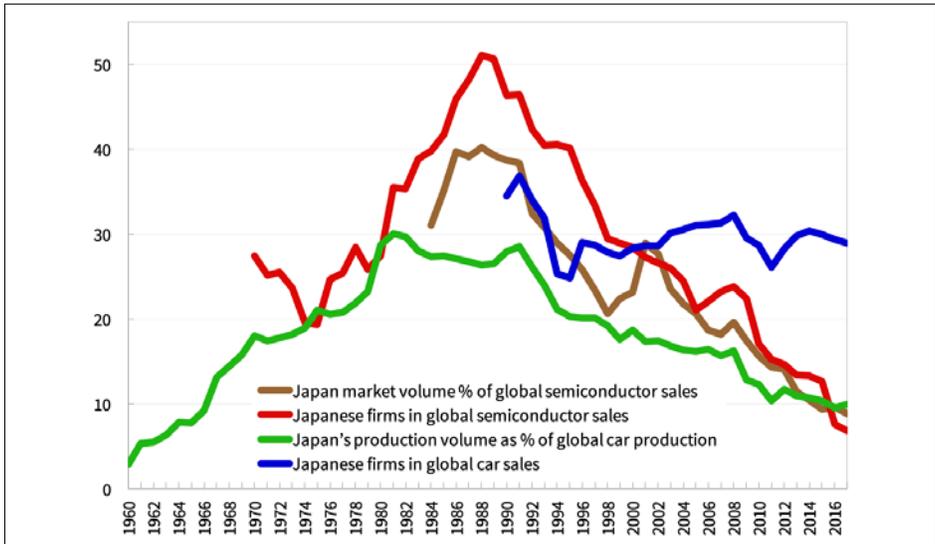
Large corporations remain dominant. For Japan's post-war economy it was essential to protect certain sectors, industries and corporations and promote long-term investment and general prosperity. This was structurally supported by lasting relationships and gainsharing between banks and industrial corporations, capital and labour, large, medium-sized and small corporations. But in the pursuit of 'structural reform' these former 'encompassing' interest alliances have been downgraded to 'narrowly based distributional coalitions' between large corporations, factions of ruling parties and the government, where only these parties reap the gains at the expense of all others and block substantial moves to alternatives.

"Secular stagnation" (Summers 2016) can be understood as an "opportunity for re-connecting and re-balancing the relation between economy and ecology" (Klingholz, Slupina 2017, 7). Trends towards digitalisation, decentralisation, networking and resource sharing can be seen as facilitators of investing into a socially and ecologically sustainable system and into problem solutions. To utilise this potential is essential to get out of the stalemate caused by the neoliberal redistribution of income and wealth and the outdated pursuit of growth. Large corporations and the competi-

capital to flow into less organised sectors, finally reducing productivity, returns and even the national income. In the same way, lobbying of certain industries, firms and unions for special interest legislation (e.g. tax loopholes or subsidies) makes an economy as a whole less efficient (Olson 1986, 180-6).

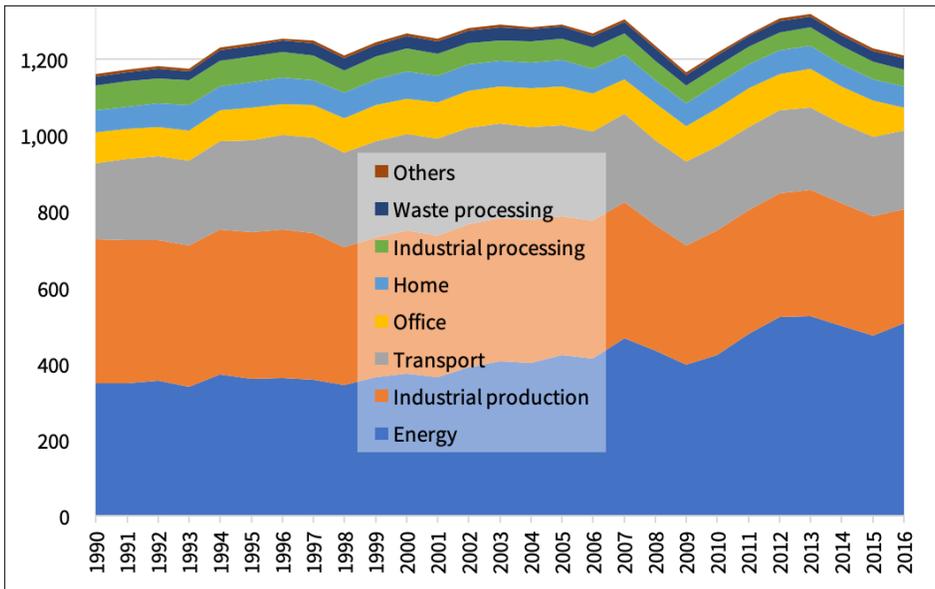
<sup>19</sup> For the electric power industry in relation to the nuclear disaster of Fukushima in March 2011 see the third chapter of this book.

Chart 1.31 Global market shares of Japan or Japanese firms (%)



Source: Author, based on market reports (JAMA/FOURIN/Dataquest/IC Insight/iSuppli/WSTS)

Chart 1.32 Trend of Japan's CO<sub>2</sub> emissions (CY, in million tons)



Source: Author, based on GIO 2018

tion among them do not automatically generate a fundamental correction; they must be forced into this path against their inherent tendencies towards exploitation, expansion, congruence and centralisation. But in today's Japan, such agency cannot be expected to come from the current macro-economic actors, neither the government, central bank or political parties nor corporate labour unions, mass media and academia. Political reform, providing the executive with legal rights to implement state control, is aimed at the opposite: a preventive protection of the privileged few against potential resistance and democratic intervention from the exploited many. Complementary constitutional reform (i.e. abolishing Article 9) is intended to make military conflict again a feasible political option, legitimising further militarisation and the building up of a domestic military-industrial complex.

It can be concluded that the current economic state of Japan is not a special case, neither due to a lack of structural congruence with a perceived global standard of a capital market centred economy (i.e. not consequently implementing the neoliberal recipes), nor due to faulty economic policy (i.e. not consequently implementing Keynesian policy measures). Japan is rather an early indicator of how economic policy, intended to implement change, fails to regain former growth. Large corporations, in the defence of their traditional business model of mass production, improve profitability mainly by reducing their cost of labour and procurement and by strengthening the financial quality of their balance sheets instead of fueling retained profits into domestic capital expenditure as well as product and process innovation. This is the outcome of a system, where large corporations, managerial and bureaucratic elites, core workforces, big shareholders, factions of ruling parties and central unions utilise state and markets for their interest at the expense of the majority of workers, consumers and citizens (Crouch 2011, IX).

## **J-Economy, J-Corporation and J-Power since 1990**

From Mutual Gain to Neoliberal Redistribution

Enno Berndt

## **2 J-Corporation: Stuck In-Between Anglo-Saxon and Traditional Management System**

**Summary** 2.1 Defining J-Corporation. – 2.2 Corporate Culture and the Rise of the J-Corporation. – 2.3 Change of the Corporate Governance and Management System in Japan. – 2.3.1 Absorption of Market Volatility Through Internalisation. – 2.3.2 Challenges and Systemic Limits for the J-Corporation. – 2.3.3 A Self-Deconstructing Ancient Regime? – 2.3.4 Adaptability and Conformity as Self-Protection. – 2.4. Collateral Damages. – 2.4.1 Collapse of Trust Among Employees. – 2.4.2 Deteriorating Quality of Processes and Products. – 2.4.3 Increasing Risk of Corporate Misconduct. – 2.5 ‘Politically Correct’ Response: Itō Report 2.0. – 2.6 What is the Alternative? – 2.6.1 The Importance of Ownership. – 2.6.2 Employment Security, Participation and Payment. – 2.6.3 Governance and Culture of the Post-Industrial Firm.

Capital providers to companies that are listed at stock exchanges and publicly traded hold the legal privilege of limited liability. This privilege is awarded to stimulate funding by shareholders and to promote corporate investment in fields with a demand for capital, technology, management and time horizons that exceed the potential of individual ownership and management. As described in the first chapter, Japan’s large corporations have chronically reduced the cost of existent business without investments, giving preference to short-term over long-term, narrow over broad, particular over general interest since the early 2000s. This casts doubt on the legitimacy of public corporations and privileges granted to them and their shareholders by society. And if interest rates remain low for decades – close to zero or even negative – then capital is neither scarce nor the most important resource anymore. Consequently, its providers do not deserve to be privileged. But so far the coalition between publicly traded corporations and government in Japan has been unfettered in its complying with so-called global standards and the demands by mighty shareholders, first of all, institutional capital providers. This chapter takes a closer look at the transformation outlined in the first chapter. The focus of analysis shifts from the comprehensive macro-economic level, which regards private corporations more or less as one macro-actor, to a micro-economic or organizational level, in the attempt to identify the interests of different actors and stakeholders within or related to corporations as well as contradictions and implications of their actions from the perspective of corporate culture and strategy.

## 2.1 Defining J-Corporation

Japan's economy has been characterised by dual structures: the existence of a few large and many small firms (often dependent suppliers or traditional retailers), a private and a public sector, domestic (service) and export-orientated (manufacturing) industries, a modern industry and a traditional wholesale, retail sector and family-based agriculture, urban centres and rural areas.

Table 2.1 Composition of enterprises by size of regular workforce (% , CY)

	Enterprises (2014)	Workforce (2014)	Sales (2013)
Small (1 to less than 5, 20 regular employees)	85.1	23.5	10.1
Medium (5, 20 to less than 50, 100, 300 regular employees)	14.6	46.6	33.3
Large (50, 100, 300 regular employees and more)	0.3	29.9	56.6

Source: Author based on METI 2018a, 432, 436, 444

This dual structure is the reason for Japan's relatively low labour productivity: a high number of small enterprises and regular employees are concentrated in industry sectors with a labour productivity that is low on average, like construction, wholesale, retail, hoteling, restaurant, entertainment, recreation and healthcare business (tabs. 2.1, 2.2).

Table 2.2 Enterprises, sales, employees and added value by industry sectors in Japan as of 2016

	Enter-prises A	Employees B	B/A	Sales C (tr JPY)	C/A (m JPY)	C/B (m JPY)	Value D (tr JPY)	D/C (%)	D/A (m JPY)	D/B (m JPY)
Agriculture/Fish.	25,992	363,024	14	5	192	14	1	24	45	3
Mining	1,376	19,467	14	2	1,486	105	1	32	481	34
Construction	431,736	3,690,740	9	108	251	29	21	19	48	6
Manufacturing	384,781	8,864,253	23	396	1,030	45	69	17	179	8
Utilities	1,087	187,818	173	26	24,142	140	4	15	3,701	21
ICT	43,585	1,642,042	38	60	1,375	37	16	27	367	10
Transport/ Postal	68,808	3,197,231	46	65	942	20	17	26	242	5
Wholesale/ Retail	842,182	11,843,869	14	501	595	42	54	11	64	5
Finance/ Insurance	29,439	1,530,002	52	125	4,250	82	19	15	651	13

Real Estate	302,835	1,462,395	5	46	152	31	9	21	31	6
Research/Tech.	189,515	1,842,795	10	42	219	23	15	37	80	8
Hotel/ Restaurants	511,846	5,362,088	10	25	50	5	10	38	19	2
Recreation	366,146	2,420,557	7	46	125	19	8	17	21	3
Education	114,451	1,827,596	16	15	135	8	7	47	63	4
Healthcare	294,371	7,374,844	25	111	379	15	21	19	70	3
General Services	5,719	484,260	85	10	1,678	20	4	39	662	8
Other Services	242,588	4,759,845	20	41	168	9	14	35	60	3
<b>Overall Total</b>	<b>3,856,457</b>	<b>56,872,826</b>	<b>15</b>	<b>1,625</b>	<b>421</b>	<b>29</b>	<b>290</b>	<b>18</b>	<b>75</b>	<b>5</b>

Source: Author, based on MIC 2018g, 2, 6, 13

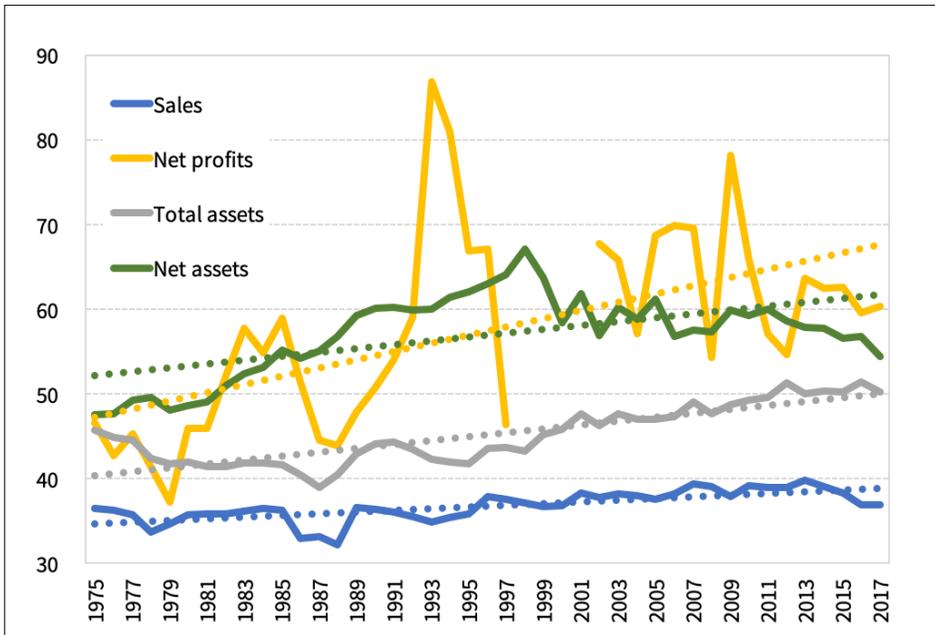
More than half of all regularly surveyed SME are dependent suppliers or vendors (*shitauke*) at the bottom layers of conglomerates (*keiretsu*), which use them as capacity and cost buffers.<sup>1</sup> Large enterprises are often stock exchange listed corporations, closely connected with banks, general trading houses and each other through cross-shareholdings. They control their supply chains, dominate domestic markets and foreign trade, influence politicians, parties and government mainly through their lobby organisation, the Japan Business Federation (*Keidanren*), and offer their employees much better conditions than SME with monthly basic salaries being about 30-50% higher.<sup>2</sup>

After the burst of the asset bubble in 1990-1991, the former six main banks reduced shareholdings to cover their asset value losses and merged into three financial groups (MUFG, SMFG, Mizuho), overlapping the former *keiretsu* borders. Cross-shareholdings have been almost halved as financial institutions were forced to sell off these assets to cover bad loan write-offs and keep the required level of equity ratio. But non-financial corporations have not reduced their shareholdings. They have maintained

1 In 1991, 77% of all regularly surveyed SME in Japan achieved more than 30% of their total sales with one particular corporate client. In 2013 (2016) the respective share fell to 61% (60%) (METI 2018a, 118). In 1995, 68.9% of all SME in Japan had only 5 or less companies as permanent clients, in 2013 (2015) 53.7% (55.65%) (METI 2015a, 114; METI 2015b, 4-6).

2 After the end of World War 2 the big four traditional conglomerates (*yondai zaibatsu*), Mitsui, Mitsubishi, Sumitomo and Yasuda, in addition to Fuji Sangyō, were judged to be responsible for supporting Japanese militarism and providing the economic base of Japan's military aggression. Therefore, the GHQ dismantled them between 1945-1947: the holding headquarters were closed, the owning families expropriated and expelled from the board of directors, the shares dispersed. But against the backdrop of the Korean War (1950-1953) and a related fundamental policy shift by the GHQ anti-monopoly regulations were relaxed and large corporations allowed to re-organise, which resulted in six big conglomerates (Mitsubishi, Mitsui, Sumitomo, Fuji, Sanwa, Daiichikangyō) with banks and general trading houses (*sōgō shōsha*) at their core (Hanazaki 2017, 95-6).

Chart 2.1 Share of corporations with capital of 1 billion JPY and more (FY, %)



Source: Author, based on MOF 2018b. Note: Net profits lacking for 1998-2001 due to negative value

their capital relations to other large corporations and important Tier-1-suppliers within the same conglomerate (charts 1.20a-b). Thus, although less dominating, conglomerates do still exist. And those large corporations, which are connected to them, have continuously increased their share of net profits (flow) and net assets (stock) to about 60% (chart 2.1).

If not indicated otherwise, these large (mainly stock exchange listed) corporations from all industries are the main subject below. They have been structurally dominant not only in the domestic market, but also in international trade as well as direct investment from inside and outside of Japan. And, as in all other developed economies, large corporations have been strongly influencing politics, public administration, jurisdiction, mass media, education and so on.

## 2.2 Corporate Culture and the Rise of the J-Corporation

Culture is a blank space, a highly respected, empty pigeonhole. Economists call it 'tastes' and leave it severely alone. Most philosophers ignore it - to their own loss. Marxists treat it obliquely as ideology or superstructure. Psychologists avoid it, by concentrating on child subjects. Historians bend it any way they like. Most believe it matters, especially travel agents.

(Mary Douglas, 1982, *Cultural Bias*, 183)

Management is about engaging actors with different interest, roles and tasks in communication and collaboration to ensure the functioning of organizational processes. Once these collective actions have borne satisfying results, they are considered legitimate and as such worthy of reproduction without reconfirmation. The involved actors begin, often unconsciously and informally, to share the aim of maintaining those very structures that they have created through their collective action in the first place (Schein [1985] 2004, 12, 17). This collective sharing, the shared assumption of legitimate structures among the majority of actors within corporate organisations, is called 'corporate culture'. As Weick has convincingly argued, corporate culture generates a kind of order or centralisation among different actors allowing for local, decentralised and unique interpretation, improvisation and action (Weick 1987, 124). In this sense, culture fills the gap between "the three 'cannot' (cannot foresee, know or control) and the three 'must' (must act, plan and organize)" (Weick 2016, 333-4), helping managers within corporate organisations, who "must act when [they] cannot foresee consequences; [...] must plan when [they] cannot know; [...] must organize when [they] cannot control" (La Porte 1975, 345). But the importance of culture is often only acknowledged when sudden change disturbs the patterns and routines of collective action (Weick 1985, 381-9).

Interest in corporate culture was triggered in the '80s by the increasing share of Japanese manufacturing corporations in the US and other foreign markets for passenger cars, motorbikes and electronic goods (chart 1.31). Questions arose why particularly Japanese corporations had been successful in outpacing their competitors from the US and Western Europe, while using the same resources, technologies, tools and processes: what enabled Japanese corporations to expand production and sales of reasonably priced products in variation and reliable quality? How could they implement flexibility into industrial mass production? Japanese corporations appeared on the stage of international competition at a moment when demand for standardised mass consumer goods had been saturated; when unionised industrial workers in Western Europe had expressed their dissatisfaction with being treated as administrated workforce, potentially inferior to machines; when centralised mass production, often organised in an oligopolistic manner, and mass consumption seemed to have reached

their economic, social and natural limits. The assumption was that, if Japanese corporations used mainly the same material hardware, it could be only the cultural software, a different way of managing that made their employees and corporate stakeholders communicate and collaborate, and enabled flexible response to changed market conditions.<sup>3</sup> Particularly Toyota appeared as the benchmark for overcoming the limits of Fordism as a learning organisation that supposedly represented central features of Post-Fordism<sup>4</sup> or Postmodern Industrialism<sup>5</sup> in the '90s.

Insofar as the recessions of 1973-1975 and 1979-1981 were perceived as crises of Fordism, it was obvious to explain the success of Japanese corporations in overcoming them as evidence for a progressive system. However, this macro perspective, insofar as it had assumed a structural superiority of the Japanese economic system, was empirically debased by Japan's entry into deflationary stagnation and the decline in global market share not only in the financial industry, but also in the electronic and automotive industries<sup>6</sup> (chart 1.31). In response to the macro-economic backlash of the '90s and 2000s, the discourse about the Japanese corporate system took a micro-economic turn: under the name of J-Firm a discussion set in to what extent Japan's corporations were to adapt to the dominant Anglo-Saxon model (Aoki, Dore 1994).

Initially, the term J-Firm was coined by Aoki (1984b, 1990, 1992) and Itami (2001) to describe the nature and general importance of the Japanese corporate governance system, based on institutional and behavioural theories.<sup>7</sup> The distinctive characteristic of J-Firm as a system was seen in the long-term orientation as well as the sharing of risks and returns

3 See Barley et al. 1988, 33, 39; Deutschmann 1989a, 1989b, 1989c.

4 In Japan, numerous respective publications were authored by former Toyota managers, for example Shibata, Kaneda (2001); Wakamatsu (2007). Outside of Japan, this perception was strongly represented in the US and spread from there to Europe: Womack et al. (1990); Adler, Cole (1993); Kenney, Florida (1993); Womack, Jones (1996, 2005); Liker (2004). As the main proponent in Japan, Fujimoto characterised the Toyota Production System (TPS) as a hybrid between the Ford System and specific Japanese elements rather than a systemic alternative (Fujimoto 1997, 120-3; 2001, 79-82; 2003, 143-70).

5 Interest from outside of Japan occurred not only in response to the success of Japanese corporations in international competition. It also arose from a postmodern discourse, which questioned capitalist modernism with its teleology and convergence dogma and showed curiosity about everything that seemed different but had previously been ignored. Central to many contributions to the Toyotism debate was the French Regulatory Theory, which attempted to define the crises of 1973-1975 and 1979-1981 as crises of Fordism and the social system of capitalism in its various national forms of development (Amin 1984, 1-39; Coriat 1991; Boyer, Durand 1997).

6 Except for Toyota, which has maintained its share in worldwide sold cars slightly above 10%.

7 Firm is a general term, denominating an organisation for doing business. Corporation is a firm that can act as an individual (legal entity) but with limited liabilities of its owners.

between all stakeholders in order to prevent moral hazard and short-term opportunism. Japanese corporations were able to shield themselves against uncertainties, such as market volatility, and achieve collective learning returns and productivity gains in the long term. Koike (1981, 1991, 1994, 1997) identified self-determined and experience-based collective action of multiple-qualified skilled workers in long-term employment with seniority pay, promotion and permanent function rotation as Japanese characteristics of labour relations. Asanuma (1997) defined the relationship between suppliers or vendors and final producers as a risk sharing and learning coalition. Aoki (1988, 1990, 2000) combined these approaches under the concept of corporate governance, described the quality of interaction between stakeholders as dominantly horizontal coordination and finally integrated them into the concept of the J-Firm. Thus the J-Firm, or more precisely the J-Corporation, was characterised as the organizational integration of (a) long-term employment, rank hierarchy, horizontal information exchange, functional rotation, internal promotion and enterprise unions as principles for internal organisation; (b) long-term relations to the main bank, which provided not only credit finance, but was also the major shareholder, leading underwriter for bond issues and investment advisor; (c) cross-shareholdings with core member firms and Tier-1 vendors; and (d) long-term vendor-relations, based on hierarchy, close activity coordination and selected shareholdings. In the name of Japanese corporate culture, specific behavioural and ideological patterns of collective acting were regarded as typical for the J-Firm (Ouchi 1981).

The popularity of this view, which had been maintained for more than a decade even after the burst of the asset bubble in Japan, is surprising. After all, the J-Firm concept seemed to have been falsified by the crisis of Japan's economy and corporate governance system as well as the declining competitiveness and world market shares of large Japanese corporations. Many of the former J-Firm supporters converted to neoliberalism in the '90s and called for global convergence to the US or Anglo-Saxon model.<sup>8</sup> However, it was not only academic remoteness from practice or nostalgia which gave rise to interest in a concept, whose subject (the J-Firm) was undoubtedly in crisis. Because social transformation is historically concrete, complex and exhausting, academics appreciated the J-Firm concept for its potential to reflect about the complexity, historicity and social nature of Japan's corporate governance system and to search for structural corrections instead of committing to an allegedly superior imported model. The

<sup>8</sup> Critical positions were taken particularly by Katō, Steven (1993) criticising Florida, Kenney (1993) and by Nomura (1994, 1998) and Kamī, Nomura (2001) in a dispute over Koike (1981). Outside of Japan, critique appeared in the form of characterising 'Toyotism as Hyper-Taylorism' (Dohse 1984), 'Totalitarian or Collective Taylorism' (Jürgens 1992) or a 'Modified Taylor-Ford-System' (Berggren 1993).

plea for diversity and respect towards path dependency inherent to the J-Firm concept was welcomed by the protagonists of a crisis-ridden system. Therefore, a closer look into the historic change of Japan's corporate governance system is required. Corporate governance is understood here in a broader sense than methods of executing a given paradigm, namely, as an institutionally reproduced power configuration, adjusting, absorbing and integrating the interest of various corporate and social stakeholders in the process of corporate management and reflecting management in its inherent contradictions (Weick 2016, 333-4).

### 2.3 Change of the Corporate Governance and Management System in Japan

As distinct from a market-orientated control nexus, Japanese corporations have been characterised as organisation-orientated and dominantly self-referential: new employees, recruited right after leaving high school or college, enter the company at the lowest rank; staff fluctuation is low and on-the-job-training is central; employees are involved in the operational management. The company is not an abstract property of its shareholders, but a community: its core members are the employees. Managers are not shareholder-authorized representatives from outside, but mainly senior members of the corporate community, promoted and selected from internal managerial ranks. Shareholders are supposed not to be primarily equity investors, demanding the maximisation of short-term returns, but banks, suppliers and distributors, that are interconnected through cross-shareholdings and interested in long-term stable transactions. Instead of being a means for delivering maximal financial returns to capital investors, corporations use capital to expand themselves (Watanabe S. 1994; Itami 2001).

Against this backdrop, the Japanese corporate system has often been ascribed an inherent network orientation (Moerland 1995a, 1995b). Rather than the final purpose, networks are merely a means for organizational expansion: they function mainly as barriers, filters or control gates of entry and exit for actors, protecting corporate organisations against opportunistic behaviour and market volatility (Ikeda 1997). Hierarchical ruling and subordination are thus neither abolished nor are realised only as top-down order-and-report or one-sided instrumentalization of the subordinated. The interaction of actors who are aware of their mutual dependency plays the central role (tab. 2.3). This relationality cannot necessarily be conceived as the inevitable outcome of a somewhat particular Japanese culture. It is historical. The period from 1912 to 1925 was characterised by entrepreneurship and market-competition: entrepreneurs were acting as trustees (*ōmotokata*) of owner families, like in the case of the four conglomerates or *zaibatsu* (Mitsubishi, Mitsui, Sumitomo, Yasuda), or as owners (and

major shareholders) of their enterprise; a huge gap of incomes and assets existed between entrepreneurs and employees; a market-driven (short-term) allocation of yield-sensitive capital and high intra- and inter-sectoral labour mobility dominated (Okumura 1992, 2-3, 186-7; Iwai 2009, 202-3). Social polarisation and speculative over-accumulation of capital led to the militarised economy of World War 2, to destruction and defeat.

Table 2.3 Comparison of Japanese and Anglo-Saxon corporate management systems

	<b>Japanese corporate management</b>	<b>Anglo-Saxon corporate management</b>
Sovereign Power	Employees	Shareholders
Stakeholders	Employees, customers, vendors, shareholders, local community, nature	Shareholders
Finance	Debt, banks, indirect, long-term investment-capital	Equity, broker, direct, short-term financial-capital
Risk/Return	Low risk, low return, safety first	High risk, high return, tolerance to change
Employees	Lifetime employment	Frequent change of employers
Personal management	Seniority, negative counting, Y-theory	Capability, result, positive counting, C-theory
Corporate formation	Comprehensive	Specialised
Corporate life expectancy	Long	Short is ok
M&A	Negative perception, difficult	No managerial resistance, easy
Organisation	Community, collectivism	Economic Rationality, Individualism
Innovation	Collective improvement, sustainable	Individual concept & product, disruptive
Business Development	Internal, proprietary, vertical	Use of external resource, horizontal
Quality	Priority of quality	Preference for speed over quality
Suppliers/Vendors	Long-term, trust, closed	Cost-performance-driven, open
Market	Galapagos-like (Domestic)	Global
Nationality	Peasant type, island country	Hunter type, colonies

Source: Satō 2016, 27

### 2.3.1 Absorbtion of Market Volatility Through Internalisation

Single elements of those structures and patterns of organizational behaviour that have been seen as typical for Japanese corporations (J-Firm), such as long-term employment and seniority-based wages, were implemented by large private corporations already in the '20s pre-war period to attract and keep well educated elites or highly performing employees as managerial cadres, and they were also applied partly to experienced workers with

special skills and knowledge in the heavy industry. Ideologically linked to general mobilisation, differences between white and blue collar workers were first reduced during World War 2.<sup>9</sup> But the main elements and structures of Japanese corporations are to be traced back to the democratic break-up of the political pre-war system, structural modification of the collapsed state-controlled war economy, economic reform in the Cold War Era of the '50s and corporate reorganisation until the early '60s.<sup>10</sup> Aoki has described these elements and structures as follows: internally, operational practices were realised through horizontal coordination by knowledge sharing and operational flexibility in contrast to the separation of planning and operation in economies of specialisation. Operational coordination and decision-making were less formalised and less hierarchical. Thus, employee competition for higher ranks in an incentive hierarchy resulted in maintaining operational effectiveness and organizational integrity. Externally, the main bank intervened only in crises. There was no clear hierarchy between corporate control and operational management. Companies competed with each other for higher rankings by growth in profits and sales. Thus, managerial decisions were affected more by employees and financial interests than by unilateral shareholders. This resulted in a longer view on investment and growth, in higher job security, in limiting workforce expansion relative to value-added growth by means of spinning off labour intensive work to suppliers or the outside, in shifting towards capital-intensive technology and in innovation based on in-house knowledge (Aoki 1990). Top managers were not managing owners with significant shareholdings in the company anymore. They were recruited inhouse, from employees and managerial ranks. The fundamental conflict of interest between capital and labour was appeased through long-term employment, mutual consultation and operational participation. Combined with seniority-linked payment components, the internal competition among employees resembled a tournament for high reputation and early promotion. Proposals were to be discussed and modified before the final decision by formally authorised managers. Participation generated informal rights to be informed and involved. The general aim was to improve communication and collaboration between related actors and to implement decisions in a faster and less contested way. But involvement has its price: it is not only time-consuming, but it also prioritizes compromise and consent over quality, consistency and emergency; it makes personal responsibility unrecognizable and hampers radical corrective action. Nonetheless, in the

9 Ōtaka 1984, 38-44; Chūma 1994, 223-41; Noguchi 1995; Iwai 2009, 201-31; Ogura 2013, 27-31.

10 Shimada 1994, 47-84; Itō M. 1995, 225-6; Yoshida 1996, 71-97; Nagano 1996, 24-32; Nitta, Hisamoto 2008, 12, 31-6, 51-6, 80-102.

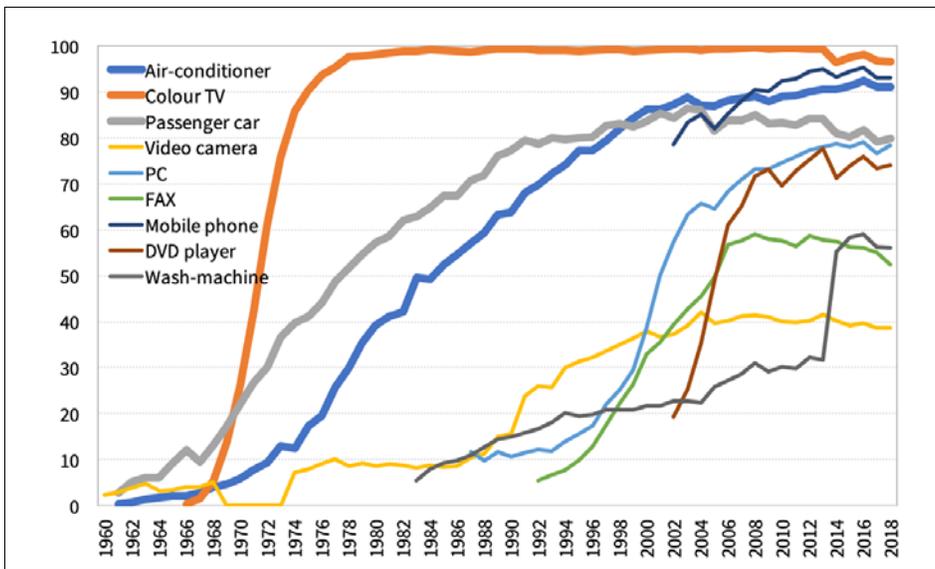
context of underdeveloped resource accumulation and insufficient market allocation, it is rational to bind important resources internally, stabilise the conditions of their reproduction and reduce transaction cost, i.e. pursue internal resource accumulation. Highly motivated, managerial and non-managerial employees committed themselves to the corporation; hierarchically organised suppliers and distributors stayed loyal; banks acted as patient creditors and corporate shareholders silently tolerated managerial decisions as long as there was no existential threat (Itami 2001).

Under this system large corporations developed collective patterns of behaviour and thinking, which facilitated continuous process improvement and incremental efficiency enhancement, and which facilitated manufacturing mass products in high variance and high quality at low cost. Its main features were: (a) internalisation and long-term allocation of core resources, (b) stabilisation of central reproductive relations and activities, (c) functional flexibility and (d) operational process optimisation in production. The benchmark for success was to expand production volume, sales turnover and market share. Accordingly, the 'how' of acting was perceived as most important. The allocation and evaluation of inputs and outputs was primarily process-orientated. Rather than signals from external markets, it was micro-political positioning, i.e. the personalised relationship between internal actors that counted most for corporate decision making. Consequently, managing in Japanese corporate organisations was shaped by inductive thinking, informal communication, decision-making and incremental acting (Yokota 1998). In contrast to the - highly rationalised - direct production in large manufacturing firms, other areas, particularly marketing, distribution, wholesale and retailing, remained conservative and, by international comparison, relatively inefficient due to systemic reasons: large-scale industrial production and final assembly were at the centre of strategy and efficiency enhancement. Here, capacity was continuously expanded and technologically renewed through high capital expenditure. A large variety of product parameter as well as short-term model changes ensured that these capital-excessive facilities were utilised at high degree, while operational process optimisation helped to reduce costs and defects. The manufacturing plants of the large corporations were seen as the 'profit centres'. Marketing and sales were 'only' to sell the output, i.e. translate the gains achieved in production into an increasing market share. Marketing and sales were therefore managed as subordinate cost centres. The top priority was to improve the process quality of production, not product differentiation.

2.3.2 Challenges and Systemic Limits for the J-Corporation

Every system contains the causes for its self-deconstruction; its expansion advances internal contradictions and incompatibilities with the external environment until it reaches its limits (Seo, Creed 2002). Given the extent to which the Japanese system had realised its goal, i.e. incremental growth, it was to meet its limits inevitably in a twofold way: on the one hand, its constantly growing product output had to be realised in the market, either by generating and meeting growing demand with sufficient purchasing power or by replacing competitive supply. On the other hand, stable allocation of resources requires their cost-effective availability, trust of suppliers in continued mutual expansion, and non-disruptive technological and intra-industrial environments. These conditions have dwindled since the '90s. In addition to the saturation of demand in the domestic market, lower-cost supply from competitors in East and Southeast Asia have led to the commoditisation of many existing mass products and to fierce price and cost competition in the related markets (chart 2.2).

Chart 2.2 Diffusion rate of durable household goods in Japan (as of March CY, % of all households with two and more persons)



Source: Author, based on CAO 2018b

Furthermore, the process competencies of Japanese corporations have been equalised and devalued by IT or internet-based open-modular production and process architectures, which shortened product cycles and expedited the diffusion of product innovations (Kokuryō 1999, 173-97). The

delimitation of decision-making and action areas as well as the technological rationalisation of communication and interaction have promoted the modularisation and transferability of goods and services, reduced transaction costs and offered external market alternatives to the internal organisation. Actors were linked to market forms of coordination and cooperation; open transaction relationships and disintegration (decentralisation) of existing business activities as well as organizational units came to the fore. These changes were practically implemented as restructuring, with an emphasis on the core business and on outsourcing. The insider learning returns, generated long-term in closed networks, were devalued (Ikeda 1997, 167-93). Qualities of action, that the Japanese corporate system was not designed to generate, became relevant: rapid decision-making by selectively assessing internal and external options, explication of tasks and duties, self-responsible action, flexible resource allocation and result-reflecting assessment. Managing could no longer rely on internal micro-political compromise, that is, consensual cooperation in the experience-driven corridor of incremental process optimisation and the constantly expanding utilisation of resources. Instead, market-responsive thinking and acting were required: changes in the environment had to be observed and immediately interpreted, potentially profitable products and business fields identified, resources acquired and the combination of exploring new business with exploiting existing business had to be organised. Business could no longer take the form of iterative authorisation and operational intervention by corporate headquarters. An indicative management, based on a transparent set of general rules for project evaluation, accounting, quality assurance, investment and capital cost calculation, was necessary; that is, a management that would mediate internal negotiations between self-responsible organizational units and individual employees over resource allocation and evaluation of results (Ōta 2017, 157-210).

According to Nadler and Tushman (1986), in the mature phase of industrial development the focus shifted from incremental process to product innovation: closed product and process architectures became disadvantageous, because they focused on process optimisation. When markets saturate, scale-dependent productivity gains can no longer be realised against competing supply at falling prices by displacing such supply or by placebo-stimulated demand, and capital investments can no longer be amortised before the respective product technology becomes obsolete. Consequently, in regard to focus as well as mode of controlling, value creation and process chains must be reset. Facing saturated markets for common goods, an intensified supply competition and an accelerated speed of transactions, neither sellers nor buyers can predict precisely what is needed for how long in which quantities at what parameters and prices. A control of process chains, which starts from market demand, presupposes that this demand persists and that customers know exactly what they want. Such a

system must be reconfigured in an open and modular way in order to meet differentiation criteria, such as variants, delivery speed and low prices. What remains, alongside such strategic variants as cost leadership, value-slicing and value-integration, is a dialogical exploration of the unknown in collaborative action between producers and customers: how does the other side think and act? What can tie both sides to each other? How does the other side evaluate existing products and new proposals? What other problems related to the use of existing products are to be solved?

### 2.3.3 A Self-Deconstructing Ancient Regime?

Both business model and governance system of Japanese corporations assume a continuous expansion, based on stable conditions for supply and demand. In contrast, the increasingly uncertain environment calls less for operating flexibility and incremental improvement within a given product portfolio or stable technology frame, but for strategic flexibility: renewing old and inventing new business models.

Table 2.4 Comparison of ROE drivers (average 2004-2013)

Country	Sector	ROE (%)	Sales Margin (%)	Turnover Rate	Leverage
<b>Japan</b>	Manufacturing	6.8	3.5	0.91	1.91
	TOPIX Non-manufacturing	6.7	3.2	0.86	2.28
	500 Total	6.8	3.3	0.92	2.02
<b>US</b>	Manufacturing	18.1	8.4	0.77	2.24
	S&P Non-manufacturing	14.5	8.0	0.61	2.33
	500 Total	16.0	8.3	0.87	2.29
<b>Europe</b>	Manufacturing	15.3	6.8	0.79	2.44
	STOX Non-manufacturing	15.6	7.8	0.68	2.74
	600 Total	15.4	7.2	0.86	2.58

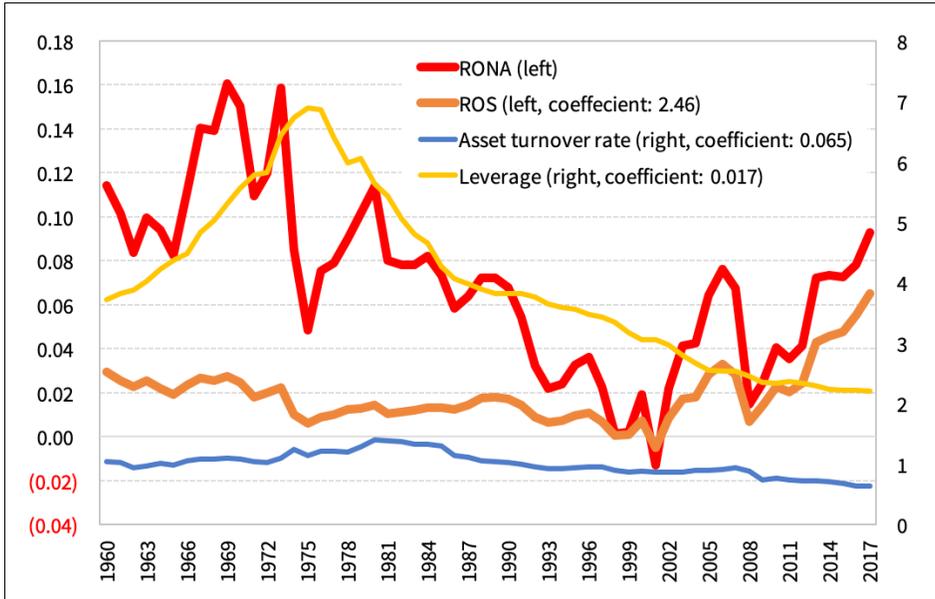
Source: Kobayashi 2015, 8

Japanese corporations and their top managers perceived these changes primarily as a problem of declining profitability and a cost issue. And indeed, a comparison of Japanese with European and US corporations, according to the Du-Pont-Formula,<sup>11</sup> shows, that their lower financial performance is due to a lower level of sales profitability, while their opera-

<sup>11</sup> In simplified terms: Return on Equity (ROE: net profits/equity) = Net Return on Sales (ROS: net profit/sales) × Asset Turnover Rate (sales/total assets) × Financial Leverage (total assets/equity); as extended version: ROE = Gross Sales Margin (earnings before tax and interest/sales) × Interest Burden Rate (pre-tax profit/earnings before tax and interest) × Tax

tional efficiency is better and financial leverage is lower than that of their foreign competitors (tab. 2.4).

Chart 2.3 Breakdown of return on net assets (RONA) at large Japanese corporations (all industries excluding financial and insurance, capital of 1 billion JPY and more, FY)



Note: multiple regression coefficient with RONA as y-value.

Source: Author, based on MOF 2018b

An analysis of the long-term trend of profitability at big Japanese corporations here measured as Return on Net Assets (RONA) and its main drivers (Return on Sales: ROS, Asset Turnover Rate and Leverage) according to the DuPont-Formula reveals that RONA has fallen until 2001, mainly due to continuously decreasing ROS, while efficiency in utilising assets for generating sales decreased (as a result of heavy investment in capacity expansion) and leverage was also reduced after 1980 (chart 2.3). Itō (1995, 236-8) and Mizuno (2016, 26-7) explain the relatively low level of capital productivity (measured as RONA or ROE) and sales margin (measured as ROS) as a consequence of relative overcapacities in production. This overcapacity is typical for large Japanese corporations and an outcome

Burden Rate (net profit/pre-tax profit) × Asset Turnover Rate (sales/total assets) × Financial Leverage (total assets/equity).

of their dominating business model, as they compete with similar core products and production technologies over small parameters, economy of scale and market share. Iriyama (2017, 140-1) calls this mode of competition the “Chamberlain type”: it results in continuous improvement, but it also leads to a narrow focus, a lack of responsiveness to competition and innovation. But Mizuno (2016, 28-9) sees not only disadvantages, because overcapacity of supply and continuous improvement had enabled Japanese corporations to increase exports, trade surplus, foreign currency reserves and foreign investment, generating a positive payment balance and income from abroad.

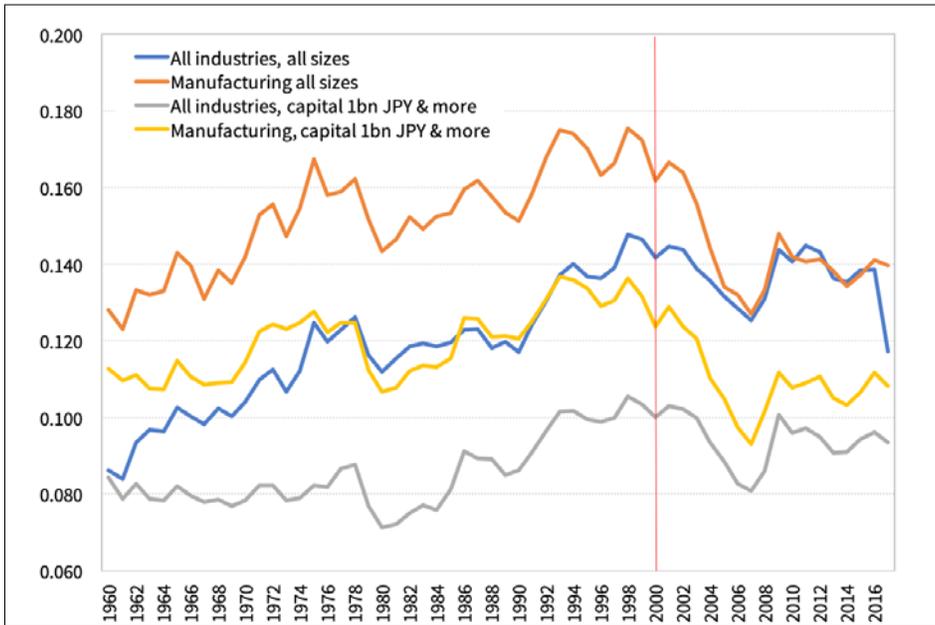
Insufficient sales profitability can be improved by raising prices (while keeping cost constant) or by lowering cost (while keeping prices constant). As prices reflect not only internal target margins, but depend also on external demand and competing supply, they are less under managerial discretion than cost. Large Japanese corporations have relied mainly on medium level price setting in order to target mass segments and continuously expand production, sales volume and market share. The absence of sufficient product differentiation and the lack of potential for raising prices were both cause and consequence of this business model. Traditionally, cost pressure was shifted to lower layers of the vendor hierarchy by reducing the vendors’ selling prices and outsourcing cost-prone operations. In case of deep recessions such as 1973-1975, shrinking demand, continuous losses and labour costs were absorbed by introducing short-time work, cutting overtime payment and bonuses, delaying promotions and regular salary raises, laying off non-regular workforce, stopping new hiring, transferring employees to other units, subsidiaries and vendors or starting early retirement programmes. But the dismissal of regular employees was always avoided if possible.<sup>12</sup> Confronted with bleak macro conditions, an aging workforce and growing competition, however, cost pressure was perceived as exceeding the scope of common responses within the existing structures. The increasing ratio of labour cost/sales and labour ratio (labour cost/added value) (until 2000) seemed to evince the necessity for a fundamental change (charts 2.4, 2.5).

An increasing share of value added, paid out as labour cost (wages, salaries, bonuses, social insurance contributions and fringe benefits) to employees including managers, is an inevitable outcome of treating regular employees as important stakeholders and meeting their expectations towards protecting long-term employment, in particular during recessionary downturns, when the ratio of value added/sales falls.

Actually, Japanese corporations, especially in the manufacturing industries, have been facing a decline in the value added/sales ratio for several

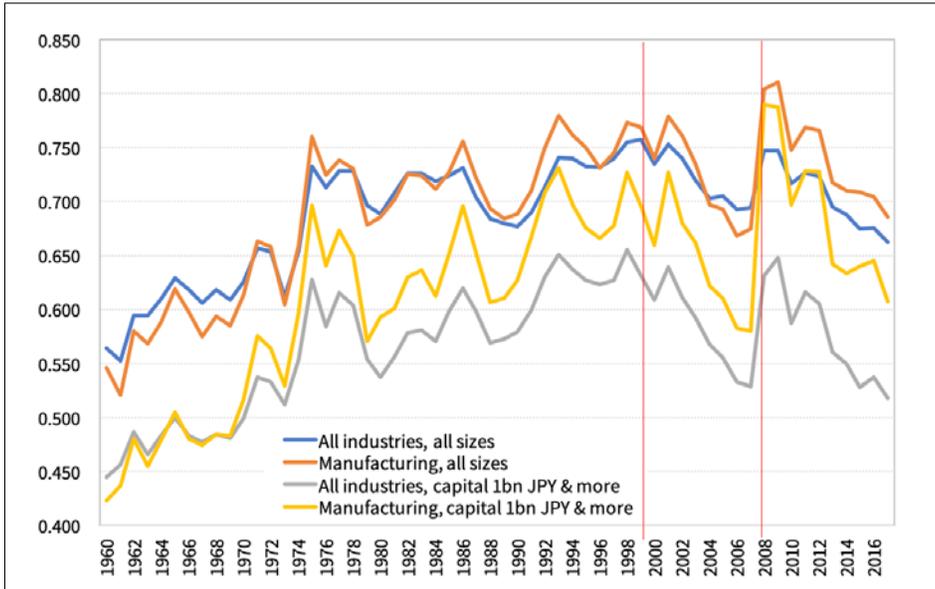
12 Nagano 1996, 24-32; Nitta, Hisamoto 2008, 27-42, 48-56, 89-102.

Chart 2.4 Labour cost/sales ratio at Japanese corporations (FY)



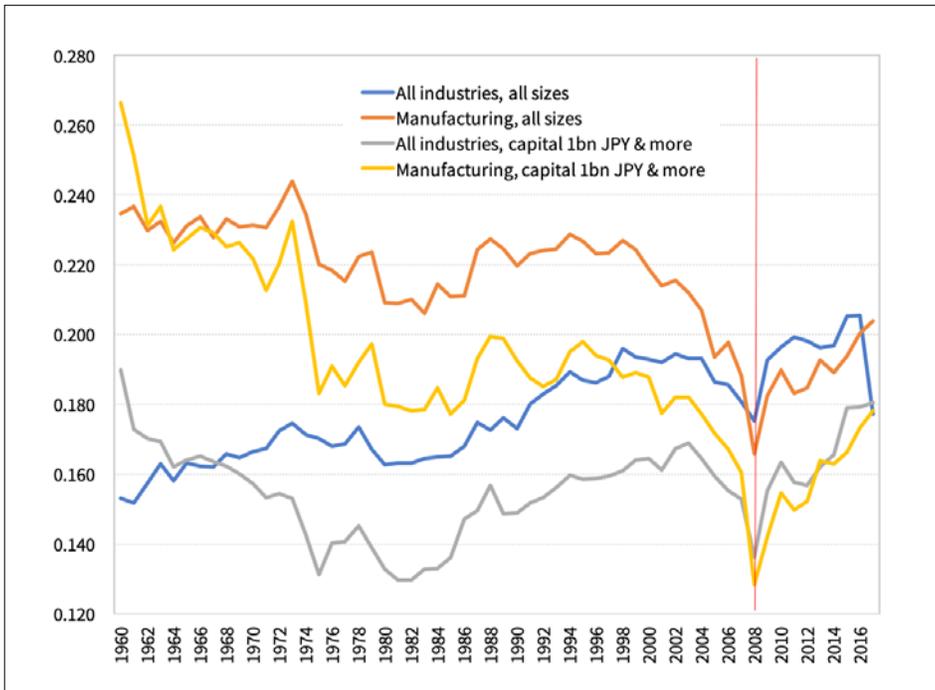
Source: Author, based on MOF 2018b

Chart 2.5 Labour ratio (labour cost/value added) at Japanese corporations (FY)



Source: Author, based on MOF 2018b

Chart 2.6 Value added/sales ratio at Japanese corporations (FY)



Source: Author, based on MOF 2018b

decades. This reflects not only a declining ability to absorb cost, but much more so the inability to set sufficiently high prices in competitive markets.<sup>13</sup> In times of cyclical expansion, prices were kept low to expand sales and market share, and to keep the utilisation rate of capital-intensive facilities high; in times of cyclical contraction and stagnation such as after the burst of the asset bubble in the early '90s, prices had to be reduced to maintain cash inflow and repay debts. But the continuously falling value added/sales ratio indicates a structural problem, which goes beyond the absorption of cyclical volatility: huge investments were made into products, technologies and market segments prone to cost and price competition and increasingly replaceable by supply from domestic or foreign competitors (chart 2.6). This shortcoming in the current business model sways the ability of

**13** The different trend in the category 'all industries' in chart 2.6 reflects the growing weight of IT, media, knowledge and infrastructure related services (utilities: electricity, gas, water, telecommunication, public transport), which have often been controlled by oligopolistic companies or regional monopolies.

Japanese corporations to maintain the traditional corporate governance system with its inherent commitment to regular workforce as a central stakeholder. Declaring the current level of labour cost unsustainable and its fundamental reduction inevitable for corporate survival affects not only the employment system. It neglects also the interest of a central stakeholder and through that a core element of the Japanese corporate governance system.

Asked in an interview about the continuous downwards correction of business results at Fujitsu since his appointment to CEO, Naoyuki Akigusa answered:

It does not go well, because the employees do not work properly. Every year they make business plans and promise to realise them. But, they do not deliver, which is causing the trouble. If they do not achieve the targets, the heads of business units should be replaced. That's what result based management is about... [The CEO] is responsible to the shareholders for managing the funds they have invested. There is no responsibility to the employees. Managing is about ordering employees to do [what has to be done]. (*Shūkan Tōyō Keizai*, 13 October 2001, 94)

Given the deep belief in allegedly Japanese virtues of diligence and consensus, this statement raised shock waves. It stood also in sharp contrast to the common position expressed symbolically by the then Toyota CEO Hiroshi Okuda in his criticism of Moody's explanation of its downgrading of Toyota's capital market rating in 1998: Moody's doubted Toyota's ability to regain and maintain sufficient profitability if the company remained committed to the traditional principle of lifetime employment. Okuda pointed to the difference in social context and corporate governance system between the US and Japan and claimed that Japanese top management has the duty to protect their employees and to find other (sustainable and socially acceptable) ways than simply reducing employment and cutting labour cost (Okuda 1999). The same scepticism towards the implementation of shareholder-centred governance and management was taken by the then CEO of Canon, Fujio Mitarai, and the then CEO of Fuji Xerox, Yōtarō Kobayashi, both top managers at globally leading manufacturing corporations like Okuda (Mitarai 2002; Kobayashi Y. 2002). In contrast, top managers of Japanese corporations that have their core business in non-bank-financing and asset trading like Yoshihiko Miyauchi (then CEO of Orix Co. Ltd.) and Uichirō Niwa (the then CEO of Itochū Co. Ltd.) expressed the opposite opinion regarding a reduction of labour cost and workforce as essential for their business model, necessary in times of crises and chronic underperformance and legitimate to ensure corporate survival (Miyauchi 1999; Niwa 1999).

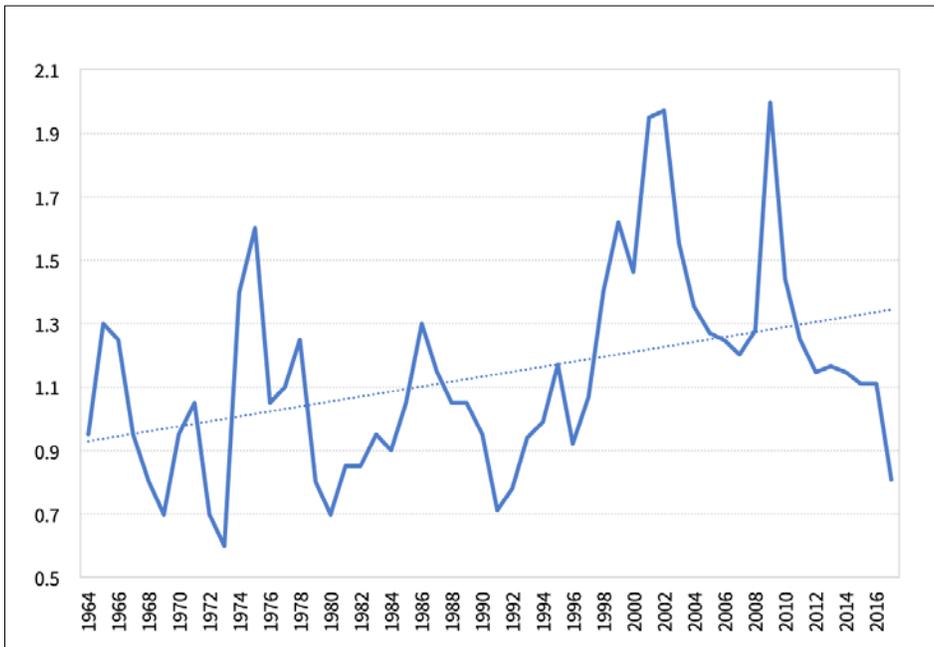
Exploring possibilities for a new combination of shareholders and employees' interest, Inagami distinguished between three types of corporate

governance: (a) the classical model aimed at maximising shareholder value with a short-term and exclusively economic (i.e. financial) orientation and exit (to external markets) as the main form of interest expression; (b) the sophisticated shareholder value model, also aimed at shareholder value maximisation but with a long-term and socio-economic orientation and voice (in internal decision making) as the main form of interest expression; and (c) the pluralistic model, aimed at increasing corporate value with a long-term and societal orientation and voice as main form of interest expression (Inagami, Mori 2004, 4-5). He identified a global trend towards model (b) in the late '90s and early 2000s, combined with shareholder activism and socially responsible investment. Against the backdrop of a shift to post-industrial economies, ageing societies and value diversity, he saw this inclination as a structural response to corporate fraud, excessive executive payment and the risen importance of institutional investors, who are managing huge pension funds. In Japan, Inagami observed a growing advocacy of a type of corporate governance, that is based on the sophisticated shareholder-value model. But shareholder activism and socially responsible investment remained weak in Japan, because the discussion about corporate governance has been dominated by top managers of large corporations, not by shareholders. Drawing on the results of his own questionnaire survey among stock market listed corporations, Inagami concluded, that the majority of corporate top managers in Japan favoured model (b) or (c) and aimed at combining long-term employment with performance-based payment, which - together with employee stock ownership schemes - allows to balance the interests of shareholders and employees (Inagami, Mori 2004, 26-8). Mori addressed the structural shortcomings in the current corporate governance system of stock market listed corporations, namely, the double function of managerial execution and shareholder representation and the related over-concentration of power in the hands of top managers (executive directors). Supervisory boards or audit committees, which are supposed to control, depend on the very top managers who are supposed to be controlled. Mori argued that employees should nominate the members of an internal entity, which observes and supports the supervisory board by providing the information necessary for independent control. In Mori's view, employees are the most committed stakeholders and have access to most of those critical information that are filtered out in vertical reporting lines and managerial hierarchies (Inagami, Mori 2004, 270-3). But can such high expectations towards balancing shareholder and employee interest actually stand up to reality?

The Japanese management system has consisted of an employment portfolio similar to modern industrial employment and management systems in the US and Europe, composed of a core workforce or regular employees and a peripheral workforce, or non-regular employees. The first was sup-

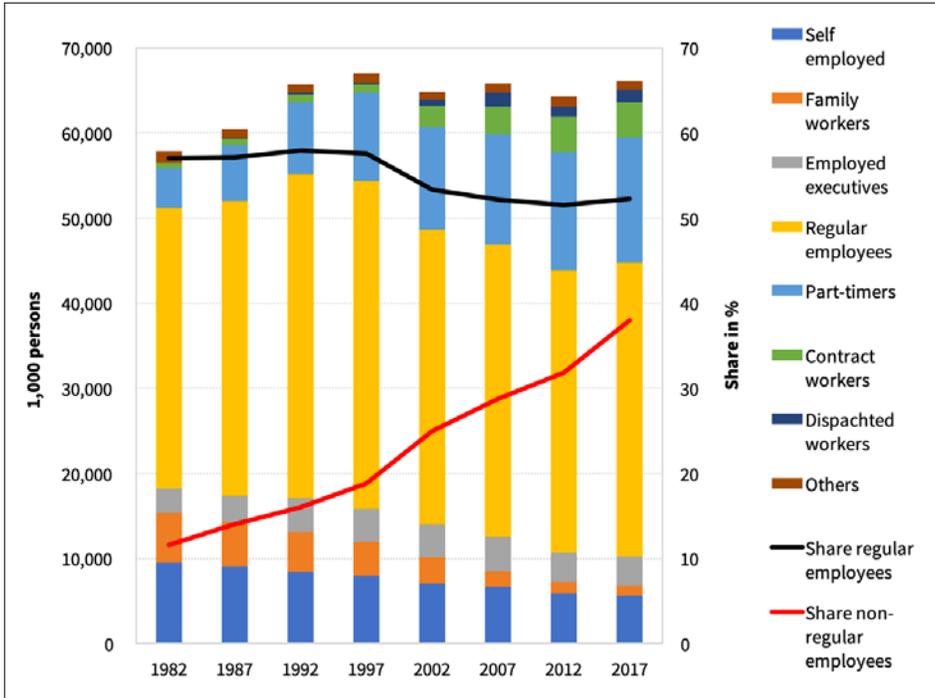
posed to be a central stakeholder, while the latter was utilised as capacity buffer, being paid lower wages and exempted from fringe benefits, bonuses, promotion and regular raise. As Nitta has pointed out, Japanese corporations tended to restrict regular employment, suppress the increase of fixed labour cost and cope with growing demand by expanding the peripheral workforce already during the cyclical recoveries of the '30s, '50s and '70s after long periods of recession (Nitta, Hisamoto 2008, 48-52, 58). Therefore, similar responses by Japanese corporations from the '90s onwards are no sufficient evidence for a fundamental departure from former practice. But the extent to which Japanese corporations have lowered labour cost after 2000 (chart 2.4) by reducing their core workforce and enlarging peripheral workforce has exceeded the previous trend by far: 32% of all working persons and 40% of all employed persons are more or less excluded from long-term job security, comprehensive fringe benefits, access to internal career building and regularly rises in working income (charts 1.23, 2.7, 2.8).

Chart 2.7 Dismissal rate at Japanese corporations (dismissals/permanent workforce × 100, in %, CY)



Source: Author, based on MHLW 2018c

Chart 2.8 Employment by status in Japan (FY)



Source: Author, based on MIC 2018c

But the labour cost of regular employees, too, have become subject to change, shifting from the promotion of long-term capability building through permanent assessment and incentives hierarchies to actual short-term performance: regular wage increases were reduced, eliminated or replaced by short-term variables and bandwidths; capability-based wage ranks were substituted by role-based ranks. These changes have led to a faster widening of wage gaps among regular employees. Statistical analysis by Yokoyama et al. (2016) shows that in the '90s all layers of (low, middle and high) wage workers had enjoyed wage increases, whereas in the 2000s middle-wage workers experienced bigger cuts than workers on the high and low wage levels. Umezaki explains this as an indication of the systematic slimming of middle layers, a general cutting of labour cost and a prioritization of a few supposedly high performers. All other employees were not treated as specific human capital, worthy of long-term investment anymore. However, the growing focus on short-term financial results and the simultaneously introduced performance-based wage system have been falling short of competency, building opportunities for almost all employee

groups and time resources needed for defining and assessing work tasks in the operational management (Umezaki 2017, 86-8). Attempts to implement new wage schemes have not been widely accepted in the operating field – due to mistrust with regard to performance assessment as well as their impact on motivation, collaboration and competence building in Japanese corporations. The new schemes often failed because they appeared more as a hidden form of labour cost reduction rather than incentives for new behaviour.<sup>14</sup> Occurring in US corporations already in the '80s, these trends have been interpreted as signs of a low-road strategy, aimed at short-term maximisation of profits and shareholder returns by minimising total cost through low payment for labour and outside contractors. Interestingly, many practices (such as long-term employment, multi-functional working teams, job rotation and quality circles) had been proposed as central features of 'high performance work organisations' in the US in the late '90s for absorbing negative effects on retention, loyalty, commitment and skill development and for increasing productivity through enhancing horizontal communication, collaboration and mutual gain sharing under the conditions of a market-driven employment system.<sup>15</sup>

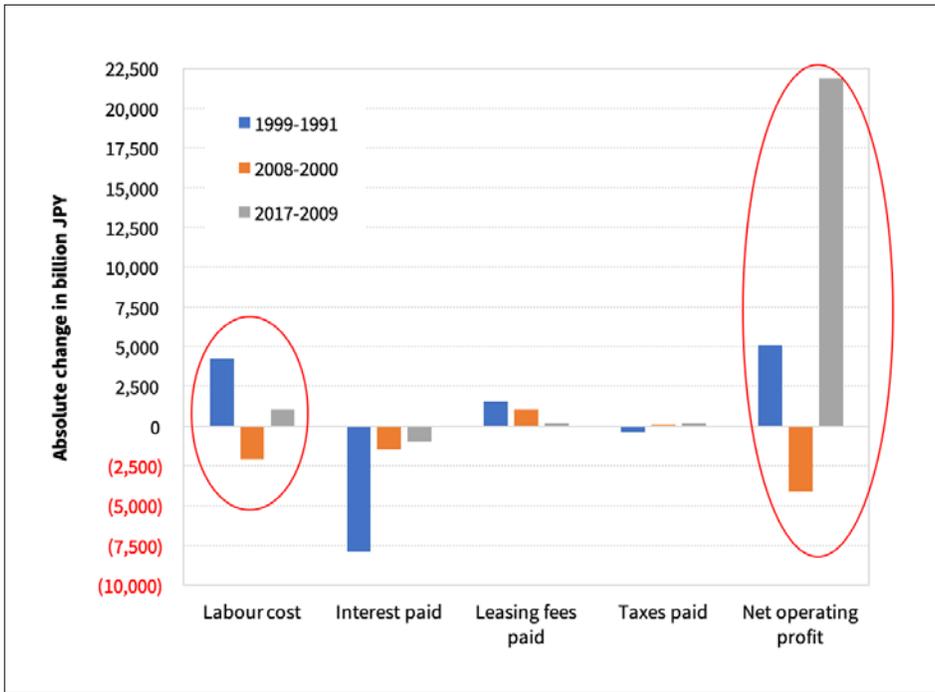
In the 2000s, Japanese corporations reversed the previous trend of increasing the ratios of labour cost/sales and labour cost/added value (charts 2.4, 2.5). But was this only another modification of the Japanese management system under changed external conditions? Or did the core of the traditional Japanese management system render the preference for a balance between different stakeholder interests insubstantial? All measures for labour cost reduction have been justified as an inevitable response towards crisis, a necessary adoption to a changed environment. Are they still compatible with the principles of a 'Human Centric Corporation', a characterisation once proposed by Itami ([1987] 2002) to explain the rise of the J-Firm in the '80s? Do they not induce the abolition of the Japanese corporate governance with its commitment to long-term corporate growth and investment, internalisation of central resources and gain (loss) sharing among the main stakeholders? Finding an answer to these questions requires to examine how Japanese corporations have actually acted after the recovery of their profitability in the 2000s. Chapter 1 of this book demonstrated that macro-economic productivity has been increasing, while labour cost and employment income have been falling (chart 1.22b).

At the micro-economic level, the added value/sales ratio has been detached from the labour cost/added value (labour) ratio and the labour cost/sales ratio,

<sup>14</sup> Nitta, Hisamoto 2008, 102-6; Jōe 2004; Takahashi, Nobuō 2004; Kusuda 2002; Kumazawa 1997; Imano 1998; Kuroda, Yamamoto 2006; Miyajima et al. 2011, 215-43; Satō 2012; Ogura 2013, 145-225; Umezaki 2017, 85-99.

<sup>15</sup> Levine 1995, 115-21; Cappelli et al. 1997, 15-88, 173-207; Cappelli 1999, 17-157; Osterman 1999, 20-70; Kochan 2015, 69-73.

Chart 2.9 Change of added value components at Japanese corporations of all industries with capital more than 1 billion JPY (in billion JPY, FY)

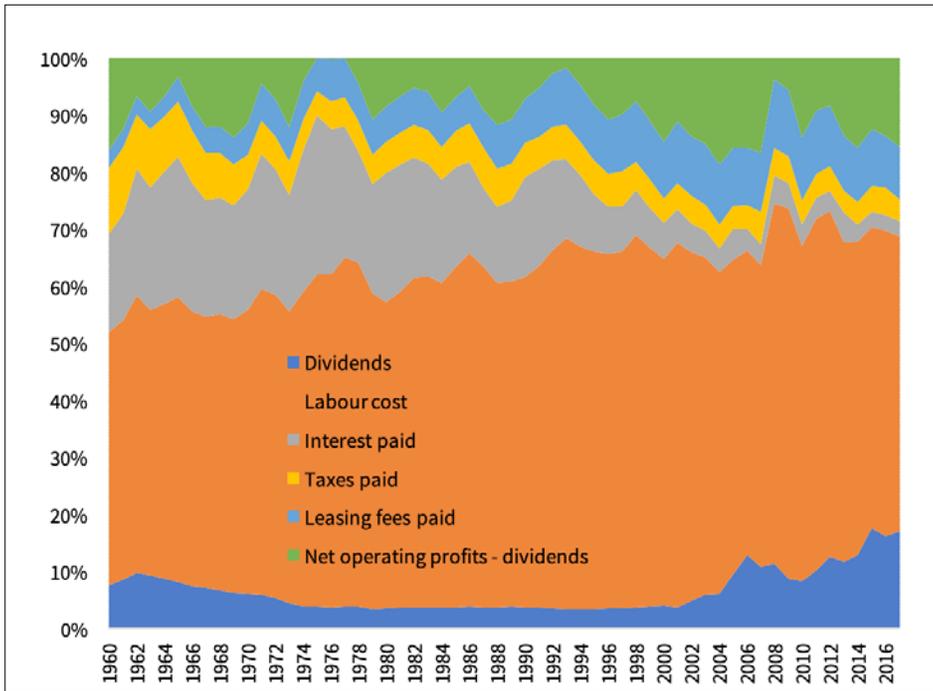


Source: Author, based on MOF 2018b

and while the first has seen both a relative and an absolute rise, labour cost has fallen relative to sales and added value. This is to say, employees and their working conditions have been sacrificed for improving corporate productivity and profitability (charts 2.4, 2.5, 2.6). The total change of added value can be decomposed into the changes of labour cost, interest paid, leasing fees paid, taxes paid and net operating profits. Doing this for Japan’s large corporations in the periods of 1990-1998, 1999-2007 and 2008-2016 shows that the increase of corporate profits was achieved mainly at the expense of labour cost in the second period. It also indicates that net operating profits have still grown considerably faster than labour cost during 2008-2017, resulting in a further reduced share of labour cost among added value (chart 2.9).

Japan’s large corporations have maintained a high level of retaining profits, while clearly preferring shareholders over all other stakeholders. This becomes obvious, if the added value of large corporations is broken down into all stakeholder income components, that is, labour cost for employees and executives, dividends for shareholders, interest paid to banks, taxes

Chart 2.10a Breakdown of added value by stakeholders at Japanese corporations of all industries with capital of more than 1 billion JPY (FY)

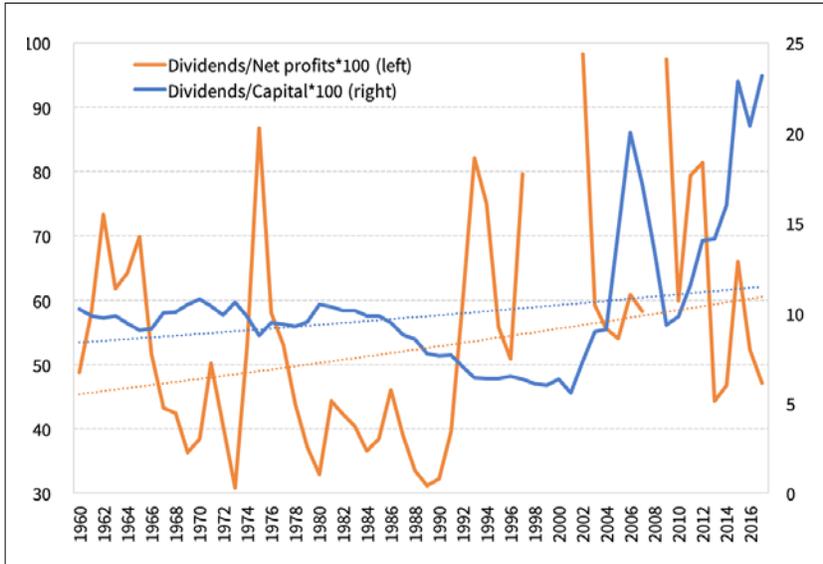


Source: Author, based on MOF 2018b

paid to the central government and local communities, leasing fees paid to real estate providers and net operating profits minus dividends as approximation for retained profits at the corporations for the long-term period 1960-2016. The trend towards corporate saving indicates an unwillingness or inability to invest into future-orientated business models, technologies and supply capacities. The trend towards increasing shareholder pay-out has to be seen as evidence for the shift from a balanced stakeholder system towards a shareholder-centred one (charts 2.10a-b).

Nonetheless, top managers of stock market listed corporations have been protecting their own power base through keeping the total pay-out ratio of dividends and share buy-backs stable at an average of 40% of net profits, and they have been maintaining managerial discretion over an expanding capital base instead of paying out net profits primarily to shareholders as dividends and share buy-backs as US corporations did at a continuously high level of 80% of net profits (charts 2.11a-b).

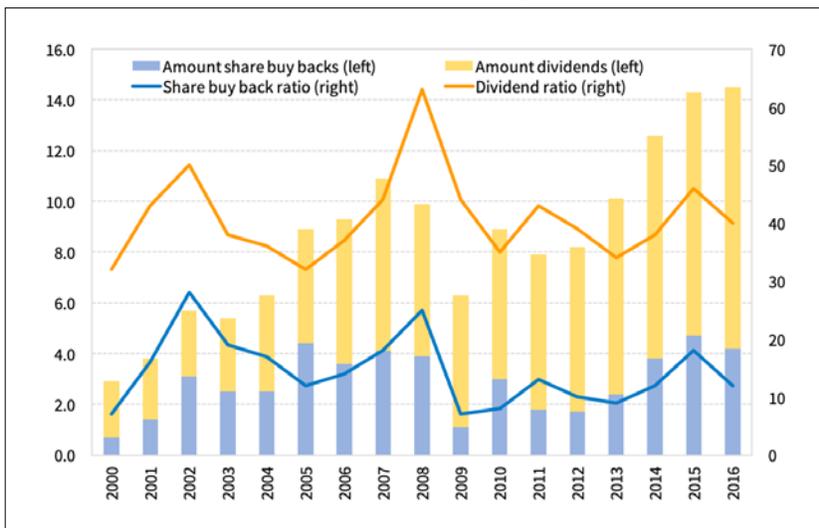
Chart 2.10b Dividend pay-out ratio (dividends/net profits) and dividend rate (dividends/capital) at large corporation in Japan with capital of 1 billion JPY and more (both in %, FY)



Note: The dividend pay-out ratio for 1998-2001 was excluded as it exceeded 100%.

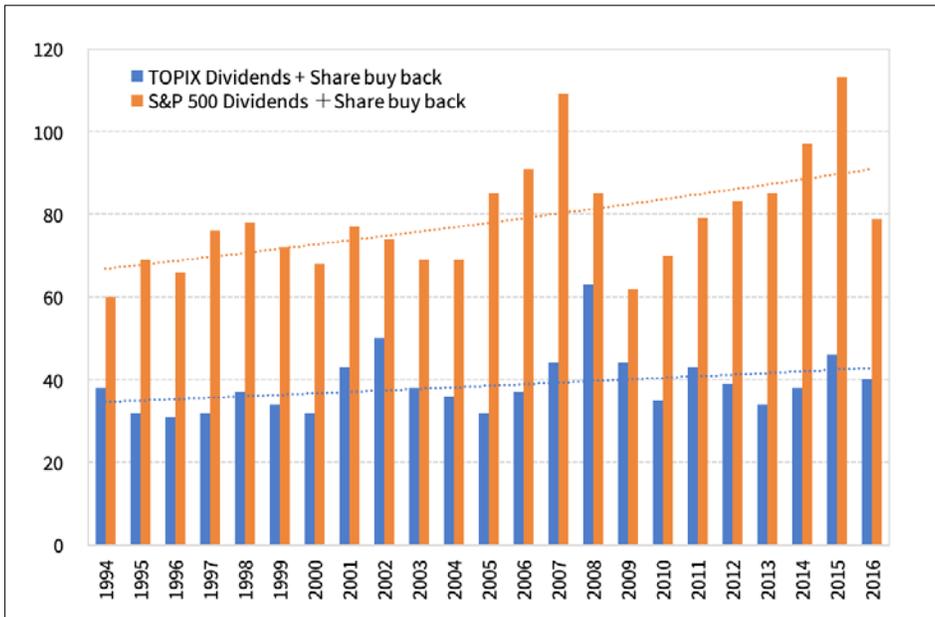
Source: Author, based on MOF 2018b

Chart 2.11a Amounts of dividends and share buy-backs by listed corporations (TOPIX) in trillion JPY and ratios as % of net profits (FY)



Source: Author, based on LIAJ 2014, 23; 2017, 29; 2018, 33

Chart 2.11b Dividends and share buy backs as % of net profits at TOPIX (Japan) and S&P 500 (US) composite corporations



Source: Author, based on Sugishita (2015, 7) for 1994-2002; LIAJ (2014, 23; 2017, 29; 2018, 33) for 2003-2016

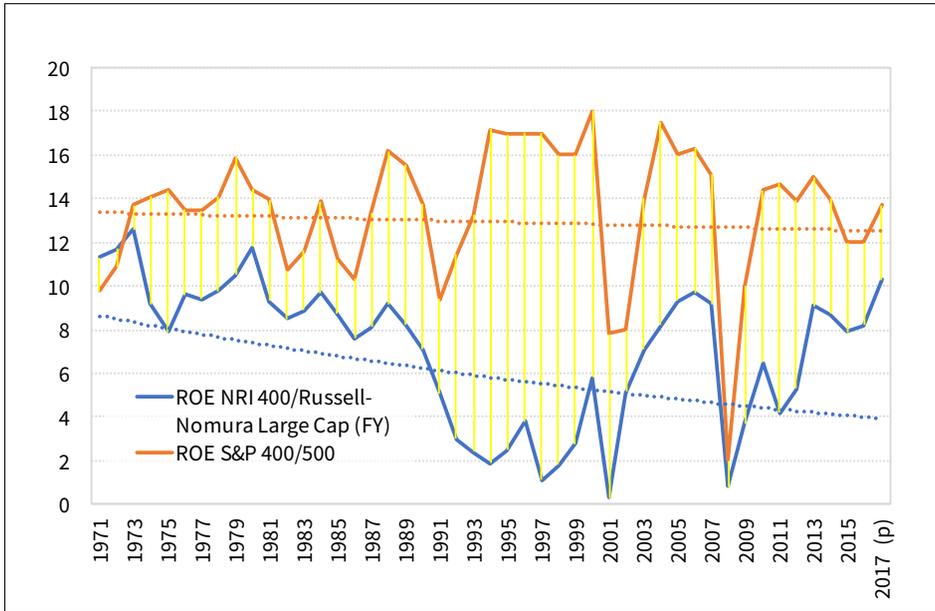
Thus, the majority of Japan’s large corporations have abandoned their traditional commitment to employees in favour of shareholders or equity capital providers – ignoring that employees are those whose living conditions are most exposed to their corporation, who take the highest risk as stakeholders as they lack switching opportunities on the labour market, but who know the business reality in the operating field best through their close relation to clients.

### 2.3.4 Adaptability and Conformity as Self-Protection

Since the 2000s, but especially since the financial crisis of 2008, top managers at Japan’s large corporations have been defending their own power positions in the name of corporate survival by boosting capital efficiency mainly through cost cutting at the expense of employees and suppliers. The accumulated macro-economic outcome has been the main cause for the deflationary stagnation of Japan’s economy since the burst of the asset

bubble. This has also been justified as inevitable compliance to globalisation and the need to better serve shareholder interest: foreign investors have become the biggest shareholders in Japan’s listed corporations and therefore more influential as ever before (chart 1.20b). They are less silent shareholders and evaluate corporate managerial performance against global benchmarks for return on investment alternatives.

Chart 2.12 ROE of Nomura Research Institute (NRI) 400 and Standard & Poors (S&P) 400/500 composite companies (in %)



Source: Author, based on Reily (1997, 5-6) for S&P 1971-1995; IDCf (2017) for S&P 500 1996-2017; Nomura Holdings (2018) for NRI 400

The gap in the level of ROE between US and Japanese listed corporations is often presented as a reason for further efforts towards increasing corporate profitability by Japanese corporations (chart 2.12). The level of expected ROE or cost of equity capital (COE) is seen as a yardstick for assessing, whether an achieved ROE sufficiently exceeds its cost and generates added value for investors. However, the actual level depends on the context, that is, differently structured economies and industries.

Frequently referred to by both proponents and critics of a stronger shareholder orientation in Japan<sup>16</sup> is the so-called Itō Report (METI 2014b). It was released by the Ministry of Economy, Trade and Industry (METI) as the outcome of a project meeting series with corporate executives, investment bankers, institutional investors and academics, and it paved the way for the Corporate Governance Code, which has been applied as guiding principle by Japan's financial and stock markets since June 2015.<sup>17</sup> The Itō Report points to the importance of achieving a level of ROE that exceeds COE or return expected by equity capital investors: due to the lack of commitment to sufficient capital efficiency and increased corporate value, corporate management in Japan has ended up in chronically low profitability without long-term strategic consistency. But the latter is needed to attract long-term committed capital investment from outside. Failing to meet equity capital investors' requirements would mean to lose out on competitiveness and innovation. It appears somewhat paradoxical that Japan's corporate profitability has remained at a low level for the last twenty years, while Japan achieved highest ranks in the category 'capacity for innovation' of the WEF Global Competitive Report (WEF 2017; METI 2014b, 10-11). The recent decline in this category is traced back by the authors of the Itō Report not to the ongoing shift from stakeholder to shareholder-orientated corporate governance and management. To the contrary, the lower reputation of Japan's innovation capacity is taken as evidence for a lack of commitment to sufficient capital efficiency and increased corporate value. But according to the Japanese National Innovation Survey 2012, issued after the turn towards a stronger shareholder orientation had been declared, the

ratios of firms that realised product, process, organisational and marketing innovations were 15.8%, 15.6%, 28.3% and 22.5% respectively and almost all of these ratios were lower than those of the US, Canada, UK, France, Germany, Italy, China and South Korea. The ratio of activities for product or process innovation in Japan was also lower than that of most foreign countries. Many Japanese firms have experienced a lack of qualified personnel and information on technology related to their product or process innovation. (NISTP 2014, 3)

The Japanese National Innovation Survey 2015, published after the turn towards a stronger shareholder orientation had been accepted by a significant number of executives at large corporations, stated that "financial factors, including lack of internal finance and difficulties in obtaining ex-

16 Takahashi 2015, 154; Yanagi 2015; Mizuno 2016, 17-20.

17 Yufu 2015; Oguchi 2015; Nishiyama 2016a, 2016b, 2017.

ternal finance, were experienced by less enterprises than other hampering factors and reasons" (NISTP 2016, 16).

Thus, the crucial question is whether capital actually represents the most critical resource for innovation. Takuma Takahashi, Iwai and Hirota (2012) are pointing out that, historically seen, the shareholder capital-based corporation was the adequate form of capital for the age of industrialisation with huge production plants as the technological base for mass production and mass consumption of physical goods and an economy of scale (decreasing unit cost by increasing total output volume). But in the current post-industrial phase with its growing uncertainty and complexity, the source for profits has shifted from quantitative expansion to differentiation, from access to huge capital funds for refinancing production capacity to human creativity, from material quantities and measurable results to immaterial qualities of behaviour, relationship and affection (Hirota 2012, 15-21). According to Takuma Takahashi, a new age of information and knowledge origination has evolved since the mid-'80s, with foregrounding human and organizational resources as collective creators and intellectual property rights to secure returns on the invested capital. Consequently, the weight of intangible assets in corporate accounting and corporate valuation through capital markets has increased.<sup>18</sup> Marx has envisaged this 160 years ago as a consequence of competitively driven progression to science-based automation, undermining the basis of industrial capitalism, where machinery dominates human labour and productivity gains are used only to gain more profit by reducing the time and cost, which is necessary to reproduce the value of the resource input (Marx [1857-1858] 2018, 574, 577, 581-2). In an international survey, based on interviews with top managers at 230 Japanese, 229 US and 112 German stock market listed corporations in 2005, 91.7% of the Japanese, 83.4% of the US and 93.7% of the German executives answered that the most important sources of their own competitiveness are the motivation, capability and competence of their employees and not tangible assets like capital investments (e.g. plants, machinery) (Hirota 2012, 81-2). Even if a bias towards political correctness, social harmony and acceptance in the answers is to be considered, this majority among corporate executives in all three countries is a striking evidence for the importance of human creativity in business. Correspondingly, the Japanese National Innovation Survey 2015 has shown that "lack of competent employees was the most prevalent hampering factor and increasingly indicated reason for the absence of innovation in comparison with that in the last round of the survey (the reference period: FY2009-FY2011)" (NISTP 2016, 16). Blair and Kochan (2000, 1-2) calcu-

18 Takahashi T. 2004, 2-19; Iwai et al. 2005, 16-36; Hirota 2012, 1-8, 81-2; Takahashi T. 2015, 180-6.

lated the weight of tangible assets in US stock market listed non-financial corporations at 31% of the corporate value<sup>19</sup> in 1998, which compares to 83% in 1978. By the end of FY 2016, the book value of tangibles assets in the corporations, which were listed in the first division of the Tōkyō Stock Exchange (TSE), represented 35.2% (2001: 39%) of the corporate value.<sup>20</sup> Against the backdrop of a declining importance of physical assets, Blair and Kochan emphasise that human and organizational capital, although still ignored by the traditional (mainstream) theory of accounting, are actually to be recognised as an increasingly important source of corporate value (Blair, Kochan 2000, 1-3, 334-82).

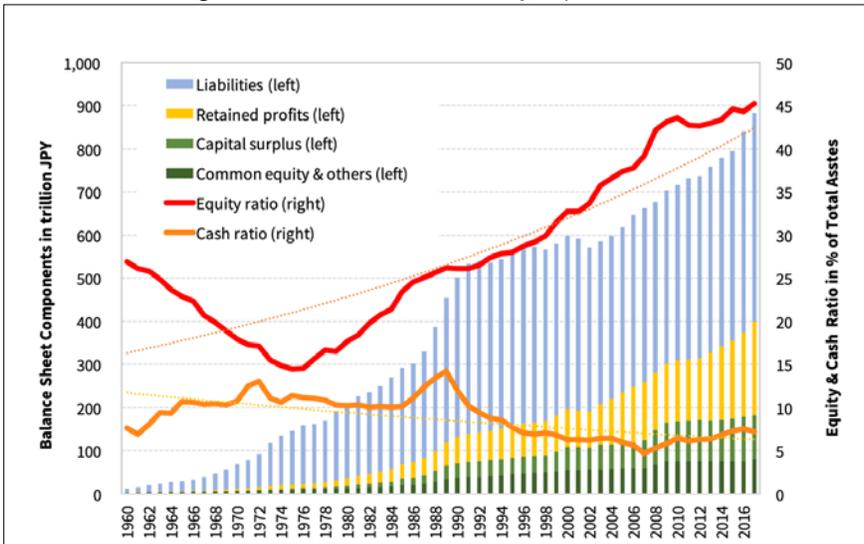
Another central argument of the Itō Report of 2014 is that Japan's large corporations will be in danger of losing sufficient access to capital funds, if they continue to neglect shareholder value. This is questionable. Japan's large corporations are currently holding cash positions, which fall only a little below the relatively high historical average of 8.9% of total assets (2017: 7.25%). They have deleveraged their balance sheets by reducing liabilities and increasing the weight of equity capital to a historical peak of 45.2% of total assets (2017). But they have been criticised for neither investing into more profitable business nor paying out abundant capital funds consequently to their shareholders (chart 2.13a). Further, the total amount of capital flowing back to shareholders as dividends and share buy-backs has exceeded the volume of equity capital raised through shareholder and public offerings, private placements, exercising of options and warrants and issuing of preferred and tracking stocks since 2000, except 2009 (chart 2.13b). This means that equity capital investors have been draining more capital from corporations than they have been providing to them.

Porter et al. (2000) once criticised Japanese corporations for depending too much on operational effectiveness and fuelling huge capital investment into scale effects, which results in even more competitive convergence towards lowering price and cost and a deteriorating profitability. In other words, not the loss of sufficient access to capital to finance supposedly innovative activities, but the lack of strategic differentiation and innovation was identified as the fundamental problem of Japanese corporations. Porter et al. saw insufficient pressure from shareholders towards higher capital effectiveness as the main factor that led to this convergence (2000, 76-91). Later Porter and Kramer (2006, 2011) recognised that prioritizing shareholders' demands at the expense of all other stakeholders is not a sustainable response to competitive challenge. To escape from the downward spiral of competitive congruence, corporations were advised to build

19 Corporate value is calculated as the sum of market capitalisation or market value of equity plus long-term debt.

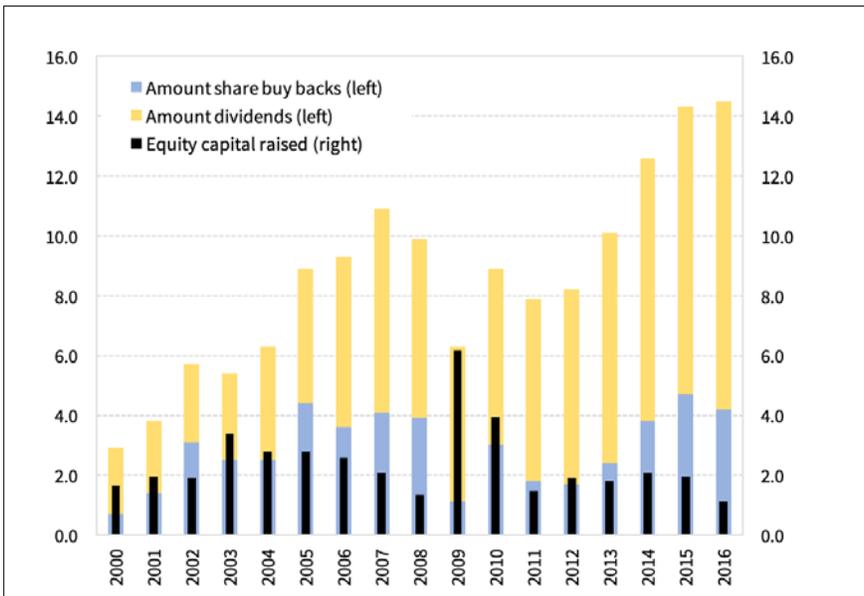
20 Author's own calculation.

Chart 2.13a Balance sheet composition of Japanese corporations (excluding financial and insurance industry, capital of 1 billion JPY and more, FY)



Source: Author, based on MOF 2018b

Chart 2.13b Amounts of dividends and share buy backs vs. equity capital raised by listed corporations (TOPIX) in trillion JPY (FY)



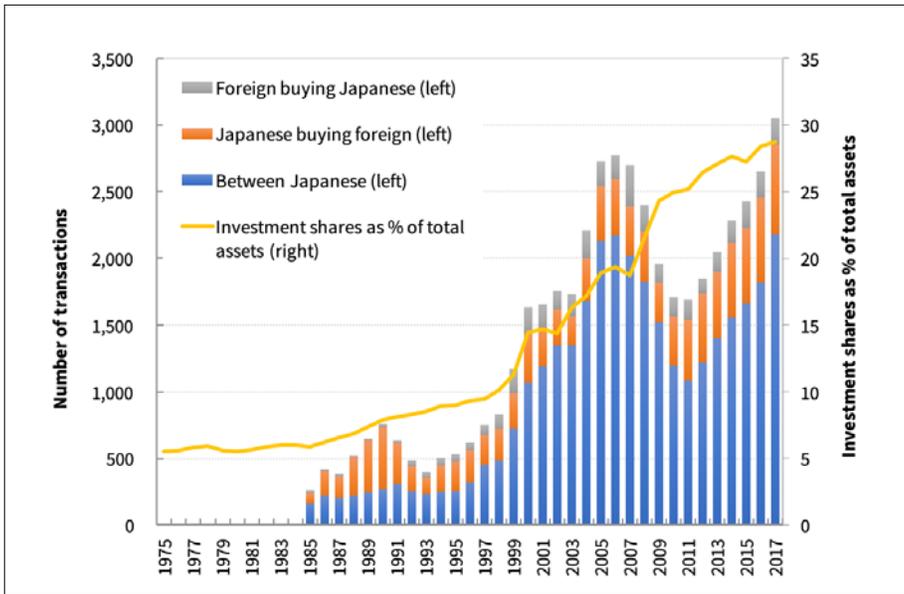
Source: Author, based on LIAJ 2014, 23; 2017, 29; 2018, 33; JPX 2018

distinctive long-term strategies, to choose either different activities or perform activities differently (Porter et al. 2000, 162-74). Mergers & Acquisition (M&A) is supposed to be one solution. Proponents of an external control of corporate management regard capital markets, including M&A, or corporate takeovers as a market for corporate control and an important mechanism for implementing discipline and commitment to the creation of shareholder value: corporate management that allows the share price to drop to a level enabling others to take over will lose the right to manage corporate resources (Jensen, Ruback 1983; Miyajima et al. 2011, 151-77). In general, M&A is a time-saving, but often expensive shortcut for expansion: one acquires assets for quick expansion of existing business (horizontally) or enlargement of business along the existing value chain (vertically). In most cases, M&A is about keeping an established business model expanding in saturated markets rather than furthering fundamental transformation or innovation.

Since the late '90s, Japan's large corporations have been investing increasingly into M&A of other corporations in order to expand domestically and abroad; they paid huge premiums but hardly achieved their initial targets, particularly abroad (Takahashi T. 2012, 291-305; Matsumoto 2015, iii-iv). The biggest capital funds were spent on cross-border M&A by large corporations that are positioned in oligopolistic industries and protected from foreign competition, such as telecommunications, pharmaceuticals, tobacco and beverages. These corporations used their price setting power and extra profits extracted from a saturated domestic market in order to invest into regions, markets and corporate assets with supposed growth potential. Actually, they have invested into prolonging the life expectancy of existing (often socially problematic) business models (Matsumoto 2015, 4-10) (charts 2.14a-b).

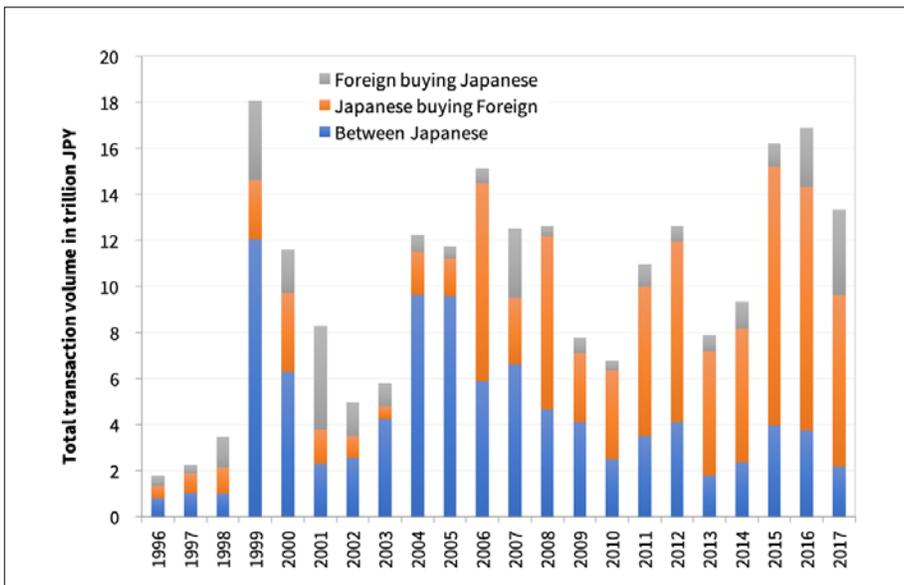
With respect to the increased weight of financial investment into shares among the total assets (chart 2.14a) or the flow of capital funds, Japan's large corporations tend to focus on M&A, while boosting ROE by buying back own shares instead of raising fresh equity capital and investing actively into their own business model or its transformation (Matsumura 2016, 2-12-3) (tab. 2.5).

Chart 2.14a M&A transactions with Japanese companies involved and investment shares as % of total assets of large corporations



Source: Author, based on RECOF Corporation 2018

Chart 2.14b Total M&A transaction volume with Japanese companies involved (in trillion JPY)



Source: Author, based on RECOF Corporation 2018

Table 2.5 Raise and investment of capital by Japanese corporations FY2006-2016 (in trillion JPY)

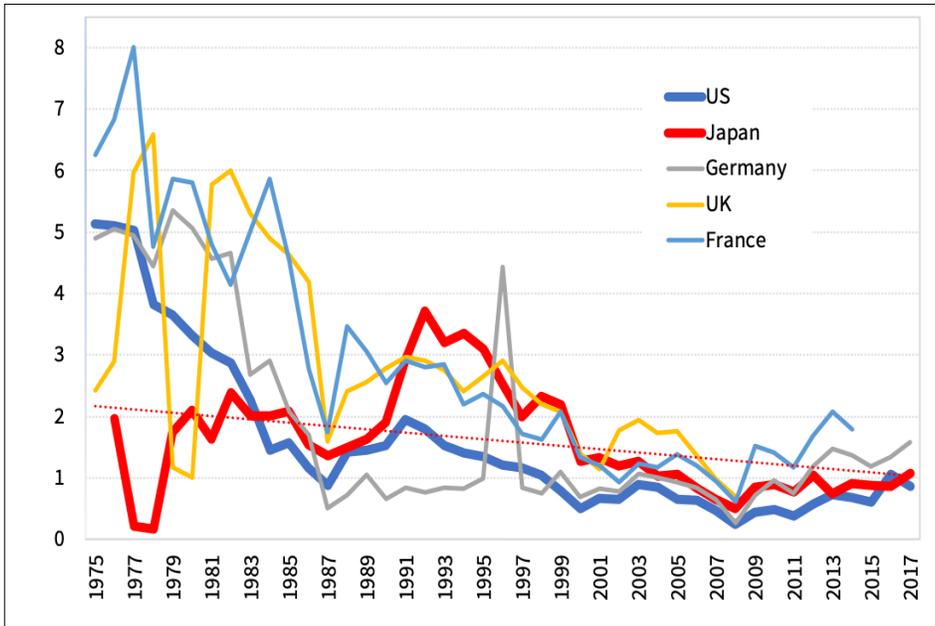
Large Companies				All Companies			
Raise		Investment		Raise		Investment	
Equity	12.5	Plant & equipment	214.8	Bonds	8.4	Plant & equipment	411.3
Bonds	11.9	Land	10.9	Long borrowing	35.8	Land	20.6
Long-borrowing	38.7	Shares & bonds	67.7	Retained profits	275.5	Shares & bonds	21.2
Short-borrowing	16.0	Long-lending	30.9	Depreciation	435.6	Long-term lending	49.0
Retained profits	100.3	Intangibles	2.6			Intangibles	3.3
Depreciation	222.1	Intra-credits	7.8			Intra-credits	12.3
		Other assets	37.9			Other assets	45.9
		Cash & savings	21.8			Cash & savings	52.7
		Inventory	4.3			Inventory	11.0
		Temp. securities	2.8			Equity redemption	122.6
						Temp. securities	1.8
						Repay short-debt	3.6
	401.5		401.5		755.3		755.3

Source: Author, based on MOF 2018b

Likewise questionable is the argument that serving shareholders’s interest is essential for a long-term orientation in corporate management and inevitable for securing long-term capital funds that are to be invested into innovation: the majority of shares of stock market listed corporations are held by institutional investors and managed by professionals, whose performance is generally measured quarterly and rewarded according to financial returns on the total investment under their management. Globally, this results in a higher turnover in shares and a continuously shorter holding period of less than one year on average (Bower, Paine 2017, 53-4) (chart 2.15).

It can be concluded that privileging shareholders and serving their interest above all others will not be effective in coping with the fundamental challenges for Japanese corporations, namely, strategic differentiation, innovation and new business models; not to mention socio-economic consequences like rising inequality, declining solidarity, growing short-termism and mistrust. Nevertheless, Japan’s corporate management has pledged its support to transforming corporate governance from traditional stakeholder balance and long-term expansion towards shareholder value orientation. Rather than reluctantly responding to pressure from foreign

Chart 2.15 Average holding period of domestically listed shares (years)



Source: Author, based on World Bank 2018

institutional shareholders, based on their increased shareholdings and voting power, corporate management has changed its orientation willingly, but with an unchanged attitude: protecting themselves by following the mainstream, that is the government as well as the domestic and foreign financial industry and their lobbyists in politics, mass media and academia. This does not mean that Japan’s top management subscribes unconditionally to a system of corporate governance, where shareholders play the unquestioned principal and corporate managers the role of an agent, who serves the interest of its principal. But as long as change is understood as prescribed and externally imposed, rather than self-constructed and open to responsible choice (van de Ven, Poole 1995, 520) passivity prevails. This passivity facilitates a corporate culture that generates more destructive congruence (instead of constructive or creative differentiation) by prioritizing (a) adaption to the external environment as the dominant way of external orientation exerting change and flexibility, and (b) internal integration based on formal-processual consistency or compliance to common standards and rules as the dominant way of maintaining stability and direction (tab. 2.6).

Table 2.6 Traits of corporate culture

<b>External orientation</b>	<i>Adaptability</i>	<i>Mission</i>
<b>Internal integration</b>	<i>Involvement</i>	<i>Consistency</i>
	<b>Change and flexibility</b>	<b>Stability and direction</b>

Source: Author based on Denison, Mishra 1995, 216

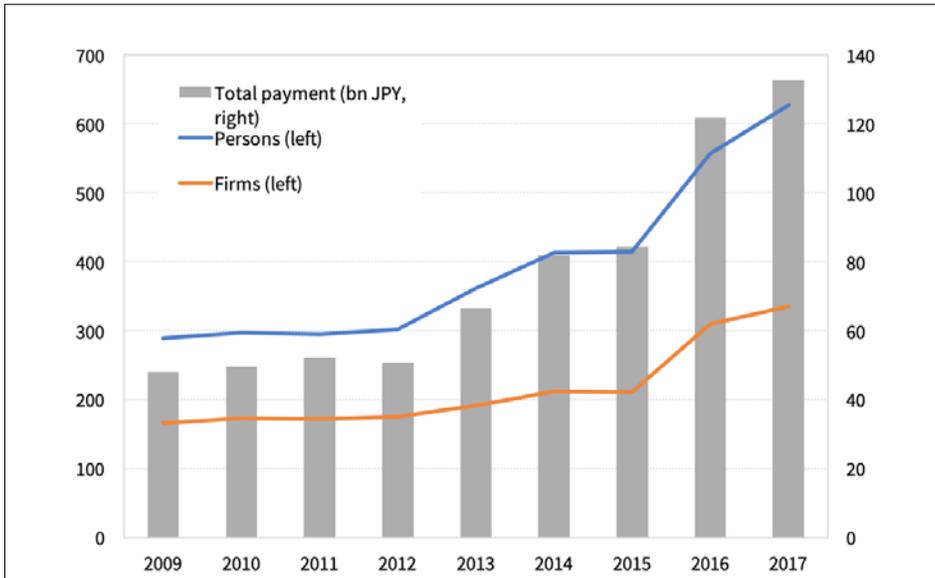
Setting the vectors of organizational culture alongside flexible adaption towards external change and internal integration through processual consistency attaches a great importance to capital markets and share prices, not only as the yardstick for evaluating the quality of corporate managing. Such a corporate culture turns the means into the final end and legitimises managerial decisions against the interest of all other stakeholders (Aoki 2007, 436-7, 440-3).

Finally, it should be noted that corporate executives have increased their own financial benefits. In Japan corporate executive payment, measured as average per person, is still relatively low in comparison to that of US executives. But it is growing faster than that of an average employee. The number of listed corporations in Japan, which pay executives 100 million JPY and more per year, has increased from 166 in 2009 to 335 in 2017. In the same period, the number of highly paid executives has risen from 289 persons to 627 persons, the total amount paid to them from 48 billion JPY to 133 billion JPY. As a result, the simple average amount paid per executive of this category has been raised from 166 million JPY (29 times of the average employee payment at listed corporations) in 2009 to 211 million JPY (35 times of the average employee payment at listed corporations) in 2017 (charts 2.16a-b).

## 2.4 Collateral Damages

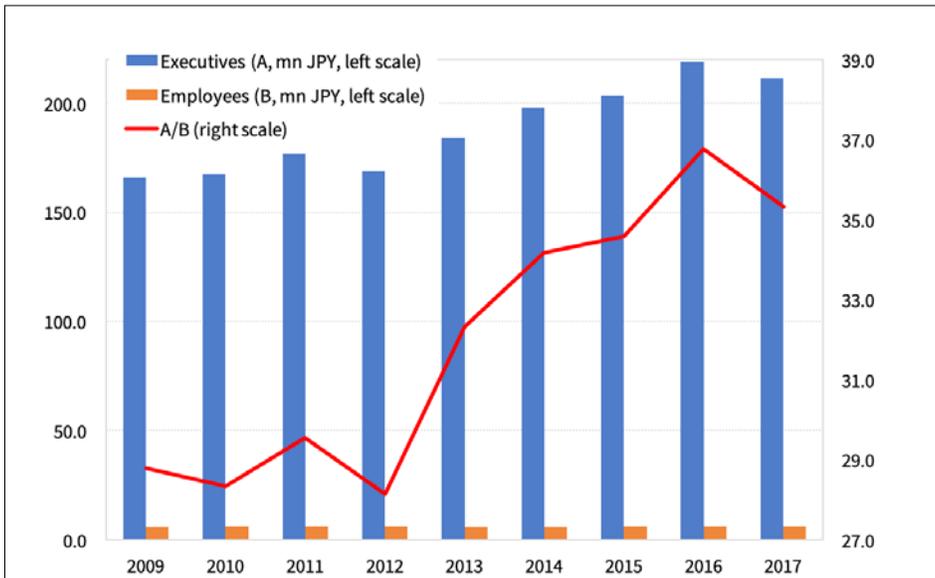
As explained above, Japan’s large corporations have responded primarily by leaving their business model more or less unchanged, while reducing cost and thereby creating the root cause for continuous deflation in Japan’s economy. This was justified as an inevitable effort to ensure survival through compliance to global standards and new requirements for capital efficiency. Academics facilitated the argument leaning on agency theory. This theory claims that a focus on maximising corporate value generates maximum social welfare, because not only shareholder value, but also the value of all other financial claims will increase and with it the economic source for satisfying the interest of other stakeholders. But even such proponents admit that corporate value cannot be maximised, if stakeholder interests are ignored, and that corporate management, committed

Chart 2.16a Number of Japanese listed firms paying single executives more than 100 million JPY, number of those executives and the total amount paid to them



Source: Author, based on TSR 2018

Chart 2.16b Average payment of employees (A) and executives (B) with more than 100 million JPY at Japanese listed firms



Source: Author, based on TSR 2018

to shareholder value, should utilise long-term value maximisation as the criterion for decisions on trade-offs among its stakeholders (Jensen 2001, 299). Below, I shall discuss how employees' competency and motivation, internal communication and collaboration, cooperation and non-market-based coordination have been affected by the decisions that executives of large corporations made.

#### 2.4.1 Collapse of Trust Among Employees

Trusting each other means to rely on positive reciprocity, e.g. to expect predictable and reliable interaction without coercion. As such, trust is characteristic of organizational cultures that provide members with an integrative frame and a general orientation, while leaving to them whether and how to act. Weick and Sutcliffe (2001) have identified a number of practices at high-reliability organisations (HRO) for coping with uncertainty, volatility and complexity, namely, preoccupation with failure (encouraging communication about errors and failures), reluctance to simplify interpretations (considering complex views and diverse sources), sensitivity to operations (being aware of imperfectness and supporting improvement of operations), commitment to resilience (i.e. a culture of intelligent improvisation based on excess capabilities) and deference to expertise (empowering those with the greatest knowledge and experience).

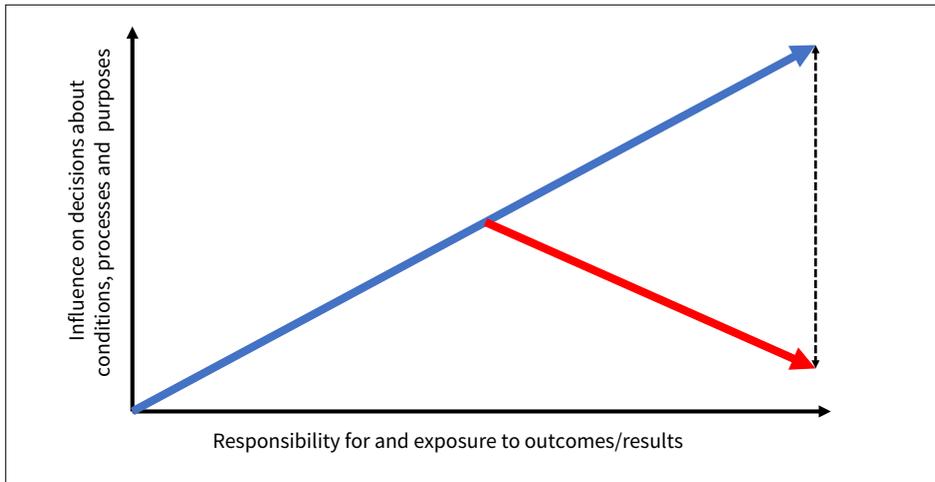
It goes without saying that processual qualities and their subjective perception can be hardly grasped by questionnaire surveys, measured statistically or quantified in time series. Such reservation notwithstanding, several international surveys from recent years indicate a level of employees' trust towards their firms that is surprisingly low in Japan compared to other developed countries. With all due caution these results seem to confirm the cultural damage caused by Japanese corporations and their executives, when unilaterally declaring former conventions obsolete: the Kenexa/IBM Work Trends Survey, which attempts to measure pride, satisfaction, advocacy and commitment and compiles these criteria in an employee engagement index for the period of 2008-2012, ranks Japan worldwide lowest with only 31% and a negative difference of 26% from the global average of 57% (IBM Software 2014, 2-4). In 2016, the IBM Smarter Workforce Institute and Globoforce's WorkHuman Research Institute tried to measure belonging, purpose, achievement, happiness and vigour worldwide and condensed them into the Global Employee Experience Index, where Japan ranked lowest in Asia and second lowest worldwide with a score of 51% and a negative difference of 18% from the global average of 69% (IBM Software, Globoforce 2017, 2, 5). The 2017 Edelman Global Trust Barometer revealed that only 18% of Japanese respondents assessed corporate executive officers (CEO) as extremely or very credible, which

is 17% below global average and worldwide the lowest score (Edelman 2017, 15, 17, 23). Other surveys indicate the same continuously low and under-average level of employee satisfaction, engagement and trust in Japan (Ōta 2017, 60-5).

Almost ninety years ago, Mayo ([1933] 2003) and Roethlisberger (1939) recognised the importance of human relations for blue-collar employee productivity, questioning Taylorism. More than forty years ago, Rohlen (1974) attempted to fill the gap between 'functional (change-orientated)' and 'cultural (tradition-orientated)' explanations for the economic performance of Japan's business organisations in the '60s from a context- and diversity-sensitive perspective informed by cultural anthropology. He had observed how important human relations were for a Japanese bank (as an example of a white-collar organisation) and how central these relations and the sharing of related value were for the livelihood of the employees (2-4). Current studies reconfirm the positive impact of employees' high job satisfaction on Japanese corporations' financial and stock price performance (Yamada et al. 2017). Thus, it does not come as a surprise that the ongoing reduction of labour cost (causing a lack of distributional legitimacy) and the decline of job security since the '90s have led to a low level of trust among Japanese employees. But distributional illegitimacy and lack of perspective are not the only reasons for the loss of trust. Changes in work organisation, which resulted from the new vectors of corporate governance and organizational culture, are also crucial. Prioritizing compliance to formal rules and consistency of procedures in order to warrant internal integration and stability means practically that the operational field has to cope with centralised budgets, reports and controls, which again reduces operational discretion as well as possibilities for improvisation and local initiative. In short, centralisation has become dominant, just when the increased complexity of the external environment calls for decentralisation. Middle management and operational levels, which have been expropriated of opportunities to decide what and how it will be done, are now increasingly charged for the outcomes under the label of performance-based management. Being held responsible for the results on the one hand and losing operational autonomy on the other hand naturally generates dissatisfaction and distrust among employees (fig. 2.1).

Although business model and competitive position are in many cases challenged by foreign competition as well as societal and technological change, culturally, the Japanese management system has fostered a mid- and long-term orientation based on stable employment, strong horizontal linkages created by the rotation of generalists through the whole organisation, shared priorities and a common language among employees and managers (Srivastava, Goldberg 2017), which eases decision-making and promotes proactive employees. Precisely these patterns of collective behaviour have

Figure 2.1 Growing centralisation, performance-based management and gap between increased exposure and reduced influence resulting in chronic distrust



Source: Author

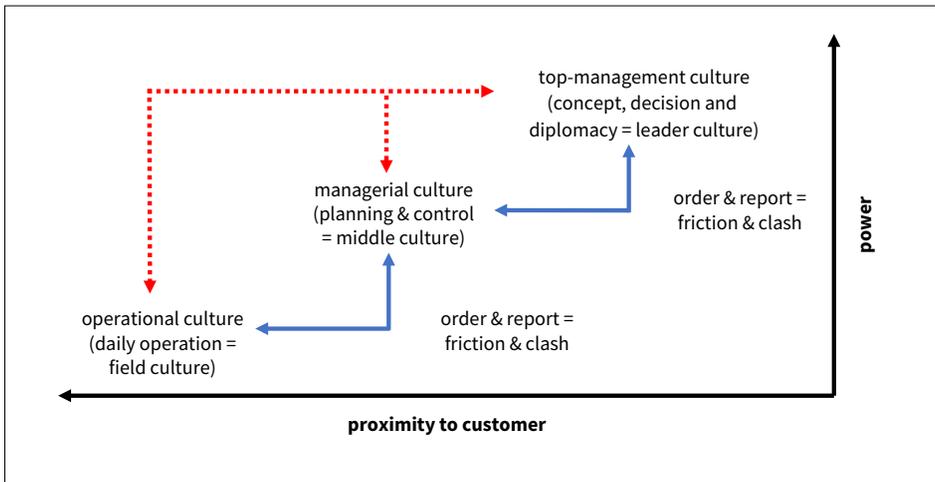
enabled the generation of tacit (i.e. non-formalised, context- or organisation-specific) knowledge as described by Nonaka and Takeuchi (1995).<sup>21</sup>

Although linked to the old business model, which is reaching its limit, a reset of the cultural vectors to external adaptability and internal consistency means to eliminate horizontal communication and informal collaboration. Formalised procedures of centralised decision-making and control come to replace intangibles by tangibles and tacit knowledge by formalised knowledge. This implies the loss of what Schein (1996) once called intra-organizational learning consortia or informal links between top executives, middle managers and the operational field with their respective subcultures. These links complemented the formalised vertical lines of order and report, which all too often cause friction, clashes and opportunistic or selective (dis)information (fig. 2.2).

Ōta (2017) has identified a different reason for the low trust, which is also directly related to work organisation, but seems to contradict one of the reasons given above. An essential part of Japanese human resource management is to not conclude formal employment contracts with regular employees and thereby not to define particular tasks and duties. Regular employees are often, without individual consent, rotated to a different divi-

21 See also Seely-Brown, Duguid 2000, 117-46; Stewart 1997, 71-4.

Figure 2.2 Losing linkages between top, middle management and operational field



Source: Author, based on Schein 1996

sion with different tasks and duties every three years. But in many cases even current tasks and duties are not formally specified. This allows to allocate labour flexibly without legal restrictions or objections by individual employees. Apart from suppressing legally based dissent, such flexibility in utilising the internal workforce pool effectuates high dependence of individual employees on their organisation, because their competencies remain organisation-specific, even if comprehensive. A work organisation that is based on unspecified individual job-design causes dissatisfaction and mistrust, especially among ambitious, talented and high performing employees: it limits (a) their individual discretion and autonomy (their voice option), (b) their ability to accumulate organisation-unspecific capabilities, which are acknowledged in external labour markets (their exit option), and (c) the possibilities to protect their health and private life against non-specified and unlimited demands by the organisation. Under such conditions, the necessity to change business models fast and fundamentally stays unaddressed and productivity stagnates due to an extreme fragmentation of activities (Öta 2017, 59-97). The prevailing conservative logic of organizational flexibility forms the background for both centralised decision-making and non-specification of job assignments, which evokes demotivation.

## 2.4.2 Deteriorating Quality of Processes and Products

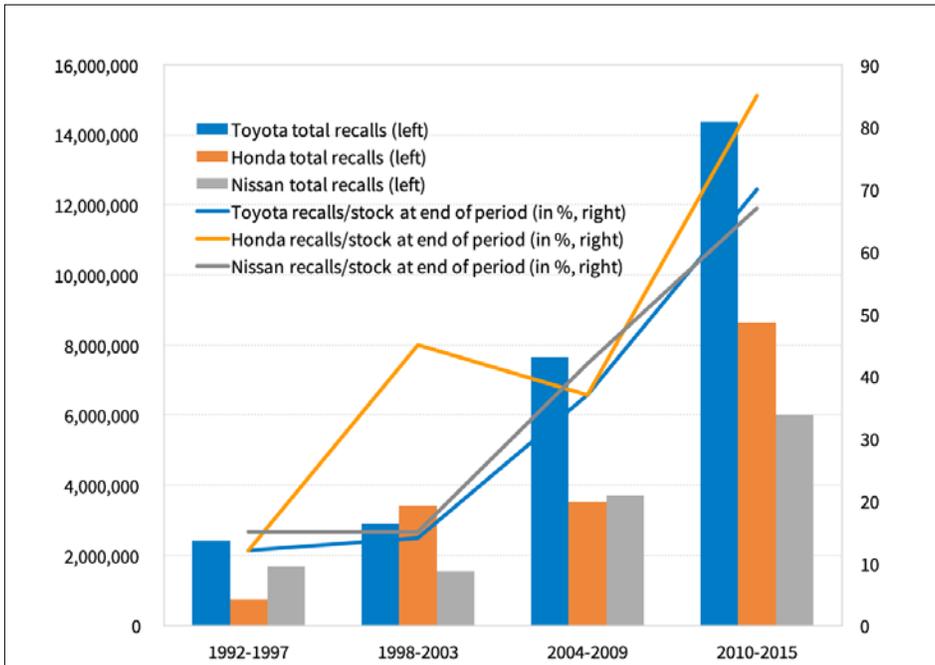
Acting and deciding in business organisations means to connect and balance different ways of thinking and behaviour: on the one hand, resources and routines are to be optimised within existing structures; on the other hand, new forms of designing, manufacturing, selling and consuming products are to be developed (March 1991; Leonard-Barton 1992). The operation of systems necessitates rules defining in advance which functions are to be fulfilled by which components and how these components are to be connected with each other.

Defining the configuration of the interfaces and their output performance *ex ante* involves the strategic advantage to select components through market mechanisms. Flexibility arises from choosing among various options, allowing competition for the best partial solutions (as long as the competitors are isolated from each other) and reducing transaction costs (Aoki, Andō 2002, 8-9). But as long as the system rests on a fixed framework and lacks the opportunity to optimise itself, adjustments will apply only to components. This becomes disadvantageous the more complex the system or its context is (Aoki, Andō 2002, 24-6). If products have to be developed to average standard functionality, proprietary-integral structures are needed, because optimisation and functionality can only be improved if all elements are internally defined and controlled. Once technologically matured, open systems are more effective (Chesbrough, Teece 2002).

Issues of configuration have been addressed under the name of industrial architecture. In the related discussion, Fujimoto (2001, 2002) is a proponent who opposes convergence to open architecture, or modularisation, for manufacturing industries with products like cars, which consist of several thousand parts. Fujimoto warns that the logic of modularisation cannot be applied unconditionally. Historical strengths and path dependencies are to be considered as both potentials and limits. He points in particular to the role of organizational learning for optimisation in Japan's automotive industry with its closed, integrative architecture. In contrast, open modular systems predominate in the global IT industries. Here optimisation results from a radical reconfiguration of resources, products and processes (Fujimoto 2002). Under conditions of growing complexity and uncertainty, business organisations as well as individuals are required to be increasingly flexible. Flexibility is – according to Fujimoto – the extent to which conflicting demands for high product quality, low costs and short delivery times can be balanced and kept unimpeded by changes in external conditions or product variance. At the product level, flexibility is advanced as interface standardisation and use of equal parts in different products, and at the process level as non-specification of work tasks and machinery functions (Fujimoto 2001, 308-9). Japan's manufacturing firms need flexibility,

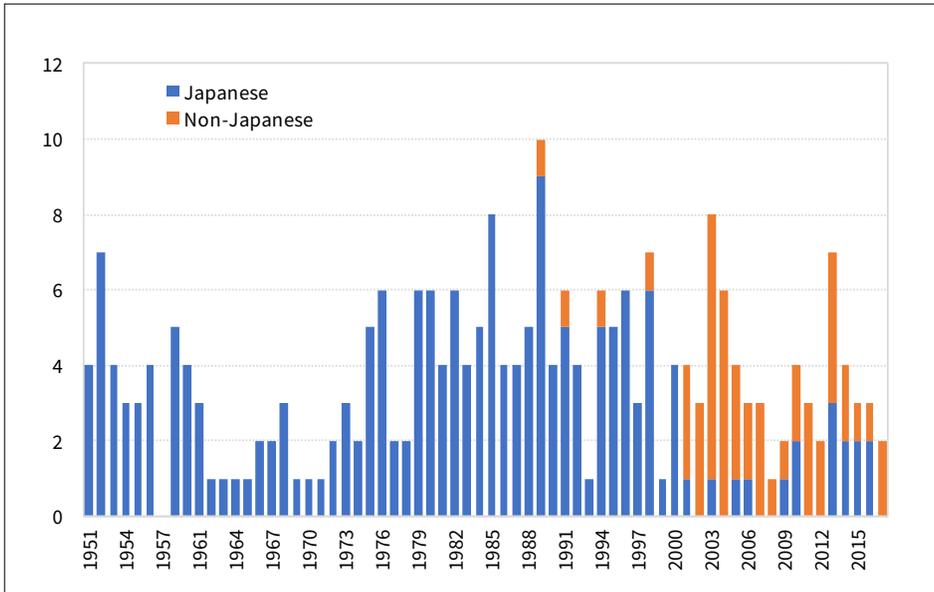
because expansion of the total output and, relatedly, scale-based effects of optimisation can be gained only through absorbing an increased variance of products or product parameters. Flexibility is therefore not an end in itself or a categorical imperative, but a means to reducing cost. Process flexibility amounts to operations that are always determined by the next step and ultimately the final stage, as well as to work tasks and machinery functions that are not exactly anticipated. In other words, the conditions for the use of men and machine are kept unspecified. So far flexibilisation has mainly applied to human work, with work tasks, locations and quantities constantly changing. Slack or easily accessible pools of human labour, time and other resources are necessary to absorb external and internal volatility. Forced into the dilemma between complexity and cost reduction, or external adaptability and internal consistence, organisations have come to regard slack as waste since around 2000, but particularly in response to the economic crisis of 2008. Indicative of this trend is the exploding number of recalled cars: in total and as weight of running stock, recalls by the three biggest Japanese automotive manufacturers, Toyota, Honda and Nissan, have increased from 1992-1997 to 2010-2015 by more than five times (chart 2.17a).

Chart 2.17a Total number of recalled cars in Japan from Toyota, Honda and Nissan in 6-year periods from 1992-2015



Source: Author, based on MLIT 2018

Chart 2.17b Number of Deming Prize winning firms



Source: Author, based on JUSE 2018, 67-72

Instead of treating quality management as an organisation-wide process task and investing into the extension and preservation of required slack, the acquisition of formal standard certification (ISO) was declared to be the objective in many corporations and seen as sufficient to comply with external demands and internal challenges. Unsurprisingly, the once highly regarded quality level of Japanese products entered a critical state: trust in it was shaken by a series of quality control related scandals (e.g. Tōkyō Electric Power, Tōyō Rubber, Hitachi High Technologies, Asahi Kasei, Kōbe Steel, Nissan, Subaru, Mitsubishi Motors), reaching a preliminary low with the bankruptcy of Takata Corporation in June 2017. This corporation, previously no. 2 in the global market share ranking of airbag producers, had hidden and delayed recalls of defective airbag inflators, linked to at least 17 dead car drivers worldwide. Ultimately, they had to recall an estimated 100 million cars since 2007.<sup>22</sup> In addition, the number of Japanese corporations being awarded the prestigious Deming Quality Prize has significantly declined since 2000, while the number of award winners from outside of Japan, mainly from India and Taiwan, has risen (chart 2.17b).

22 See: <http://www.bbc.com/news/business-40401471> (2018-10-11).

Obviously, the current quality problems at Japanese corporations cannot be explained only as a failure of single organisations or related groups and individuals. Rather, they indicate the declining importance attached to process and product quality and the related interest of customers as stakeholders, in addition to a deteriorating communication between top management, middle management and the operational field. Thus, they have to be regarded as collateral damage in close relation to the change of corporate governance and organizational culture at Japanese corporations after 2000.

### 2.4.3 Increasing Risk of Corporate Misconduct

In December 2001, Enron Corporation, which had been named America's most innovative company by the US business magazine *Fortune* consecutively from 1995 to 2000, filed for bankruptcy: the company had hidden losses and kept huge debts off balance by using current value-based accounting (mark-to-market) and special purpose entities in order to meet profit projections and stock market expectations. Thousands of employees lost their jobs. Market capitalisation of Enron shares of several tens of billion USD and related pension plans for employees evaporated.<sup>23</sup> A few months later, in July 2002, WorldCom Inc. filed for bankruptcy and laid off 17,000 employees due to overstated sales income of about 9 billion USD<sup>24</sup> (Sidlak 2003; Pandey, Verma 2004). In the same year the Sarbanes-Oxley Act was put into force to recover trust in capital market-based corporate governance by introducing stricter requirements for financial disclosure and prevention of accounting fraud. Nevertheless, even years later corporate fraud occurred, only at a bigger scale and with much more destructive consequences, i.e. in the cases of Fannie May and Freddie Mac, American Insurance Group (AIG) and Lehman Brothers. All these cases have in common that corporate executives, focused on short-term maximisation of share prices and meeting profit projections, manipulated income statements and balance sheets. Here again, the root cause is not merely individual misconduct as the 'bad apple theory' would have it, but the interrelation of systemic, organizational, collective and individual factors. At the systemic level, corporate fraud is tied to a governance system that defines the nature of stock market listed corporations simply as a bundle of contracts with shareholders, who are the ultimate principal. It

23 Chandra 2003; Seeger, Ulmer 2003; Gillan, Martin 2007.

24 The top management of WorldCom too had improperly released reserves and reduced operating expenses by accounting them as capital investments in order to meet profit projections.

sets maximisation of the principal's benefit as the ultimate corporate goal, and share price as the most effective measurement of the performance of corporate management and M&A as the market for corporate control. The stock market does not provide price-relevant information completely, simultaneously and equally to all market participants; it is not protected against price overshooting and manipulation by insiders at the expense of other stakeholders, and it does not reflect mid- and long-term implications of corporate decisions (Kuhn, Ashcraft 2003; Hara 2017, 66-8).

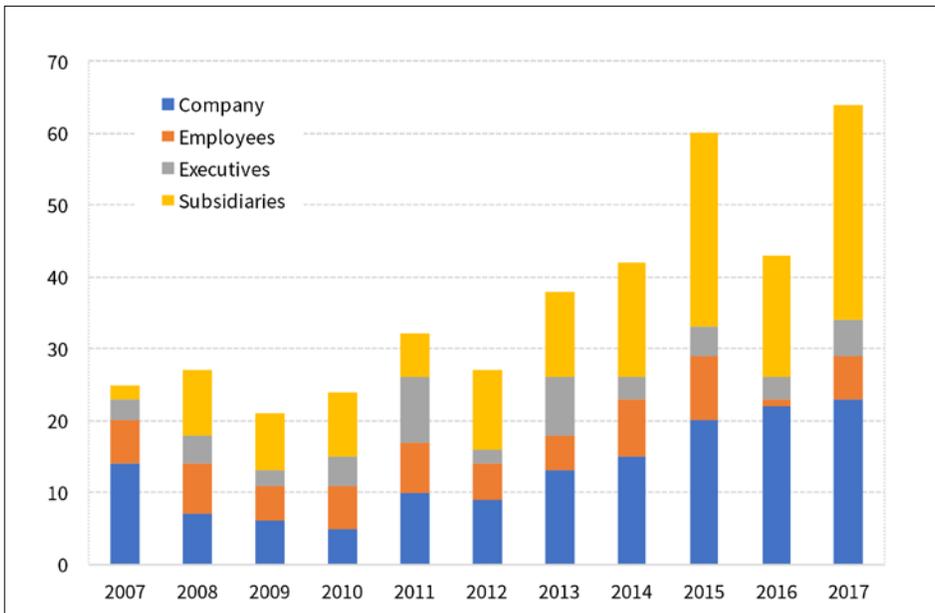
As Marx stated, "Hegel remarks somewhere that all great world-historical facts and personages occur, as it were, twice. He has forgotten to add: the first time as tragedy, the second as farce"<sup>25</sup> (Marx [1852] 1960, 115). So, what happened first in the US happened second in Japan: after a series of accounting and financial report frauds by stock market listed corporations like Seibu Railways/Kokudo in 2004, Kanebō in 2000-2004 (Takeuchi et al. 2015, 80-1), Livedoor in 2004-2006 (86-7), Nikkei Cordial in 2005 (Higuchi 2012, 177-80) and Olympus in 1999-2011 (Higuchi 2015, 130-51), the Japanese government urged capital market participants to comply with the new rules of the Stewardship Code (released in February 2014, revised in May 2016) and the Corporate Governance Code (introduced by the Tōkyō Stock Exchange in June 2015). Together with the Itō Report of 2014, these guidelines aimed at strengthening corporate governance through shareholder monitoring and a corporate management that would be committed to the increase of corporate value. Matsumura (2016) criticises that the underlying notion of corporate governance is biased by an oversimplified and one-directional route of cause and effect from monitoring capital providers to corporations, and that the latter are held responsible for delivering the requested results. Such an approach leaves the nature of corporation, i.e. generating value through organised interaction of several stakeholders, in a black box. It overlooks that investors only provide capital, and that coping with shareholders demands from the right (lending) sight of the balance sheet creates cost, while managing should focus on generating value and profit on the left (borrowing) side by organising activities of all stakeholders (Matsumura 2016, 2-12-7). But corporate managers put themselves under short-term pressure to meet external expectations. Thus, the new guidelines might even work to the opposite inviting pressured managers to avoid failure by 'cooking the books', not only occasionally, but systematically. Tōshiba's accounting fraud represents the preliminary low. Their illegal practices had already begun in 2008 and brought the firm close to the brink of bankruptcy, when made public 2015-2016. In the aftermath, the firm had to sell almost all valuable

25 Cf. <https://www.marxists.org/archive/marx/works/1852/18th-brumaire/ch01.htm> (2018-11-07).

assets to survive as nuclear plant builder with the help of the Japanese government (see chapter 3). It comes as no surprise that Tōshiba executives were accused of having falsified accounting reports for years, first of all to hide the heavily overpriced acquisition of US nuclear plant builder Westinghouse in 2006 and the related losses. In the '90s Tōshiba top managers had declared themselves true followers of the management system and corporate culture of General Electric under CEO Jack Welch and for that they were celebrated by capital market participants, mass media and academia in the US and Japan. And they were praised in Japan as pioneers of adopting a market-driven management style, a (decentralised) internal company system, a work-position and short-term result-based payment policy and US standards for accounting.<sup>26</sup>

But accounting fraud is not limited to a few spectacular cases of large stock market listed corporations. Data indicate that respective cases are increasing (chart 2.18a). Whether due to stricter prosecution of such offenses or an actual increase, fraud cases occur simultaneously with the diffusion of corporate governance structures and elements that are supposed to serve the interest of shareholders by keeping their agents aligned through share price-based compensation (chart 2.18b).

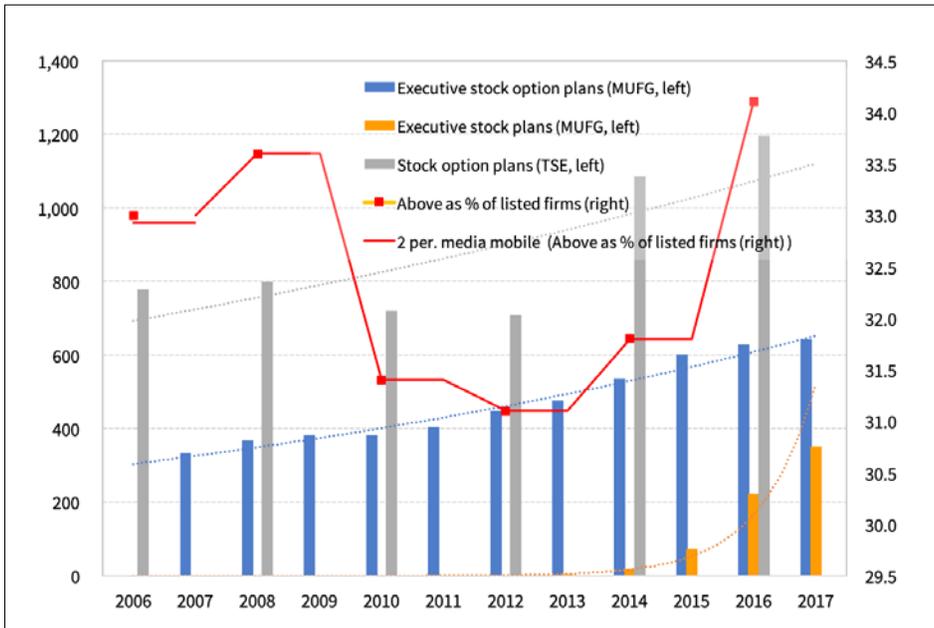
Chart 2.18a Irregular accounting cases at listed corporations in Japan by main culprit (FY)



Source: Author, based on TSR 2018

26 FACTA 2017; Matsumura 2017; Higuchi 2017a, 6-38; Higuchi 2017b, 103-23.

Chart 2.18b Number of listed companies with executive stock option and stock compensation plans in Japan



Source: Author, based on TSE 2018; MUFG 2017

Higuchi (2012) points out, that most analysed cases of corporate misconduct in Japan are tied to outsourcing, cost reduction, performance-based payment (i.e. weakening of internal integration) and a specific corporate culture of homogenisation, overriding legal and other social rules (97, 149, 187, 236, 264). Obviously, all these factors became reinforced, once corporate governance and culture attached more weight to external orientation and control.

## 2.5 ‘Politically Correct’ Response: Itō Report 2.0

In response to a shift of emphasis towards social value or social-problem solution as the source of sustainable corporate value generation (Porter, Kramer 2011), and probably also to criticism against the Itō Report of 2014, a new report was released in October 2017, the ‘Itō Report 2.0 - Final Report of the Study Group on Long-term Investment toward Sustainable Growth (Investment Evaluating ESG Factors and Intangible Assets)’ (METI 2017c; Itō 2017, 8-31; Callon, Yoshida 2017; Itō et al. 2017). First the report outlined the importance of innovation and intangible assets for growth in profitability (capital efficiency) and meeting international demands for

contributions from corporations and their investors to the solution of social problems (METI 2017c, 9-14). Then it assessed that Japanese corporations have invested relatively much in R&D, but have been unable to translate these expenses into persistently higher operation profits. Instead of investments in innovation, R&D expenses have been treated as cost and therefore directed at short-term improvement of existing technologies, products and business models. For the same reason Japan's corporations have been lagging behind in their investment into intangible assets and human resources (METI 2017c, 15-20). In order to make such investment mid- and long-term and promote innovation as key to higher capital efficiency, Japanese corporations were to attract long-term orientated equity capital investors, which are often public or semi-public institutions (like pension funds and central banks). These institutional investors comply increasingly with the UN Principles for Responsible Investments (PRI) of 2006, which address Environment, Society/Social and Governance (ESG) as crucial criteria. ESG have been perceived as both risk and opportunity, even though ESG-committed investments have not earned shareholder returns above average in the past (METI 2017c, 26-31). Nevertheless, the Itō Report 2.0 implicitly assumes that (a) the valuation of corporations by capital markets<sup>27</sup> is of prime importance; (b) the relatively low price-book-value ratio<sup>28</sup> of Japanese public corporations reflects a relatively low capital efficiency<sup>29</sup> and growth expectation,<sup>30</sup> and (c) that these are caused by the still prevailing passivity of related long-term shareholders in Japan (banks, life insurances and other corporations) and the lack of a market for corporate control, i.e. the threat of a take-over and of sacking of executives when the share price is too low (METI 2017c, 32-7). In their view, corporations have to show commitment to higher capital efficiency and future growth by entering a dialogue with shareholders and other capital market participants about a permanently change-orientated corporate culture, an ESG-compliant business model generating sustainable growth, a corporate strategy for investing into critically important resources such as human capital, technology, software and brand, a performance orientation and an understanding of governance as disciplinary frame to realise their commitment and deliver the expected results (METI 2017c, 44-60).

A constructive dialogue requires equality among the discussants, not a relation of subordination between principals and their agents. And if the outcome is to go beyond reconfirming the status quo, contributions from

27 Market Capitalisation (MC) = issued shares × share price.

28 Price Book Value Ratio (PBR) = share price/net assets per share.

29 Return on Equity (ROE) = net profits/equity capital.

30 Price Earning Ratio (PER) = share price/net earnings per share.

all involved sides are needed. But the Itō Report 2.0 maintains previous positions, namely, that the ultimate end of stock market listed corporations is to generate an increase in corporate value and to deliver above-average returns on investment for equity capital providers. Price movements on capital markets are seen as the most rational criteria for assessing success. The proposed corporate culture prioritizes high adaptability to a changing environment and consistency in serving the interest of equity capital providers, while fundamental questions remain unaddressed, for example, inherent irrationalities of capital markets, the short-term bias of institutional investors, social and environmental problems directly and indirectly caused by corporative activities and capital markets, trade offs and balancing between stakeholder interests under external pressure to maximise financial return and participation of stakeholders in decisions about corporate goals, processes, outcomes and investments. Thus, stressing the importance of innovation, intangible assets, ESG compliance and long-term orientation of investment appears to be a politically correct disguise of an unchanged end. This does not come as a surprise in view of the report's authors and members of the study group: they were mainly executives of Japanese stock market listed corporations, financial institutions and institutional investors, with the METI as hosting coordinator and some ministries of the central government as well as the *Keidanren* as observers.

## 2.6 What is the Alternative?

The current mainstream of corporate management prioritizes adaptability to the environment as the main source of change and flexibility. In contrast to that, firms could set a mission that expresses a specific reason for the existence of the very firm and a related goal as the anchor of stability and direction under increasingly complex conditions. In order to provide stability and direction to the organisation, the mainstream calls for consistency in compliance, while the alternative counts on participation and involvement of all stakeholder parties as sources of internal integration, change and flexibility. In short, the mainstream appears responsive, urging to comply with external demands from capital market participants, whereas the alternative appears active, generating stability and flexibility from inside the firm by setting a specific goal and enhancing involvement of its diverse stakeholders (tab. 2.7).

Table 2.7 Alternative traits of corporate culture

External orientation	<i>Adaptability</i>	<b>Mission</b>
Internal integration	<b>Involvement</b>	<i>Consistency</i>
	Change and flexibility	Stability and direction

Source: Author, based on Denison, Mishra 1995, 216

But what is the nature of a corporate mission that generates stability and direction in response to increasingly complex external conditions? Necessarily, it has to be focused on providing products or services that are not in oversupply and thus not prone to destructive cost cutting, something which does not answer already addressed problems and therefore has a high demand potential. This requires a business model that generates sufficient added value to reward all stakeholders and that promotes innovation to the advantage of all who are involved. Such a mission puts innovation at its centre as distinct from the mainstream, which exploits innovation as a means to the traditional end of higher capital efficiency. It distinguishes itself also fundamentally from business models that are based on the economy of scale and actually cause environmental and societal problems. As such, the alternative model enables firms and their stakeholders to shift from serving saturated markets towards addressing environmental, societal and individual needs, including a radical reduction of paid working time made possible by technological progress, i.e. artificial intelligence and automation. Providing a sufficient basic income to all citizens instead of increasing the administration of poverty and unemployment will absorb frictions that are likely to occur in the process of transition from cost-driven to innovation-seeking business models. Last but not least, it will encourage risk-taking that is needed for innovation.

### 2.6.1 The Importance of Ownership

Equity capital investors are granted several rights: to vote on board members, executive payment, fundamental changes of structures and goals, stock issues, options and splits, mergers and acquisitions; to buy and sell their shares; to participate in profits through dividend payment and, in case of liquidation, receive assets and income, after demands of creditors, bondholders and preferred shareholders have been satisfied. Shareholders do not have a say in the operation of a corporation. In return for being only limited liable, shareholders cede also possession of corporate assets or incomes. General ownership exceeds the limited rights of shareholders: it implies responsibility for and autonomy of the business with respect to decisions about products, processes and results. A non-mainstream type

of ownership is needed, if the aim is to generate products and services that are not in oversupply, are not socially and environmentally harmful and are not prone to destructive cost reduction, and a corporate culture is required, which provides orientation and stability by means of a mission and generates flexibility through participation of all stakeholders.

At the same time, financial capital is not critical anymore, but rather externally and internally abundant as indicated by extremely low long-term interest rates and overpriced asset markets. If so, there is no logical reason to privilege shareholders with a dominant stakeholder position. To the contrary, stock market listed corporations that hold on to the mainstream, inherently expand their power and, once obtained, establish oligopolistic or monopolistic market control, prevent competition, exploit suppliers and consumers, pressure states, governments and communities and finally get subjected to anti-monopoly measures, takeovers and delisting. Interestingly, recent research about firms with a short corporate lifespan scale shows that a considerable number of start-ups in the US failed, not despite but due to external funding, because external investors had not provided sufficient time for these firms to develop and refine their business model (Quartz 2016). Responsible ownership means to protect the firm and its stakeholders against unjustified claims from external parties. And ownership has to be practiced by the most contributing stakeholders. These are normally the employees, because they encounter most of the challenges, risks and consequences of doing business, not the capital providers. Fortunately, new technologies such as 3D-printers and digital networks are beginning to free businesses from the necessity to scale up under all circumstances and to obtain huge funding for capital investments. Whatever scale and scope are required, they can be achieved through intra-local networks of firms – easier and faster with less capital investment and external funding.

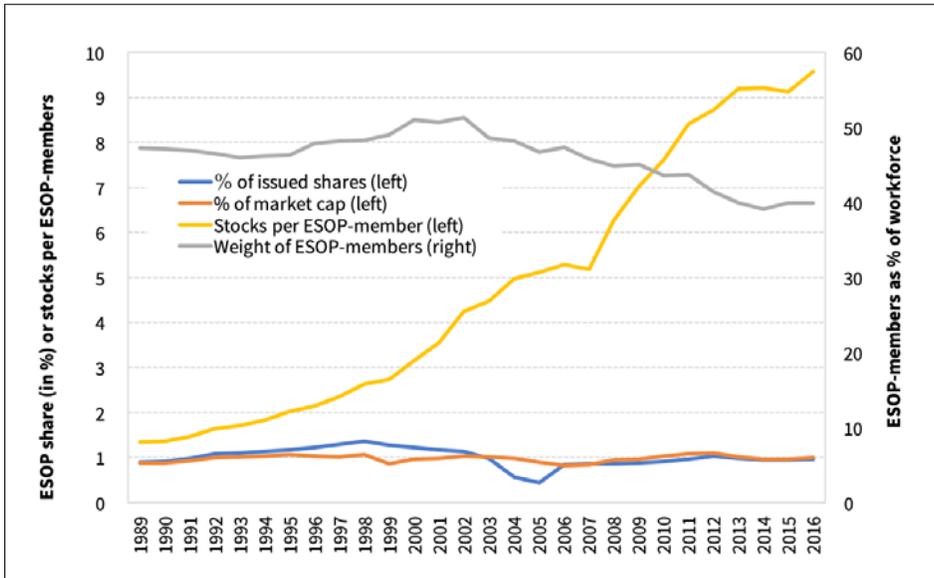
## 2.6.2 Employment Security, Participation and Payment

Fear of unemployment causes passivity, short-term opportunism and distrust among employees. Thus, employment security is essential, if innovation and productivity are to be taken seriously, as such central elements cannot be achieved without long-term committed, collaborative and creative employees. Pfeffer (1994, 1998, 2015) pointed out, that employment security not only helps to avoid short-termism and loss of talented employees to competitors, including prior investment into their training; it also enhances careful hiring, promotes a deep understanding of corporate goals and the sharing of informal rules and rights, mutual expectations and general demands. Furthermore, it enables long-term investment into professional qualification and a decentralisation of organizational design based on self-managing

teams, which includes broad information sharing and the reduction of organizational layers as well as status differences. These features of human-resource management become especially productive if linked with not necessarily high, but compressed compensation schemes, which are contingent on team and organizational performance and sometimes combined with stock options. Pfeffer (1994, 30-59; 1998, 64-98; 2015, 189-90) illustrated how human-centred practices of high performance management systems affected the corporate performance in such prominent cases as AMD, New United Motor Manufacturing, Lincoln Electric, Southwest Airlines, AES and SAS Institute. Their practices were called features of 'responsible corporations' (cf. Osterman 1999, 146-78), 'partnership capitalism' (cf. Kochan, Osterman 1994; Blair, Kochan 2000), combining Employee Stock Ownership Plans (ESOP), profit sharing, broad-based stock options and employee participation, or 'new corporation' (cf. Blasi et al. 2003). These human-centred practices could be found at many start-ups in Silicon Valley (such as Intel). They have proven effective for winning over talent and stimulating creativity among employees (Blasi et al. 2003, 31-61, 153-76, 205-21). Job security, long-term contracts and compensation schemes, regular feedback, a tolerant bankruptcy law and structural protection against short-term biased performance demands by outside directors and shareholders are essential for enhancing explorative behaviour and strengthening a corporate culture that is committed to innovation as well as inherent learning through failures and risk taking - this has been shown by Manso (2017) in several empirical studies on public corporations and medical R&D organisations as well as in scientific experiments. His cases stand in sharp contrast to the legions of contemporary employees, who are urged to behave like internal entrepreneurs in mission statements and reports on corporate social responsibility (CSR), but are finally treated as cost positions by executives and, accordingly, highly frustrated.

Particular cases cannot be taken directly as proof for the existence of something new, but they can stimulate the conception of alternatives (Flyvberg 2006). The cases mentioned above show literally that alternatives are possible. Such cases exist also in Japan. Some of the features raised and described by Pfeffer (1994, 1998, 2015), such as long-term employment, bottom-up decision making and gainsharing, were once even common parts of human resource management and organizational culture at Japanese corporations. But they belonged to the traditional business model of industrial production, not post-industrial knowledge-based innovation of product, process and management. And neither did they involve employee ownership (Iwai 2009, 340-2). Most employee stock ownership plans (ESOP) in Japan have not gone beyond a symbolic level (chart 2.19).

Chart 2.19 Weight of employee owned stocks (ESOP) in Japan



Source: Author, based on JPX 2017

The recently most prominent Japanese firm, which puts its employees first, grants them ownership-based gainsharing, practices participation and sustains high performance, is Japan Laser Corporation (JLC). Being a small trading company specialised in laser, with 49 employees and annual sales of 3.3 billion JPY by now, it began as a start-up in 1968, then converted into a subsidiary of Japan Electron Optics Laboratory (JEOL) Co. Ltd., and as a result of Japan’s first Management and Employee Buy Out (MEBO) in 2007 turned into joint ownership of JEOL (14.9%), JLC directors (53.1%) and JLC employees (32.0%).<sup>31</sup> JLC and its management under President and CEO Nobuyuki Kondō acknowledge that only motivated and respected employees satisfy the firm’s customers. Accordingly, JLC has done everything to protect employment. In return, it has been rewarded by its employees with initiative, commitment and the kind of service that is necessary to keep a small trading company, which belongs to the endangered species of mediator, highly appreciated by laser technology manufacturers outside Japan and users in Japan. The once lossmaking dependent subsidiary of a large corporation has been independent for more than a decade and accomplished

31 See JCL company homepage [online]. URL <https://www.japanlaser.co.jp/EnglishTop/Company/tabid/90/Default.aspx> (2018-06-08).

a job turnover rate close to 0%. 30% of all managerial positions are held by women and 20% of all employees are older than 60 years of age. Furthermore, JCL has been without any financial losses for 23 consecutive years (Kondō 2017). Thus, it can be seen as a pioneering example for an alternative alignment of strategy, governance and culture, not pursuing expansion under all circumstances, but its own specific way of providing value to the good of its stakeholders and the society it is embedded in.

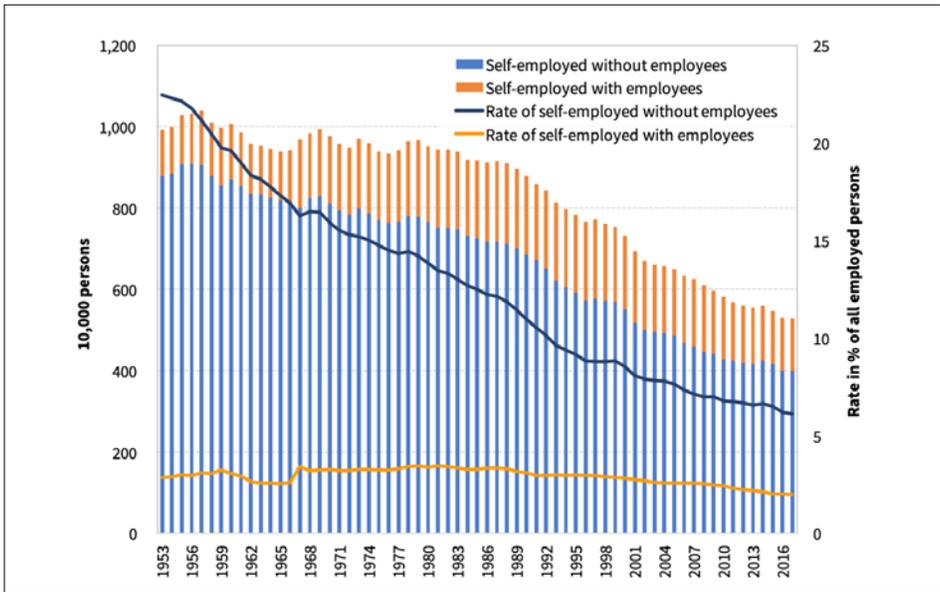
### 2.6.3 Governance and Culture of the Post-Industrial Firm

If today access to huge capital funds is not primary for sustainable success in business, then there is no reason for separating ownership and management, privileging shareholders with limited liability and corporations with income tax benefits as well as access to public subsidies over individuals and private forms of business. Some proponents demand the break-up of large stock market listed corporations into locally committed and simply organised firms, which are directly interconnected with their customers, prioritize subsidiarity and sustainability over expansion and pay dividends to their shareholders not in cash, but in products. The reasons they raise are the growing cost of internal control and external manipulation (including advertisement and lobbying), the huge losses due to mismanagement and the declining ability to both innovate and address broader social interests (Okumura 1992, 211-29; Mizuno 2016, 212-8). The alternative is to have firms owned by those who manage the central process of knowledge creation, and to be managed by those who generate, share and link human knowledge, organise collaboration between diverse individuals and collectively create connections between different, formerly unconnected elements, which is the very essence of innovating. Iwai (2009) predicts a revival of the classical firm as a clear sign of post-industrial capitalism, where ownership and management are not separated anymore. He sees the increasing number of self-employed persons in the economies of most OECD-member countries as indicative of an entrepreneurial renaissance.

But in Japan the number of self-employed persons with employees and new business entries (vs. business exits) has been going down since 1990 (charts 2.20a-b). This is seen by some as a result of the long-lasting macro-economic stagnation, by others as evidence for a lack of entrepreneurial spirit. But it should not be overlooked that the increase of self-employed persons in the US and Western Europe was partly boosted by an outsourcing boom of large corporations orientated at cost-cutting.

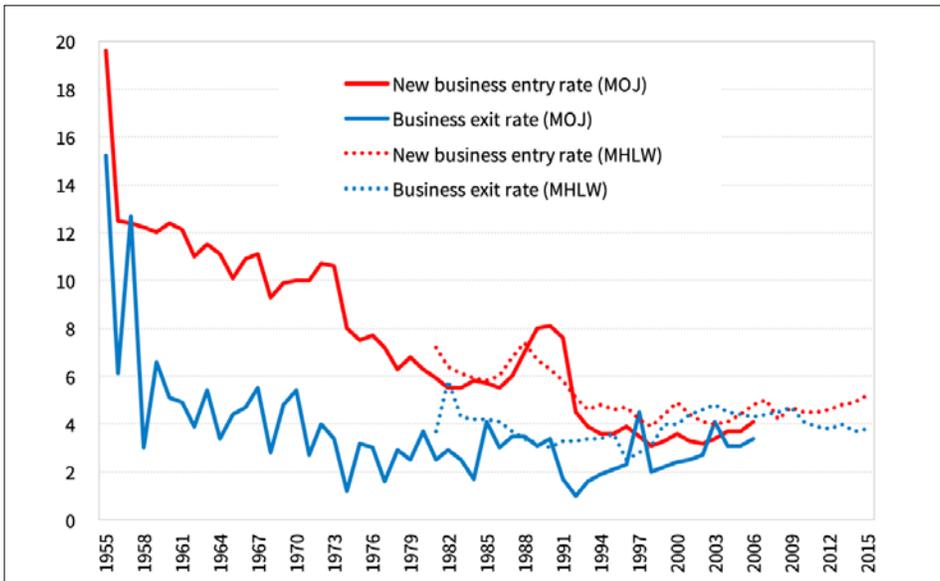
Seely-Brown, Duguid (2000) and Iwai point out that firms as corporate organisations will not become extinct: formal organisation and structure, division of labour and specialisation will still be required, even if less rigid, i.e. informal and spontaneous practices room. External capital funding

Chart 2.20a Self-employed persons with and without employees and their weight as % of all employed persons in Japan (CY)



Source: Author, based on MIC 2018c

Chart 2.20b Rate of business entries and exits in Japan (in % of the previously registered total stock)



Source: Author, based on METI 2018a

will be needed until cash flows are generated from new business ideas. Furthermore, legal protection of ideas and knowledge for the sake of commercialisation includes the dilemma of how to decide which prices and margins are for how long legitimate and meaningful (Seely-Brown, Duguid 2000, 167-72; Iwai 2009, 311-2). But the biggest challenge for these firms remains how to keep those who generate ideas and knowledge through their communication and collaboration motivated to do it within and for the firm (Stewart 1997, 79-108; Iwai 2009, 321-39). Precisely this makes an innovative and participation-friendly linkage of ownership, management and culture inevitable (Manso 2017, 23).

All the ideas about how business may be organised in the post-industrial era let Japan's alliance of large corporations, central government and public bureaucracy appear as a cartel that blocks moves towards alternatives at rising cost for the majority. The next chapter analyses the electric power generating industry of Japan, exemplifying how and why this backbone industry has become a costly burden and life-threatening risk for Japan's future under the eyes and in the interest of the above alliance.

## **J-Economy, J-Corporation and J-Power since 1990**

From Mutual Gain to Neoliberal Redistribution

Enno Berndt

### **3 J-Power: Political Economy of the Fukushima Nuclear Catastrophe**

**Summary** 3.1 Personal Blind Spot. – 3.1.1 Earthquakes and Nuclear Power Plants in Japan. – 3.1.2 The ‘Nuclear Earthquake Disaster’ of March 2011. – 3.1.3 Historical Parallels. – 3.2 Cui Bono? Interests, Power and Nuclear Power Generation in Japan. – 3.2.1 Ownership and Business Model of the Electric Power Industry in Japan. – 3.2.2 State Political Interests: Hidden Military Budget? – 3.2.3 Industrial Policy Interests: Infrastructure Export. – 3.3 Fundamental Problems of a NPP-Centred Electricity Industry. – 3.3.1 Inflexible and Costly Control of Power Supply. – 3.3.2 Nuclear Fuel Cycle Unclosed. – 3.3.3 Actual Costs of Nuclear Power Generation: Complex, Hidden and High. – 3.3.4 Liberalising Japan’s Electricity Market: Making Nuclear Power a Defensive Wall. – 3.3.5. Nuclear Power as a Rescue from Global Warming? – 3.4 Future Scenarios: Politics, Market and Technology.

#### **3.1 Personal Blind Spot**

In hindsight one knows better, as the saying goes. But when trying to understand something that has already happened, practical science aims primarily to discover new contexts, reveal still unseen consequences and outline alternatives for acting. The objects of such science are contested terrain since the search for how and why something happened is pervaded by interests. And the searchers themselves are involved in power relations and conflicts. Ignoring and obscuring critical events help to protect predominant actors and their interest. Therefore, hindsight does not necessarily make smarter.

I have been living in Japan since 1991, researching and teaching about how companies in the automotive industries of Japan and Germany work on problems they themselves create in their pursuit of increasing profits through expansion of production and sales of fuel-burning automobiles. Like most of my fellow citizens, I had not seriously considered the way electricity is generated in Japan, the dangers and risks, critics’ warnings and energy policy decisions. It took a disaster to become aware of it. This blind spot is worked on below to understand what happened, why it happened and what may happen in future. Apart from the personal search for meaning, the electric power generating and distributing business in Japan is a striking case of the close alliance between state and monopolistic corporations and the consequences that ensue for the vast majority of citizens, when this alliance dominates a central infrastructure. Similar to the field of automotive mobility and many other zones of public infrastructure,

social services and private business, here, too, the transition to decentralised, flexible and sustainable forms of doing business has apparently been blocked by powerful players who cling to principles derived from industrial economy. Literally, the subject of this chapter is political economy.

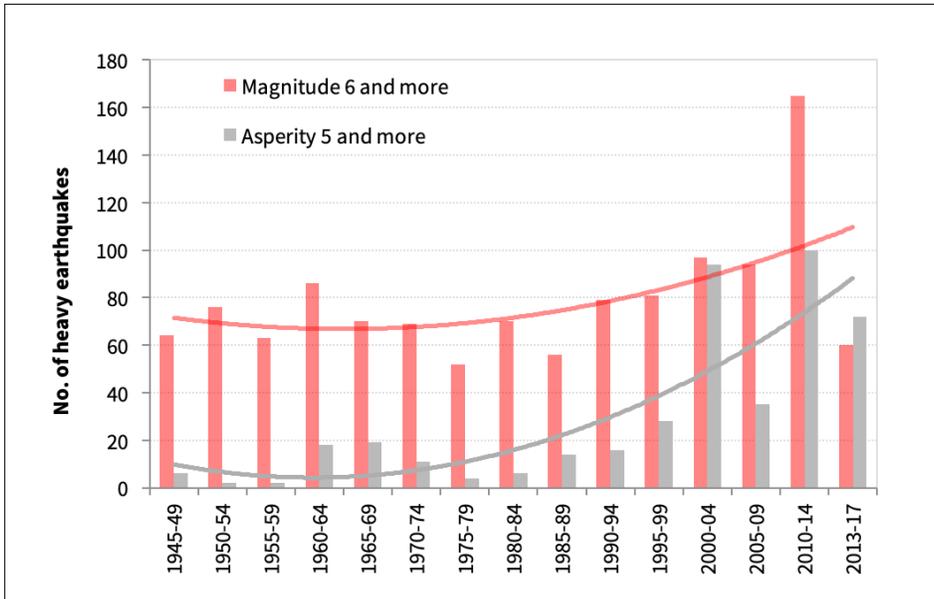
### 3.1.1 Earthquakes and Nuclear Power Plants in Japan

Japan's territory accounts for 0.1% of the earth's surface and 0.3% of the earth's land. From 1500 to 2017 10.0% of the world's earthquakes with a magnitude of 6 and more occurred in Japan (NOAA 2018). The number of severe earthquakes in Japan declined in the '70s, but it has risen again since 2000 and furthermore drastically since 2010 (chart 3.1). Almost the complete Pacific coastline and the northern half of the Sea of Japan coast are located along the boundaries of four huge continental plates. These plates move, generating large strain energy and releasing the accumulated stress as heavy earthquakes when rock mass fractures. Earthquakes due to energy accumulated between continental and marine plates are called subduction-zone earthquakes or ocean-trench earthquakes. As of January 2018, the Japanese Government Headquarters for Earthquake Research Promotion (HERP) estimates the probability of earthquakes in the range of magnitudes 7-9 within the next 30 years for the Nankai and Suruga Trough (southwest-south of Kyūshū, Shikoku, Kinki and Chūbu) to be 70-80% (magnitude 8-9), for the Sagami Trough (south of Kantō) 70% (magnitude 7) and 0-5% (magnitude 8), for the Ibaraki off coast area over 90% (magnitude 7), for several Tōhoku off-coast areas 50-90% (magnitude 7; magnitude 8: 4-30%) and for several areas southwest of Hokkaidō 8-80% (magnitude 8) (HERP 2018). Based on its 2017 Seismic Activity Projection Model, the National Research Institute for Earth Science and Disaster Resilience (NIED) indicates 22 subduction-zone earthquakes of a magnitude range between 6.8-9 to occur with a probability of 0-73% within the next 30 years and of 0-93% within the next 50 years (NIED 2018).

Furthermore, Japan's inland territory sits on a cluster of active faults (*katsudansō*), which have been created by earthquakes in the upper layers of the earth mantle and are themselves prone to so-called inland earthquakes.<sup>1</sup> At the end of the '90s, more than 1,600 active faults were known (Yamazaki 1997, 494). In 2009, the Earth Faults Database of the National Institute of Advanced Industrial Science & Technology (AIST) detected 548 faults zones or segments of varying sizes. As of February 2018, AIST indicates 583 active fault zones or segments based on data from FY2015 (AIST 2018). As of January 2016, the number of known active faults in Japan was estimated

1 Ishibashi 1997, 720-1; 2008, 54; Watanabe M. 2010, 35; Watanabe et al. 2012, 125-34.

Chart 3.1 Heavy earthquakes in and around Japan (CY)



Source: Author, based on JMA (2018)

at ca. 2,000. Among them, 100 fault zones with a high concentration or density of faults were chosen by HERP and broken down into segments. 200 locations among them were evaluated to have a probability of a heavy earthquake (of magnitude 6.8 and more) to occur within the next 30 years. 34 locations were assessed as having a high probability of 3% and more. Another 50 locations were found to have a ‘rather high’ probability of 0.1%-3% (Masumitsu 2016, 92-7). As of January 2018, 36 locations are ranked by HERP (2018) as zones with a high probability of 3% and more. Based on its 2017 Seismic Activity Model, the National Research Institute for Earth Science and Disaster Resilience (NIED) identifies 260 major active fault zones and 151 other active faults (NIED 2018). There are serious doubts among experts about whether and how precisely probabilities of earthquake occurrence can be calculated (Geller 2011). But there is no doubt that Japan is one of the most active seismic zones in the world and that Japan has entered a long-term period of increased seismic activity since 2000.<sup>2</sup>

At the beginning of March 2011, 17 nuclear power plants (hereafter NPP) with 54 reactors (hereafter NPR) and a generating capacity of 49 gigawatt

2 Ishibashi 1997, 720-4; 2008, 52-60; Kamata 2015, 23, 28, 43; 2016, 8-9; 2018, 161-5.

(GW) were in operation in Japan. They represented 12% of all NPRs worldwide and 13% of the world's nuclear power generation capacity. As of the end of 2016, the International Atomic Energy Agency (IAEA) indicated for Japan 42 NPRs in operation (equivalent to 9.4% of all reactors worldwide) with an installed nuclear power capacity of 39.7 GW (equivalent to 10.2% of the global capacity) (IAEA 2017, 136). As of early June 2018, the Japan Atomic Industrial Forum (JAIF) accounted 39 NPRs with a generating capacity of 38.6 GW as currently existing nuclear power generating stock. 25 NPRs (with 24.8 GW) had applied for assessment, among which 14 NPRs (with 14.3 GW) saw their assessment completed. 12 NPRs (with 11.6 GW) got conversion or rebuild approved; 8 NPRs (with 8.0 GW) are operating (JAIF 2018). As of mid-June 2018, the METI indicated 8 NPRs permitted for operating, 6 NPRs with completed procedures for re-permission, 12 NPRs under evaluation for permission renewal, 16 NPRs without application for permission renewal and 18 NPRs to be decommissioned (METI 2018d).

The average age of all Japanese NPRs was 24.3 years in March 2011; 29 of them were older than 25 years and 19 older than 30 years (Ino 2011, 659). At the end of 2016, 13 reactors were older than 40 years, another 18 reactors were older than 30 years (chart 3.2). But the approved standard lifetime for pressurised-water reactors (PWR) is 30 years and 40 years for boiling water reactors (BWR). This means that Japan's stock of NPR is highly aged.

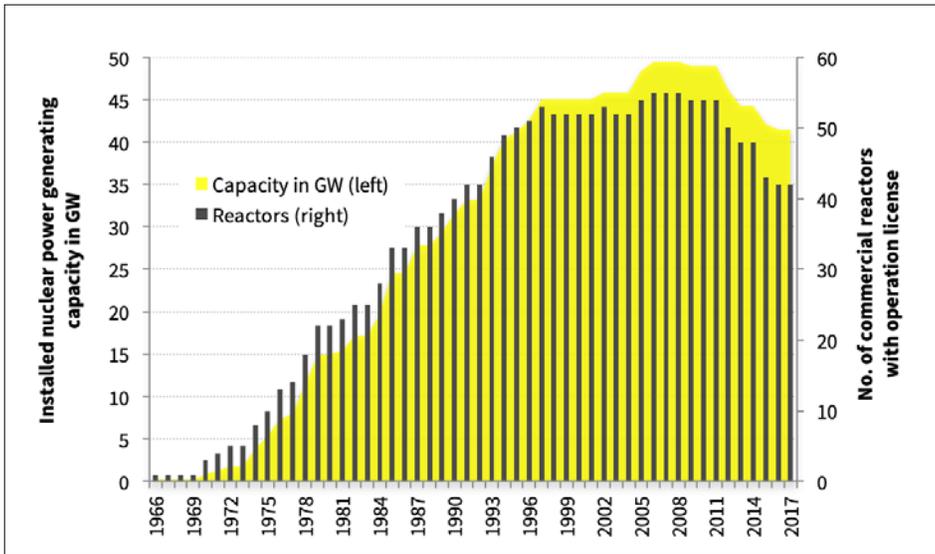
The number of reported issues ('troubles or accidents and safety relevant quality issues') at Japanese NPP/NPRs reached a first peak in the early '80s. In the second half of the 2000s, the total number of reports increased again and peaked preliminarily (chart 3.3).

Heavy earthquakes had severely damaged nuclear reactors in 2007 and 2009 and forced emergency shutdowns.<sup>3</sup> In 2006, METI tightened the criteria for assessing whether nuclear reactors are earthquake-proof. But METI accepted the self-audits of the NPP/NPR operators, according to which all (self-)tested NPP/NPRs were earthquake-proof (Hirose 2010, 165-75). Before the Fukushima nuclear disaster had occurred (hereafter referred to as 3/11), the public authorities in charge of regulating and overseeing nuclear power generation did not have any reason to correct their assessment that the likelihood of a maximum credible accident (MCA) or nuclear worst case scenario due to an earthquake amounted to only 1:1 million to 1:10 million per year (Ban 2011, 167).<sup>4</sup> In October 2011, Tōkyō Electric Power Company (TEPCO) published the result of their own risk assessment, carried out after the Fukushima disaster. According to this, the likelihood of a meltdown has increased from 1:10 million to 1:5,000 or

3 Yamaguchi 2007, 1156-9; Ishibashi 2008, Hirose 2010, 57-62.

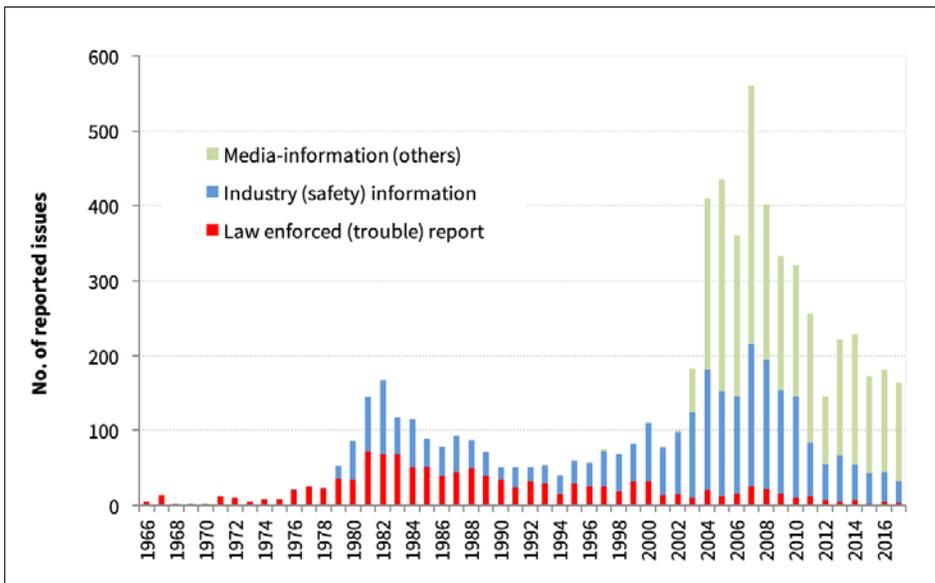
4 For the historical development of probabilistic risk assessment in the US see Wellock 2017.

Chart 3.2 Stock of NPR and generating capacity in Japan (CY)



Source: Author, based on JNES 2013; METI 2018a, 2018b

Chart 3.3 Reported troubles, safety and other issues at Japanese NPP/NPRs (CY)



Source: Author, based on NUCIA 2018

0.02% per year (cf. [www.asahi.com](http://www.asahi.com), dated 20 October 2011). However, the result of a simple retrospective calculation (as of 2012) results in one meltdown per 500 NPR running years or an occurrence probability of 0.2%.<sup>5</sup>

In August 2009, METI approved the continuation of operating reactors no. 1 of the NPPs in Tsuruga and Mihama until 2016 and in Fukushima until 2021. These NPRs had been in operation since 1970 and 1971, thus exceeding the period of 40 years planned by their builders by 6-10 years respectively (Ino 2007, 1124; 2011, 658; Tanie 2011, 55). In addition to seven more reactors older than 40 years, these three reactors were shut down or destroyed by accident and are now decommissioned. But in April 2015 Kansai Power Electric Company (KEPCO) applied for permission to operate reactors nos. 2 and 3 of the Takahama NPP and reactor no. 3 of the Mihama NPP for another 20 years, exceeding the originally set lifespan of 40 years by 50% (AEC 2017, 155). In June and November 2016, these permissions were given by the National Regulation Authority (NRA) despite continued warnings from experts of the risks of operating nuclear reactors beyond their designed lifespan (Ino 2016a, 2016b). At the end of February 2012, 2 NPRs were treated as reactors under construction, one in Shimane and the other one in Ōma. At the end of 2016, government reports indicated even 3 NPRs as being under construction: TEPCO's NPR no. 1 at the Higashidōri NPP was re-added to the former two (AEC 2017, 152).<sup>6</sup>

In 2010, Japan's government had decided to revise its energy master plan. At least nine new nuclear reactors were to be built by 2020 and another five by 2030. NPR utilization was projected to be increased from 61% (in 2007) to 85% (in 2020) and 90% (in 2030) and the share of nuclear power in electricity generation to be raised from 30% (in 2010) to 53% (in 2030) allegedly in order to reduce Japan's energy dependence from imports of fossil fuel, produce electricity cost-effectively and limit the emission of greenhouse gases (METI 2010, 9). The revised energy master plan of 2014 repeated these arguments in favour of nuclear power generation, foregrounding the necessity to continuously increase operational safety and re-establish the conditions for stable commercial use of nuclear power, but it did not provide a specific definition of the future volume and composition of electricity supply. The master plan has been in revision since August 2017. Meanwhile, METI released a long-term energy

5 Previous three core meltdowns divided by previous 1,406 NPR running years (54 NPR × average age 24.3 years + 94 years of NPR shutdowns) = 0.2% = 1 core meltdown per 500 NPR running year (see also § 3.3).

6 Newspaper *Yomiuri* reported that, due to 3/11 and its own critical financial situation, TEPCO had decided on 30 November 2011 to discontinue the construction of NPR no. 1 in the Higashidōri NPP, started in January 2011 (planned start of operation: 2017). The decision to build NPR no. 2 (planned start of operation: 2020) was supposed to be canceled soon afterwards (*Yomiuri Online*, 1 December 2011).

demand-supply vision in July 2015, according to which the share of nuclear power in electricity generation is projected for 2030 at 20-22%, equivalent to 213 TWh (METI 2015c, 7).

### 3.1.2 The 'Nuclear Earthquake Disaster' of March 2011

In March 2011, an earthquake of magnitude 9 shook north-eastern Japan. Shortly after a powerful tsunami hit the coast and buried countless people, houses and villages. As a result of accidents or emergencies, 25 NPRs with a generation capacity of 29 GW (equivalent to 12% of Japan's total installed generating capacity at the time) were shut down (Motoshima 2011, 46). These included 14 NPRs at the NPPs of Onagawa, Higashidōri, Fukushima-1, Fukushima-2 and Tōkai-2. In four of the six reactors at the NPP Fukushima-1, explosions occurred during the first four days after the earthquake. Since then, the cores of reactors nos. 1, 2 and 3 have been melting. In June 2011, the Japanese government announced that  $1.6 \times 1,017$  Bq of iodine 131,  $1.5 \times 1,016$  Bq of caesium 137 and  $1.1 \times 1,019$  Bq of xenon 133 had leaked from the damaged NPR, while an independent estimate assumed  $3.5 \times 1,016$  Bq caesium 137 and  $1.7 \times 1,019$  Bq xenon 133 (Brumfield 2011, 435-6). This independently estimated volume equals 41% and 260% of the respective leakages caused by the 1986 maximum credible accident (MCA) in Chernobyl (IAEA 2006, 19). Immediately after the 3/11 earthquake, 8.71 million households in north-eastern Japan were out of electric power. In the supply region of TEPCO, blackouts occurred 32 times and lasted for several hours from 14 March 2011 onwards for ten days (Motoshima 2011). Japan's central government and Fukushima-1 NPP operator TEPCO claimed that this could not have been anticipated, because it was the extreme and unpredictable magnitude of the earthquake and the tsunami that rendered power generation and cooling systems at many NPRs inoperable (*The Asahi Shimbun*, 1 December 2011, 1). But as early as 1990 researchers of NPP/NPR operator Tōhoku Denryoku (Tōhoku EPCO) had shown that in the 9th century a heavy earthquake had triggered a tsunami whose height was several meters above the officially accepted maximum of 6 meters for Japanese NPP/NPRs. Under the legitimate assumption that such a thing could happen again at any time, scientists had repeatedly warned that there is a severe lack of protection against heavy earthquakes and tsunamis in Japan (Geller 2011, 46-63; Kamata 2015). Critical experts and former NPR specialists like Tanaka (2011a, 2011b, 2011c, 2012), Gotō (2011a, 2011b) and Watanabe (2012) suppose that it was not the tsunami and the related power failure, but the earthquake that destroyed the cooling water pipes in NPR no. 1 and the cooling and pressure regulating steam pipes in NPR no. 2, effectuating the meltdowns and hydrogen explosions. Gundersen (2012a;

2012b, 21-55) is of the opinion that after the cooling failure hydrogen was produced in NPR no. 1, and that the consequent pressure prompted the top seal of the reactor pressure vessel to leak and let hydrogen flow into the reactor building, where it exploded. In addition, TEPCO's top level emergency command, fearing the loss of more NPRs, refused to flood NPRs nos. 2 and 3 with seawater immediately after the emergency cooling had failed (Yamaguchi 2011, 2012). With a multiple Loss of Coolant Agent (LOCA), it finally came to the meltdown in NPRs nos. 1-3 and the leakage of large amounts of radioactivity.

One of the aftershocks interrupted the regular and, in parts, the emergency power supply in the NPPs Onagawa and Higashidōri in April 2011 (Gotō 2011a, 429). Heavily criticised for his crisis management, the then prime minister Naoto Kan urged NPP/NPR operator Chūbu Electric Power (CEPCO) to shut down at least the particularly earthquake-prone Hamaoka NPP in May 2011 (Shushō Kantei 2011). Under the condition that it would be recommissioned in compliance with new safety requirements to come, CEPCO disconnected NPR nos. 4 and 5 from the network.

By March 2012, only one among Japan's total stock of 54 commercial NPRs was in operation, 38 were in control reviews and 14 were down due to accident-related damages and inoperability (CNIC 2012a). But already in August 2011 NPR no. 3 of the NPP Tomari and in November 2011 NPR no. 4 of the NPP Genkai were restarted, although the latter ran only until an accident in December 2011. In March 2012, the government signalled its intention to intervene into the permission procedure in favour of recommissioning NPRs nos. 3 and 4 of the NPP Ōi, which had been tested for safety after 3/11 in line with previous regulation procedures (*The Asahi Shimbun*, 24 March 2012, 1). At any rate, all NPRs in Japan were out of operation in early May 2012 for the first time in 42 years.

Already in 1997, earthquake researcher Ishibashi had pointed out that after a relatively calm period since the mid-'60s, the 1995 earthquake in Kōbe instigated a new period of heightened seismic activity. This would increase the likelihood of heavy earthquakes and the danger that such an earthquake irreversibly destroyed NPP/NPRs and with them large parts of the country (Ishibashi 1997, 720; 2008, 54, 57). Ishibashi coined the term *genpatsu shinsai* (nuclear earthquake disaster). In his view, METI had superseded the danger and avoided eventual damage control, let preventive measures. Therefore, Ishibashi demanded the immediate shut-down of all Japanese NPRs, but especially the earthquake-prone NPP in Hamaoka (Ishibashi 1997, 721-3; 2008, 57).

### 3.1.3 Historical Parallels

In the early '80s, a research group at Japan's Military Academy analysed pivotal battles lost by the Imperial Japanese Army during World War 2. The researchers identified as the most decisive cause of defeat a deplorable combination of features related to strategy and organizational culture, prevalent not only in the former military, but also, according to them, in many contemporary Japanese firms: unspecified, fuzzy objectives, short-term and dominantly tactical decision-making, inductive thinking, underdeveloped option-building, inconsistent and opportunistic response, collectively dispersed liability, organizational integration through interpersonal-relations and subordination, short-circuited interventions, personalised evaluation and promotion according to attitude and process participation (Tobe et al. 2001, 338). The title of their book was *The Nature of Failure*. The assumption that the basic patterns of goal determination and achievement as well as the implicit rules of behaviour are still in place was reconfirmed by 3/11. Yoshioka (2011d, 131-4) attributes the failures of the Japanese state during the Fukushima disaster to the fact that worst-case scenarios are not simulated, respective lines of order and report not determined, and that warnings stay unheard and corrections delayed due to unrealistic plans.

The above listed features seem to distinguish traditional Japanese organisations from those that have to work under unpredictable conditions, where any mistake can cause catastrophic consequences, the so-called high reliability organisations. Such organisations draw the attention of their members to two things: first, always to expect a deviation from the expected and consequently search for early signs of error, refuse simplistic explanations, pay attention to local peculiarities; and second, after the occurrence of an unexpected case to keep functioning under extreme conditions, learn self-critically and respect local expertise (Weick, Roberts 1993; Weick, Sutcliffe 2001).

In his last publication, Jinzaburō Takagi, nestor of Japan's Anti-Nuclear Energy Movement, asked why repeated nuclear accidents had not led to clarifying responsibilities and correcting errors. He found the answer in unquestioned patterns of behaviour, practiced by the majority of Japanese society: open discussion, critical thinking and ethical conviction are chronically lacking (Takagi 2000a, 33-5). Instead, the dogma of a coercive community of fate, authoritarianism and totalitarian nationalism have been prevailing (47-67). A consideration of the wider public, which could guide the thinking and acting of responsible members of society, is missing (98-121; Saitō 2015, 324-9) as is aspiration to critical self-reflection (Takagi 2000a, 124-56).

In 2009, Hidenori Kimura, a professor in advanced engineering and control technologies, contended that the supposedly high competitive-

ness of Japanese manufacturing companies is a myth. Mass production and consumption have made industrial processes so complex that they can be measured, steered and controlled only abstractly. The modernisation of Japan, however, was characterised by basic lack of dealing with abstraction, due to a chronic shortage of capital, industrial technology and scientific knowledge. Industrial machinery was limited to specific areas and often used as a mere tool, empirically and incrementally adapted to labour-intense applications. In Kimura's view, Japan's defeat in World War 2 was caused by a craft-based military and economic system, inferior to the large-scale mass industrialised and science-based US-American one (Kimura 2009, 97-142). In contradistinction, the commercial use of nuclear energy manifests the post-mechanical revolution of science and as such the limits of traditional ways of thinking and acting (152). But in contemporary Japan attempts prevail to deal traditionally with complex processes and developments, which exceed the logic of classical mechanics based as it is on labour-intense optimisation. Similar to Ishibashi (1997, 2008) and Tobe et al. (2001), Kimura (2009), too, draws parallels to World War 2 in regard to how organisations and experts in business, science, education, politics and mass media ignore deficits and dangers, overestimating traditional models or even promoting them nationalistically (12-15).

Ishibashi coined the term 'nuclear earthquake disaster' in 1997 against the backdrop of a big difference between Europe and Japan. Since the disaster of Chernobyl in 1986, there had been public debates and political movements, focused on how to cope with the immense risk of nuclear power generation and how to phase out eventually. In Japan, on the other hand, the situation was different. Despite some public debate and local civil movements, the government maintained its promotion of nuclear energy and rural regions embraced the inflow of private capital and public subsidies as well as employment opportunities generated by local NPPs and the related businesses. According to Ishibashi, the social paralysis, which hampers any step towards a nuclear phase-out, resembles Japan's situation in view of its defeat in World War 2 (Ishibashi 1997, 724): people were aware of the inevitability but not able to take another path. In 2008, Ishibashi also described the earthquake-related reactor accident at the Kashiwazaki NPP in 2007 as a message from nature, not unlike the Potsdam Agreement which was a last call to capitulate, that is, to tackle the nuclear phase-out (Ishibashi 2008, 52). Otherwise, Japan would encounter a third nuclear disaster after the atomic bombings of Hiroshima and Nagasaki. But, according to Ishibashi, Japan's electric power producers, the government and connected scientists have ignored the signals and justified the previous course. That nuclear power plants are indispensable and safe has been spread by mass media and believed by the majority of Japan's population just as the war-time pronouncements by the Imperial Army's headquarters (Ishibashi 2011c, 126-7). In 2011, Ishibashi wrote that the

peculiar constitution of Japanese society, which had led to war and defeat, found its post-war equivalent in the illusion that nature and earthquakes could be controlled (Ishibashi 2011b, 411).

The Fukushima nuclear disaster was the result of a social failure: organisations in politics, business and science as well as their representatives had ignored the dangers of nuclear power generation, manipulated assessments and suppressed criticism. The question arises as to who gained. Under capitalist conditions, the interest in generating profits or return on investments must be assumed to be of central importance. Obviously, however, the high risks and actual costs of nuclear power generation have hardly been included and sufficiently considered by Japan's electric power companies. The question of why interest in nuclear power generation has become so dominant in Japan is investigated below by interrelating research from the fields of Japanese economic, political, business and technological history, including the related statistics.

### 3.2 Cui Bono? Interests, Power and Nuclear Power Generation in Japan

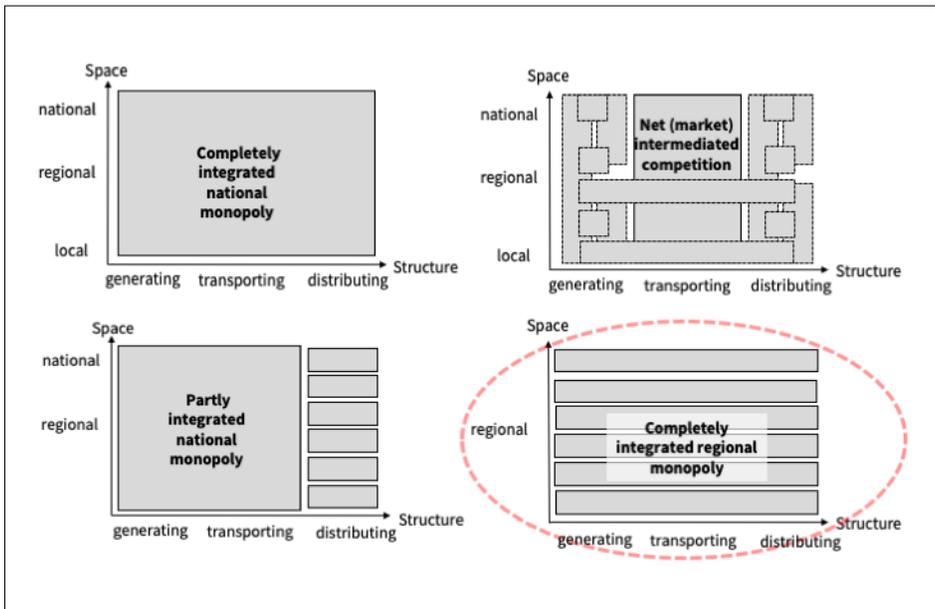
#### 3.2.1 Ownership and Business Model of the Electric Power Industry in Japan

In Japan the generation, transmission and distribution of electricity is in the main vertically integrated and organised as a private-sector business of regional monopolies. These monopolies are subject to state supervision. Electricity prices are to be approved by METI. This hybrid organizational form was determined in 1950 by the GHQ against the will of the Japanese government and the conservative ruling parties. They preferred the wartime model of a national monopoly, with only the final distribution handed over to private companies. The GHQ, however, saw this as an attempt by the Japanese political class to restore state-monopolistic structures. It ordered the Japan Electricity Generation and Transmission Ltd. (*Nihon Hassōden Kabushiki Gaisha*), founded in 1942, to be split into nine private-sector regional monopolies and subjected those to state price control (Kikawa 2004b, 166-91) (fig. 3.1).

This means that the electricity price<sup>7</sup> is set by the central government and outside the scope of individual entrepreneurial decisions, at least formally. Under such conditions, private power companies would be interested in keeping costs as low as possible, while increasing production and

<sup>7</sup> Electricity price is defined as the sum of the variable and fixed costs per electricity unit required for the provision of electricity and an appropriate return on the assets used for this purpose.

Figure 3.1 Structures of electric power business

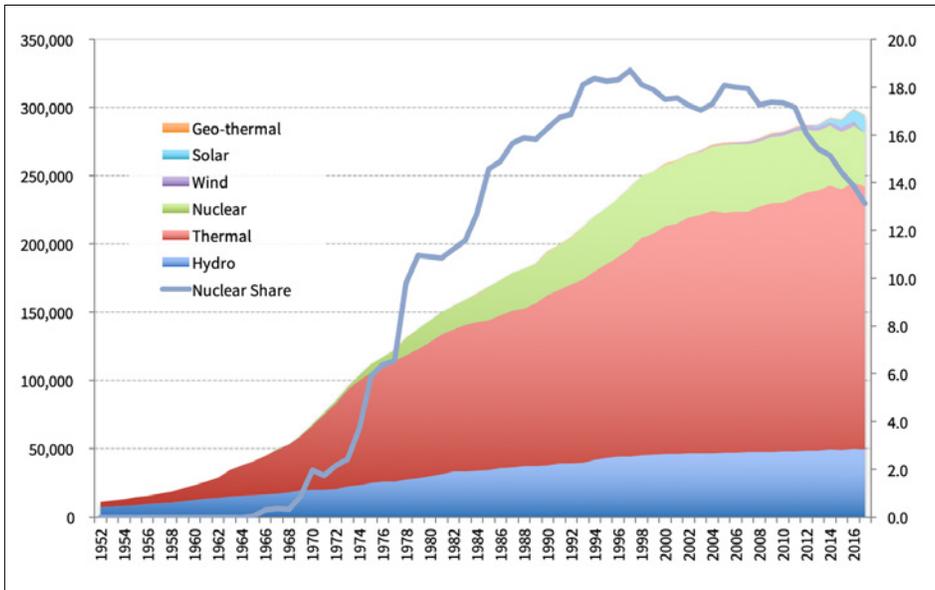


Source: Author

consumption of electricity and maintaining the balance between both. In the electricity industry costs occur from financing investments, the construction of facilities or the corresponding write-downs, their subsequent elimination and related provisions. Costs incur also from the purchase of fuels, the operation and maintenance of installations, the disposal of waste and exhaust gases as well as the related taxes. The biggest positions are depreciation and fixed operating costs. They do not depend on fluctuations in the production and consumption of electricity.

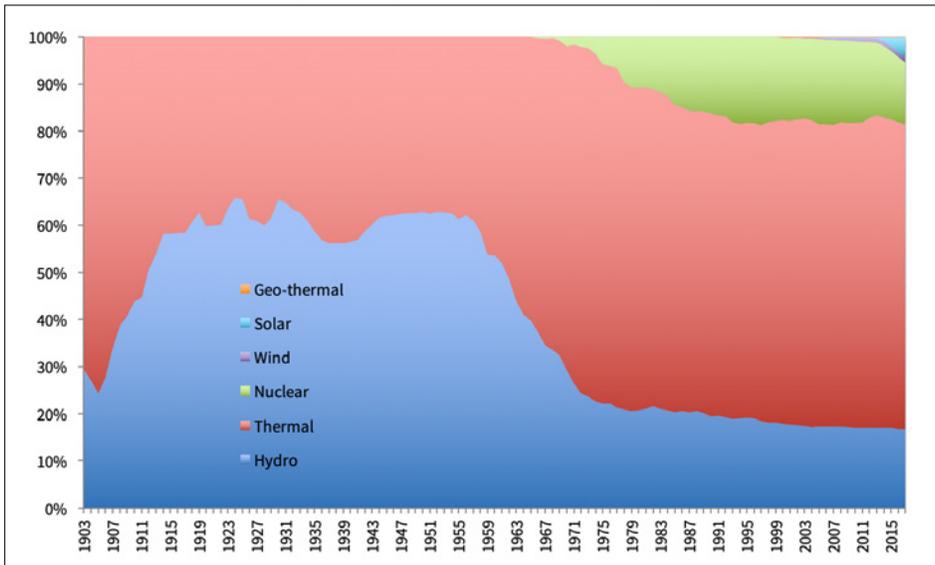
From a business point of view it is therefore vital to reduce the fixed costs, i.e. to keep the investment and depreciation costs for power plants and electricity grid as low as possible and the utilization of both assets as high as possible, without endangering the stability of the electricity supply. Balancing out the production and consumption of electricity means that production needs to be adjusted to changes in consumption. Electricity companies use different types of power plants for this purpose: to cover the baseload they use power plants that can only be started up or shut down slowly and at high cost and are efficient only in continuous operation, whereas, to cover peak loads, they use power plants that can be started up and shut down faster and at lower cost. From the '30s to the '60s, the

Chart 3.4a Electric power generating capacity in Japan (as of end of FY) by energy source (MW, left) and share of nuclear capacity (% , right)



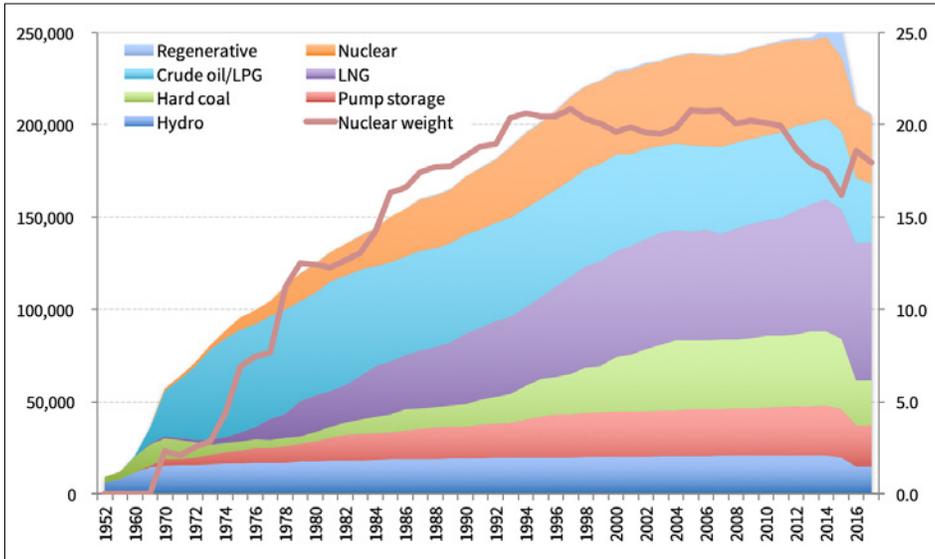
Source: Author, based JBHI 2018; METI 2018b

Chart 3.4b Composition of generating capacity in Japan by energy source (as of end of FY)



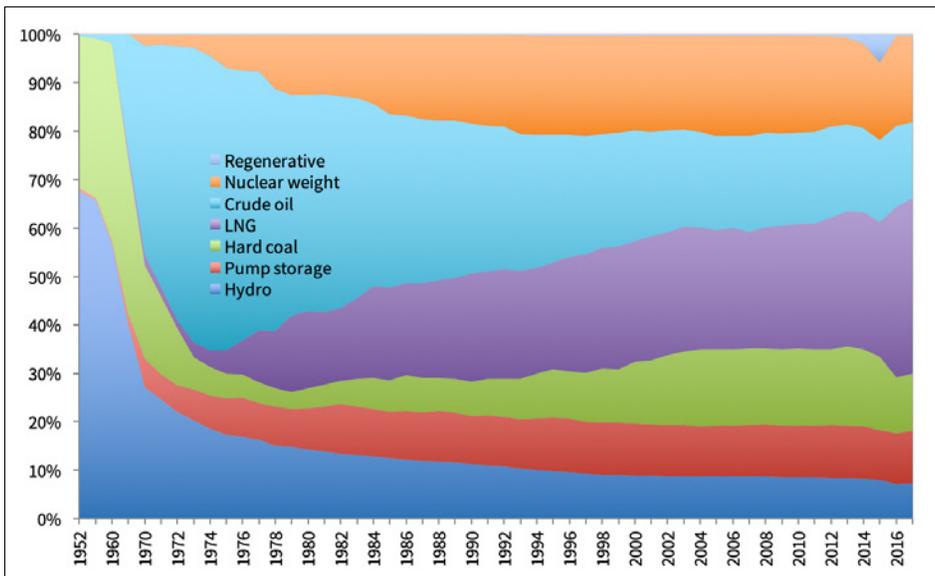
Source: Author, based on JBHI 2018; METI 2018b

Chart 3.5a Installed electric power generating capacity (as of end of FY) at general utilities by source (MW, left) and share of nuclear capacity (%), right)



Source: Author, based on FEPC 2018; METI 2018c

Chart 3.5b Composition of installed electric power generating capacity at general utilities by energy source (as of end of FY)



Source: Author, based on FEPC 2018; METI 2018c

baseload was covered by large hydroelectric power plants, while coal-fired thermal power plants were used during peaks (Kikkawa 2004a, 133-43) (charts 3.4a-b).

Regional monopolies can only grow if production and consumption in their own supply area increase. Increasing the production of electricity beyond a maximum utilization of existing capacities requires investment in new power plants. These must be cheaply financed with outside capital, used to full capacity and quickly amortised. High economic growth in the '60s led to an explosive increase in demand for electricity and, relatedly, the danger of chronic shortage. Japan's electric power companies, for their part, initially sought to achieve a mix that was both capital and cost-saving: newly built oil-fired thermal power plants were to cover the baseload, while new pumped-storage power plants and old hard coal-fired thermal power plants were to cover the peak load. To be operated efficiently, thermal power stations can be fired with cheap crude oil. They are quicker to erect and require less investment than hydroelectric or coal-fired thermal power plants. However, the construction of new power plants met with growing resistance among the population due to escalating air pollution (Kikkawa 2004a, 237-49) (charts 3.5a-b).

In addition, the investment behaviour of power companies stood in sharp contrast to the government's political and industrial policy, which was aimed at expanding the heavy industry through economies of scale and, to that effect, increasing electricity production. Thus, covering the baseload with hydroelectric power plants and the peak load with thermal power plants, which were to be fired with domestic hard coal, received preferential treatment (Kikkawa 2004a, 271-2, 295-7). As early as 1952, the government had founded a company to build up and operate electric power generation capacity (*Dengen Kaihatsu Kabushiki Gaisha*). This was to run hydroelectric and thermal power plants, i.e. to enter a field where private companies acted with reserve. In order to promote domestic plant and heavy machinery construction, the then MITI (today's METI) urged owners and operators of new power plants to import only the pilot plants and commission all other to domestic plant manufacturers or builders (Kikkawa 2004b, 259-63).

### 3.2.2 State Political Interests: Hidden Military Budget?

From 1937 to 1941, the world's largest battleship *Yamato* was built in strict secrecy in the Kure Shipyard (Hiroshima Prefecture). Its construction costed 137.8 million JPY, or 1.8% of Japan's government spending 1938-1941. From 1942 to 1943, the *Yamato* was the flagship of the Japanese Navy in WW II. In April 1945, it was sunk off the coast of Kagoshima by US Navy aircraft. In August 1945, a US-American atomic bomb destroyed Hiroshima, killing more than 120,000 people. Located 18 kilometres from Hiroshima, in Kure's Shipyard No. 2, where once the *Yamato* turrets were built, Hitachi assembles and tests nuclear reactor pressure vessels today.'

(Katsuhisa Miyake, *Nihon o horobosu denryoku fuhai*, 2011, 283-6)

Progress in nuclear conversion in the UK, Canada, France and the Soviet Union unsettled US president Dwight Eisenhower (Yamaoka 2011, 46; Suzuki 2006, 126). Pushed for commercial liberalization by the US nuclear industry, among other things, he delivered his 'Atoms for Peace' address to the UN in 1953. It was labelled as an appeal for the peaceful use of nuclear power. Yet, it did not imply the renunciation of military use.<sup>8</sup> In 1949, the Soviet Union demonstrated the functionality of its own atomic bomb, breaking the US monopoly on nuclear weapons technology. As a result, the US government tried to integrate their allies into the now nuclear arms race. For the civilian use of nuclear power, fissionable and weapons-grade uranium 235 must be enriched. Neutron exposure of uranium 238 generates weapons-grade plutonium 239.<sup>9</sup> To build NPPs, producing nuclear fuel and disposing of it or reprocessing it require huge investments. In view of the quantitative nuclear arms race, it was in the interest of the military to industrialise the production of weapons-grade uranium or plutonium. This, in turn, corresponded to the economic interest of electric power companies to rapidly amortise high investments and increase profits through economies of scale.<sup>10</sup> NPP manufacturers or builders gained export oppor-

8 Suzuki 2006, 12; Tanaka, Toshiyuki 2011, 1285; Hirata Kōji 2011, 1275-6.

9 Suzuki 2006, 34; Takubo 2011, 165-76; Fujita 2011, 1270-1. Officially, Japan had 30.1 t of fissionable plutonium at the end of 2010, 6.7 t in Japan and 23.4 t in the UK and France for reprocessing (AEC 2011a). As of late 2016, Japan owned 46.9 t, 9.8 in Japan and 37.1 in the UK and France (AEC 2017, 112). According to the IAEA, 8 kg of fissionable plutonium are required for a nuclear warhead (IAEA 2001). If so, the amount of fissionable plutonium owned and held domestically by Japan in 2010-2016 corresponds to a quantity of 837 (2010)/1,225 (2016) nuclear warheads. However, estimations from 2010 state that the newer generation of warheads needs only 4 kg (Sanger 2010).

10 This means the reduction of unit costs associated with the increase in production volume.

tunities as well as chances of follow-up business related to the licensing and maintenance of NPPs. Growing demand for nuclear fuel led to rising prices and profits in uranium mining and uranium enrichment.<sup>11</sup>

US-American nuclear bombs destroyed Hiroshima and Nagasaki in 1945, killing hundreds of thousands of people, and in 1954, Japanese fishermen were fatally contaminated during a US-American hydrogen bomb test on the Bikini atoll (Yamazaki 2011, 1277-83). In this respect, there should have been reasons for a general rejection of nuclear technology among the Japanese population. Nevertheless, the promises of its peaceful use were widely accepted by the majority, ranging from right-wing revanchist and conservative to liberal-democratic and socialist positions (Yamaoka 2011, 13, 98). But the political initiative for promoting nuclear power was taken by those whose ambitions had failed with the defeat in World War 2. In the access to nuclear technology they saw the opportunity to restore their own position and bring Japan back into the circle of powerful states (Suzuki 2006, 29, 30; Yamaoka 2011, 11, 14).

Supported by the US government and its secret service, two key figures came to excel, the former naval officer, right-wing conservative politician and later prime minister Yasuhiro Nakasone and the later founder of the private television station Nippon TV and entrepreneur of the Yomiuri media group, who had been convicted of war crimes in 1945, Matsutarō Shōriki. They pushed for the immediate use of nuclear power in state economic policy and legislation (Arima 2011; Tateno 2011, 1287-8). Tackling cleverly with prime ministers Shigeru Yoshida (1946-47, 1948-54), Ichirō Hatoyama (1954-56) and Nobusuke Kishi (1957-1960), Nakasone and Shōriki received important cabinet and committee positions from the mid-'50s onwards. In 1954, Nakasone pushed the state funding of nuclear research (i.e. NPP development) and in 1955-1956, in the form of an initiative by a parliamentary member, the laws necessary for the institutionalisation, realisation and financing of the civilian use of nuclear energy (Yoshioka 2011c, 1296-7). While Nakasone regarded nuclear technology as being in the interest of the state, Shōriki represented the private sector (Yamaoka 2011, 99; Yoshioka 2011c, 1297). As their political influence and the prospects for commissions and state subsidies grew, they became interesting for and generously financed by big business (Onizuka 2011, 130-47).

In 1964, China tested a nuclear bomb for the first time. As a result, the Japanese government re-examined the possibility of producing and owning its own nuclear weapons. In the end, however, it saw itself unable

<sup>11</sup> Onizuka (2011, 12-36) sees in Victor Rothschild (1910-1990) the driving force behind US nuclear policy and its expansion to Japan, because as the majority shareholder of Rio Tinto he benefited most from the military and civil use of nuclear power and the resulting boost in demand for uranium. The uranium price actually rose from 17 USD per kg (1972) to over 110 USD per kg (1980) (OECD 2006, 35).

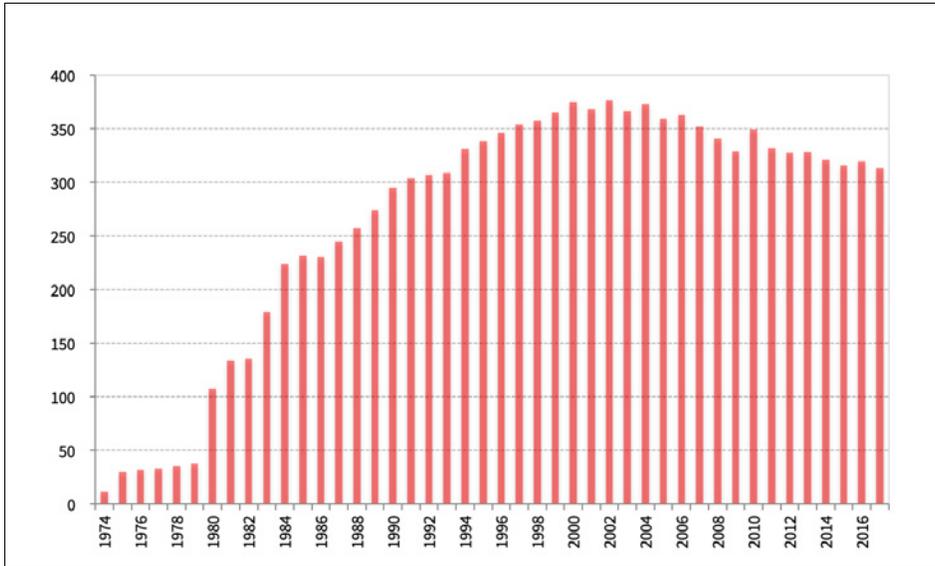
to produce nuclear weapons on a militarily relevant scale at justifiable cost. Japan had to renounce this option anyway, when it joined the Non-Proliferation Treaty (NPT) in 1970 and went under the 'nuclear umbrella' of the US. With respect to the civilian use of nuclear technology, Japan was subject to International Atomic Energy Agency (IAEA) supervision and licensing by the US, although it secured limited reprocessing rights and retained the technological conditions for the production of nuclear weapons (Suzuki 2006, 191-3).

In 1961, the Japanese government passed the Act on Compensation for Damage Caused by NPP. Responding to foreign demands, NPP builders were exempted from any liability. Initially, operators had been held fully and indefinitely liable except in case of natural or social catastrophes, and they had been obliged to insure each NPP as a corporation in a twofold way: up to the maximum limit set by the private insurer and up to the same amount once again with the state. However, the Act left the settlement of claims exceeding the recovery limits of insurances of 50 million JPY (equivalent to 120 billion JPY as of 2011, cf. *The Asahi Shimbun*, 11 April 2012, 3) to the state – albeit depending on parliamentary decision.<sup>12</sup> This minimised the liability risk for NPP operators and created the socialisation of claims for damages that cannot be covered by private insurance companies. For the NPP operators it increased the necessity to steer government, parliament and bureaucracy in their interest not only with respect to the supervision of business operation and price fixing, but also in the event of an emergency (Shimura 2011, 128-66).

Government bureaucrats, electric power companies and politicians argued over who were to take the initiative in the civilian use of nuclear power, how to build and operate the first NPP, and whom to charge with the costs and risks. The solution was the founding of the Japan Atomic Power Company (*Nihon Genshiryoku Hatsuden Kabushiki Gaisha*) in 1957. Electric power companies and other private investors held 40% each, while 20% were owned by the state (Kikkawa 2004a, 301-2). The development of fast breeders (FBR) for the production of plutonium and plutonium reactors (ATR) as well as the reprocessing and uranium enrichment stayed with the Government Agency of Science and Technology. In 1957, the latter established the Nuclear Fuel Corporation (*Genshiryoku Nenryō Kōsha*), which was absorbed by the Power Reactor and Nuclear Fuel Development

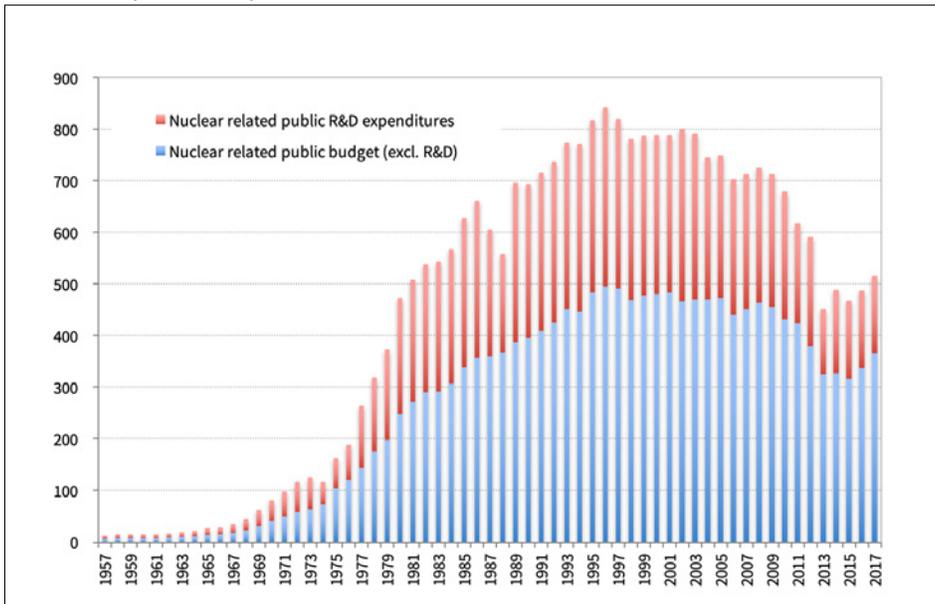
<sup>12</sup> This final passage is seen by Takemori as a compromise between the political proponents of nuclear power generation, civil law experts and the Ministry of Finance. The latter considered it unacceptable to exempt private NPP operators from any obligation to pay compensation beyond the insurance limits and to burden public finances with such a risk of compensation. Since then, the nuclear power proponents and the NPP operators have ensured that the parliamentary decision-making process in the event of a disaster would follow their interests (Takemori 2011, 137-9).

Chart 3.6a Power generation promotion tax income in Japan (since FY 2007: 0.375 Yen/kWh, in billion JPY, FY)



Source: Author, based on MOF 2017b; AEC 2018

Chart 3.6b Released central government’s budget volume for promotion and R&D of nuclear power in Japan (in billion JPY, FY)



Source: Author, based on JAIF 2018; AEC 1994, 2018; IAEA 2018a; MOF 2017b

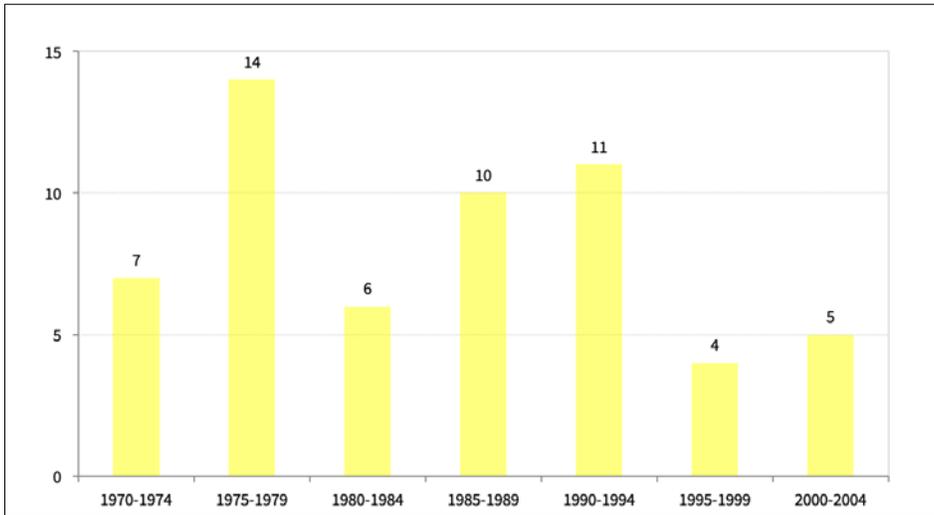
Corporation (*Dōryokuro Kakunenryō Kaihatsu Jigyōdan*) in 1967. This created a bipartite organizational structure of nuclear state activities: the METI promoted and oversaw the commercial use of nuclear power by the electric power companies, while the unprofitable activities were delegated to the Government Agency of Science and Technology (now within the Ministry of Education, Culture, Sport, Science and Technology, abbr. MEXT) (Yamaoka 2011, 90-7, 118).

Local resistance to new power plants of all kinds had been growing since the '60s. These plants produce electricity for remote metropolitan or industrial areas, but they affect people's land and fishing rights in rural areas (Yoshioka 2011a, 148). In 1974, the so-called Three Laws (*Dengen Sanpō*) were put into effect to promote and allow the construction of new power plants, especially NPPs, against local resistance and to pay high subsidies to willing communities.<sup>13</sup> The related budget is financed by a tax imposed on the electricity sold, included in the price and finally paid by the consumer (charts 3.6a-b).

The Electricity Act of 1964 regulates the power companies' application for the electricity price to the METI for permission. They submit their demand projection, investment and rationalisation plan and the cost accounting. The latter includes ongoing operating costs (personnel, maintenance, repair, materials, insurance, taxes) as well as fuel and capital costs (depreciation). The METI determines a rate of return on the fixed and current assets, which allows the company to continue business, that is, to pay sufficient dividends to the shareholders or interest to the lenders. The total of cost and interest on property is allocated to the types of electricity or customers and the expected demand quantities. Thus, the electricity companies are dependent on the METI insofar as the latter formally acknowledges their submitted cost and approves prices and profit margins. In other words, with the Electricity Act the state took over the risks related to damage compensation and business allocation and enabled the companies to get investment cost immediately reflected by the electricity price. Thus, costs and risks of NPPs sank to such an extent that private-sector electric power companies had no reason not to use nuclear energy commercially. Japan's first commercial NPP started operation at the NPP Tōkai in 1966.

<sup>13</sup> According to Ōshima, 70% of these subsidies went to NPPs (Ōshima 2010, 36). In 2011, a municipality, siting a 1.35 GW NPP with a construction period of seven years and an operating period of 40 years, could receive 48.1 billion JPY in state subsidies during the decade prior to start of operation and a total of 138.4 billion JPY in state subsidies until the end (METI [2011] 2018, 3).

Chart 3.7 Number of NPRs in Japan by start of operation (ex. Tōkai and Monju, CV)



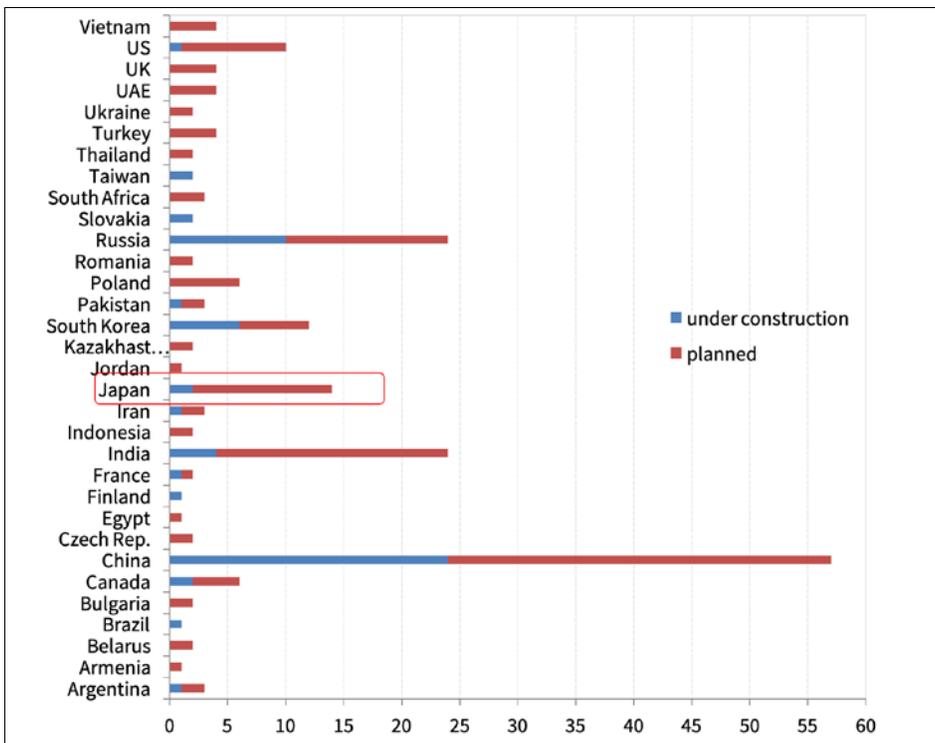
Source: Author, based on JNES 2013

In 1957, Shōriki had succeeded in importing a gas-cooled Calder Hall reactor (GCR) from the UK as research minister and vice-prime minister. The GCR was initially offered to Japan as a civilian application of military nuclear technology, able to produce weapons-grade plutonium (Yoshioka 2011c, 1292; Yamaoka 2011, 86-102). In 1960, the Japanese Atomic Power Company commissioned the construction of the reactor that started operation six years later (Yamaoka 2011, 102). At the same time, however, General Electric (GE) was commissioned the turn-key construction of a 12.5 MW boiling water reactor (BWR) for research purposes. In August 1963, it was launched with a six-month delay as the Japan Power Demonstration Reactor (JPDR), but it had to be stopped after two months due to severe malfunctions.<sup>14</sup> Its commissioning in October 1963 is considered to be the beginning of nuclear power generation in Japan and a shift towards the light water reactor technology promoted by the US (Yoshioka 2011c, 1297). Since 1976, GE technicians had ignored indications that the Mark-I type reactor vessel, used in addition to reactors 1-6 at the Fukushima-1 NPP in ten other reactors in Japan, is an unsuitable and extremely dangerous misconstruction for an earthquake-prone country (Tanaka 2011c, 3, 5; 2012, 106-7, 110-1).

<sup>14</sup> The criticism of the unreliability of GE technology and its misfit to the local conditions by Japanese researchers has been defamed and suppressed as ‘communist agitation’ (Tateno 2011, 1288).

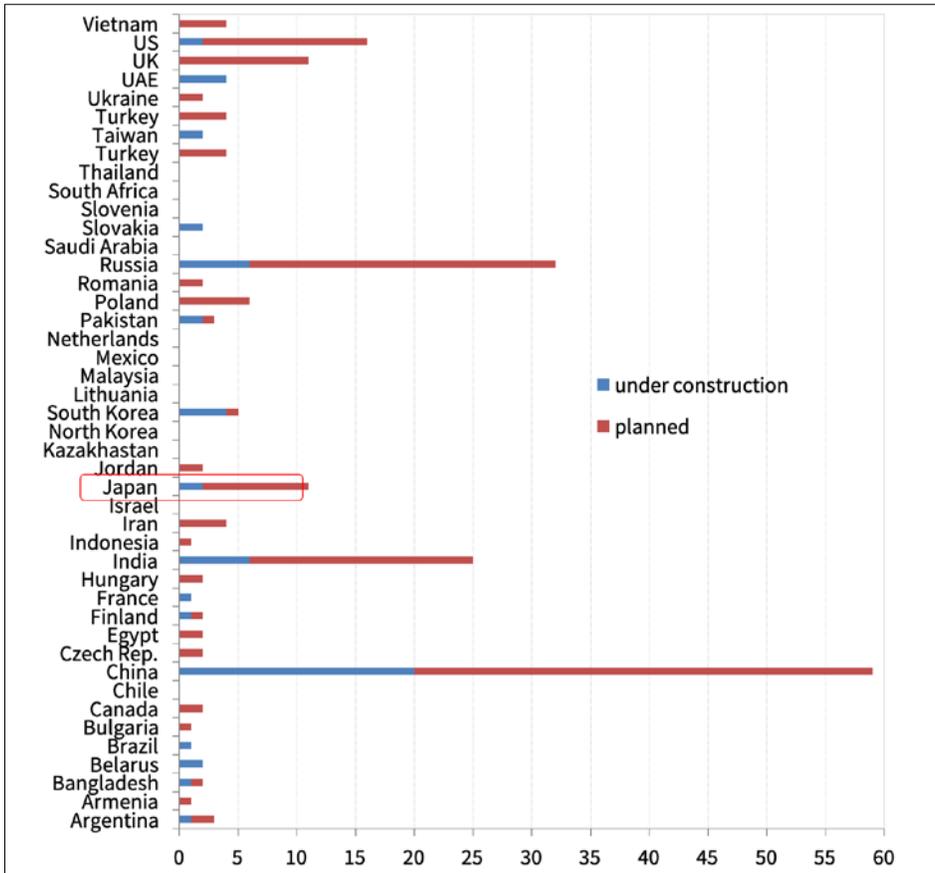
In the context of the oil crises of 1973, 1979 and 1990, averagely two new NPRs were commissioned each year. Promoted by METI, TEPCO choose the BWR developed by GE and built by GE licensees Tōshiba and Hitachi, KEPCO took Pressurized Water Boiling Reactors (PBR) developed by Westinghouse (WH) and built by its licensee Mitsubishi Heavy Industries (MHI) (Kikkawa 2004a, 303-7; Yoshioka 2011, 1297). While in the US and Western Europe NPPs were only rarely built in response to the severe catastrophes of Three Mile Island 1979, Chernobyl 1986 and Tōkaimura 1999, these disasters did not affect Japan: New NPPs were built until 2005 (charts 3.2, 3.7, 3.8a-b).

Chart 3.8a NPRs planned or under construction as of 1 July 2010 (n = 208 (59 + 149))



Source: Author, based on WNA 2018

Chart 3.8b NPPs planned or under construction as of 1 February 2018 (n = 220 (57 + 163))



Source: Author, based on WNA 2018

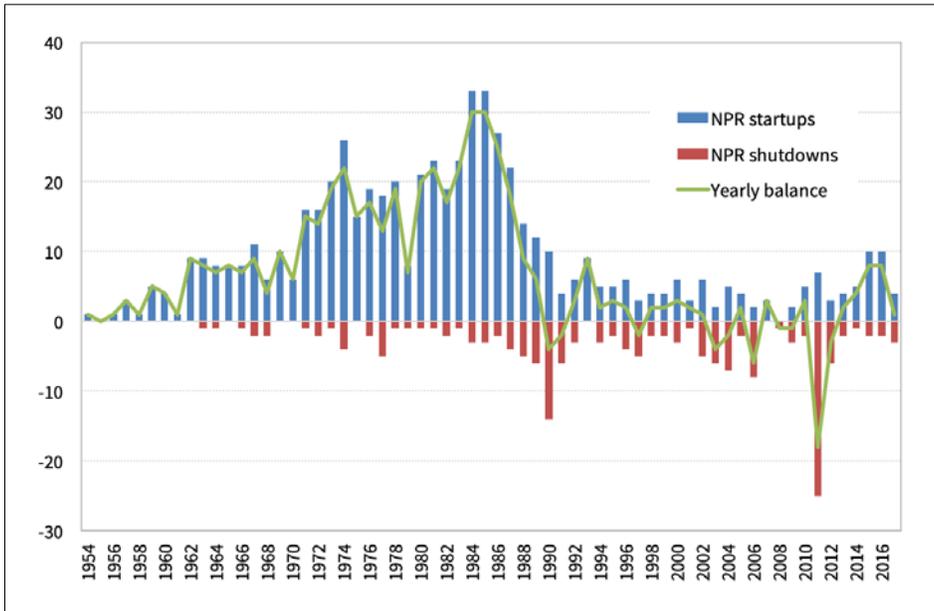
### 3.2.3 Industrial Policy Interests: Infrastructure Export

State-political interests had paved the way for the commercial use of nuclear energy in Japan and given rise to a network called ‘nuclear village’ (*genshiryoku mura*), consisting of politicians, METI bureaucrats, electric power companies, NPP manufacturers or builders, construction companies, local communities, scientists and media companies (Kainuma 2011a; Īda Tetsuji 2012, 114-24). Kainuma has characterised this as ‘domestic colonisation’ (Kainuma 2011b, 1300-2). State policy in Japan was and is primarily economic or industrial policy. With regard to the electric power industry, the state has not only supervised, but also supported the involved

companies. Ever since the '70s, Japan's government has focused on reducing the dependence on nuclear technology imports from the US and developing Japanese companies' expertise in manufacturing and maintaining NPPs through an economy of scale in the domestic market up to a level, where they can eventually meet demand from overseas. Applying this pattern, the METI had guided the heavy industry in the '60s, the automotive industry in the '70s and the electronics industry in the '80s. In the '90s, however, Japan entered persistent deflation and demographic stagnation. Against this backdrop, the METI considered promoting the domestic nuclear industry and its export potential one of the last fields of influence (Takemori 2011, 56-68). For that, it was indispensable to keep the domestic use of NPPs trouble-free and at low cost, despite the site risk, serious accidents and actually high costs. With the increasing number of NPP/NPRs built in Japan in the '70s and '80s, the volume of orders and the share of value of Japanese NPP manufacturers or builders grew. In the late '80s, they exported reactor pressure vessels to China together with US manufacturers (CNIC 2012b) and jointly developed a new generation of so-called Advanced Boiling Water Reactors (ABWR) for the Kashiwazaki NPP. But the nuclear catastrophes of Three Mile Island in 1979 and Chernobyl in 1986 revealed the dangers and economic risks that a private NPP/NPR operator would actually have to bear. When the US government deregulated electricity markets in the '80s and '90s, demand for new NPP/NPRs dropped. In Western Europe, too, the demand declined. The attempt to export NPP/NPRs to developing countries and OECD countries in the wake of the 1997 Kyōto Climate Change Agreement failed (Akaishi 2011, 156). NPP/NPR manufacturers in the US and Western Europe had to limit their business to stock maintenance and reprocessing (chart 3.9).

Meanwhile, Japan's NPP/NPR builders were able to erect new NPPs until the first half of the 2000s. However, the partial liberalization of the Japanese electricity market and the reduction in electricity prices since the late-'90s had forced electric power companies to reduce investment in new capacity and focus on cost-effective capacity replacement. In order to obtain competencies and capacities in manufacturing, NPP/NPR builders and the METI had to open up external demand. An opportunity presented itself with the so-called Nuclear Renaissance: in response to the imminent closure of older NPPs and rising oil prices, the US government under president George Bush (2001-2009) promoted the expansion of NPP capacity as the supposedly cheapest route to reduce CO<sub>2</sub> emissions (Yoshioka 2011b, 15-9; Akaishi 2011, 157). The Japanese government regarded this change as highly appealing as the *Guidelines on Nuclear Policy (Genshiryoku seisaku taikō)*, AEC 2005) and the *Plan for National Development of Nuclear Technology and Industry* (METI 2006) evince. Both aimed to secure domestic demand for NPP/NPRs and promote reprocessing of nuclear fuels (plutonium enrichment) in Japan as well as NPP/NPR exports from Japan.

Chart 3.9 Worldwide annual NPR start-ups and shutdowns

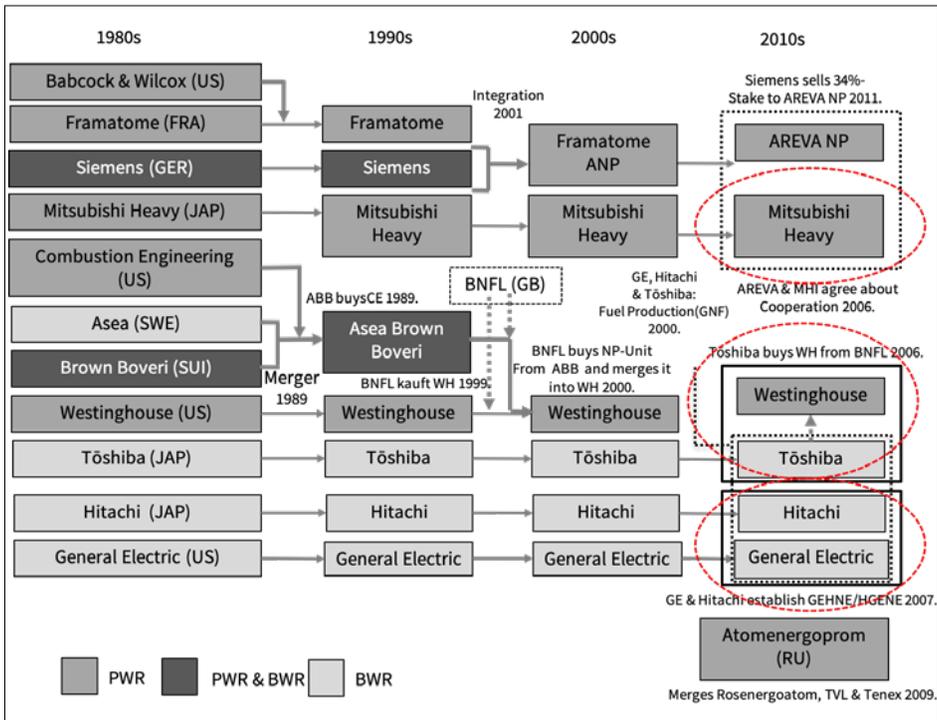


Source: Author, based on Schneider et al. 2011, 2017, 2018

Meanwhile, lacking own capabilities in building new NPP/NPRs due to the implosion of demand after 1979 and recognising the endemic risks of huge delays and cost-overruns, the US government saw its preferred partner for serving the NPP/NPR markets of the US, Asia, the Middle East and Eastern Europe in Japan and its NPP/NPR manufacturers (Akaiishi 2011, 158). For their part, METI and Japanese NPP/NPR manufacturers considered the US the ideal partner for eliminating all foreign and security policy obstacles - notwithstanding the ultimate guarantee of Japan’s right to operate NPP/NPRs and process nuclear fuel.

In 2006, Tōshiba acquired a 77% majority stake into Westinghouse (WH) from BNFL for 5.4 billion USD or 640 billion JPY, which was about three times as much as the initial estimations among insiders and more than double the competing offer made by Mitsubishi Heavy Industries (MHI). Later, Tōshiba took over another 10% of WH shares. Meanwhile, MHI began a cooperation with French AREVA. A year later, Hitachi and GE merged their NPP manufacturing businesses. Supported by the METI with subsidies, insurances and loan guarantees, Japan’s NPP/NPR manufacturers decided to enter the global market (chart 3.10, fig. 3.2).

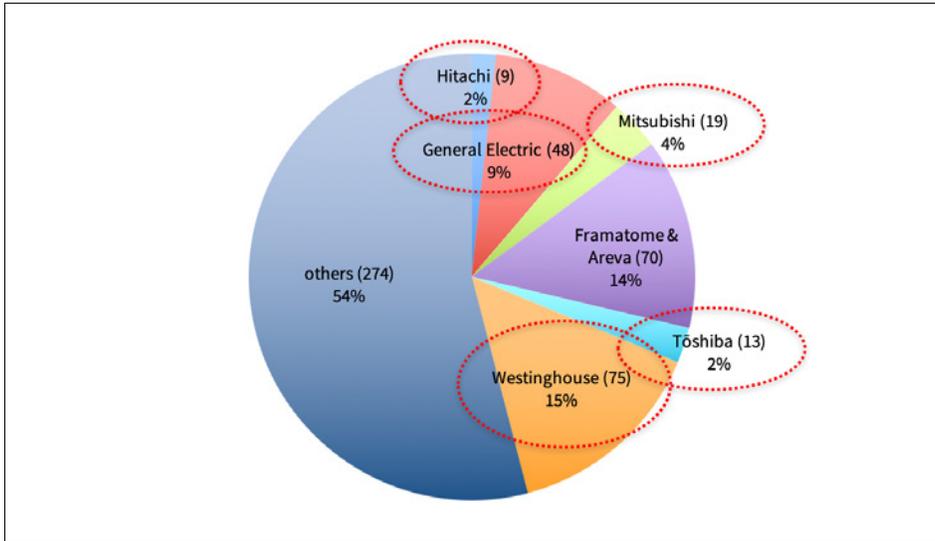
Figure 3.2 Concentration of ownership in the global NPP/NPR building industry



Source: Author, based on AEC 2017, 255

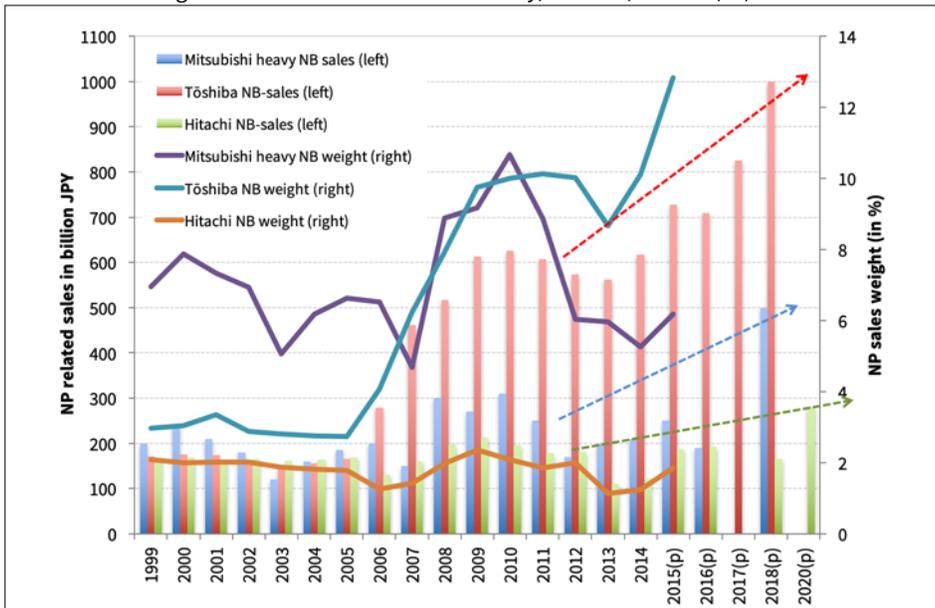
But these manufacturers are diversified conglomerates, in whose portfolio the NPP/NPR business is only one part. Thus, NPP/NPR exports were considered promisingly profitable even after 2011 insofar as they were insured and subsidised, that is, made less risky by Japan’s government at the expense of the taxpayer (CCNE 2017, 264-5) (charts 3.11a-b).

Chart 3.10 NPRs in operation or under construction by plant builder (worldwide n = 507, as of 2017/12/31, in brackets: no. of reactors)



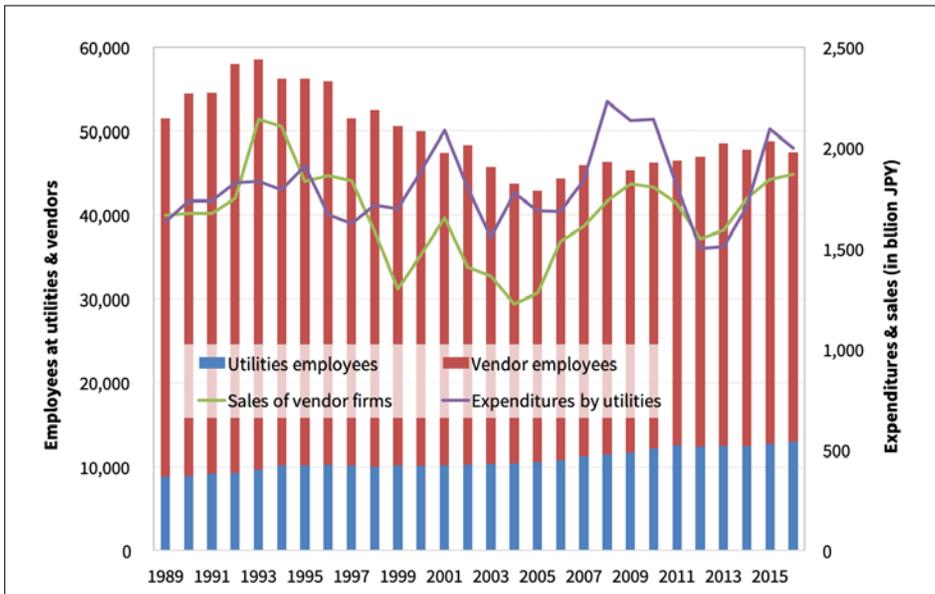
Source: Author, based on IAEA 2018b

Chart 3.11a Estimation of nuclear power plant business sales and weight of total sales at Mitsubishi Heavy, Toshiba, Hitachi (FY)



Source: Author, based on investors relation (IR)-reports

Chart 3.11b Nuclear power related expenditures of utilities, sales of vendors and employees of utilities and vendors in Japan (FY)



Source: Author, based on JAIF 2017

Even on paper (that is, in the planning phase) building and exporting NPP/NPRs is not feasible as private business without comprehensive state support and monopolistic or oligopolistic electric power companies as final client and NPP/NPR operator. In order to bundle export activities nationally, especially towards Vietnam, METI, the nine electric power companies and the three NPP/NPR builders founded the International Atomic Energy Development Corporation (JINED) at the end of 2010. But prospects deteriorated due to the Fukushima nuclear disaster of March 2011: new orders for NPP/NPRs were held off. Whether domestically or abroad, almost all new NPP/NPR building projects have seen huge delays and cost overruns. Despite intense political, financial and diplomatic support by Japan’s government, Japanese export projects have been cancelled in Vietnam, Taiwan, the US, suspended in Lithuania, delayed in India (Suzuki 2017, 90-3; CCNE 2017, 251-60) or will be in Turkey (*Tōkyō Shimbun Online*, 16 March 2018).

Facing a series of troubles, decreasing profitability and piling compensation demands from WH clients, Tōshiba manipulated its financial accounting to avoid huge impairments on its WH-related goodwill to an amount, that exceeded its equity capital. Based on optimistic expectations for sales

and profits<sup>15</sup> the goodwill was accounted as asset value, reflecting the gap between the investment of more than 6.1 billion USD paid by Tōshiba to acquire and control WH and the book value of WH net assets (estimated at 1.7 billion USD). Impairments became necessary, as the profitability of WH's business and its net assets deteriorated and the gap between expected and actual earnings widened. Even after first impairments of 2.4 billion USD in FY2015, further impairments were estimated to account for more than 3 billion USD in FY2016 against equity capital of 2.7 billion USD in FY2015. Ultimately, as the problems at WH could not be solved, Tōshiba's critical financial state surfaced. Thus, Tōshiba decided to let its subsidiary WH go bankrupt in March 2017. But it had to pay WH-related guarantees of 5.8 billion USD, mainly to WH clients. As a consequence, the risk of losses exceeding equity capital became evident in March 2017. Tōshiba had to indicate a negative equity capital of about minus 5 billion USD. In order to secure sufficient cash flow and avoid its own bankruptcy, Tōshiba sold most of its profitable businesses (e.g. medical equipment manufacturing for 6 billion USD to Canon in 2016, flash memory manufacturing for estimated 15 billion USD to Pangea in FY2017) and all its financial claims of 8.1 billion USD against WH for 2.1 billion USD to Nucleus. Finally, it had to raise new equity capital of 5.4 billion USD (by issuing 2.3 billion new shares in addition to existing 4.2 billion shares) in late 2017. Thus, the total WH-related losses for Tōshiba amounted to more than 12 billion USD (cf. FACTA 2017; Matsumura 2017; Tōshiba 2018).

Although domestic taxpayers and electricity consumers are charged with the financial burdens caused by NPP exports under the guidance of the Japanese state, this business itself inheres a level of exposure to political, financial and technological risks, that exceeds the controlling abilities of the alliance between state, builders and operators.

15 Before the decision to exit the WH-related NPP/NPR building business (outside Japan) in 2017, Tōshiba assumed for its business planning in November 2015 that there were more than 400 NPRs planned worldwide, of which Tōshiba aimed at receiving 64 (Tōshiba 2018).

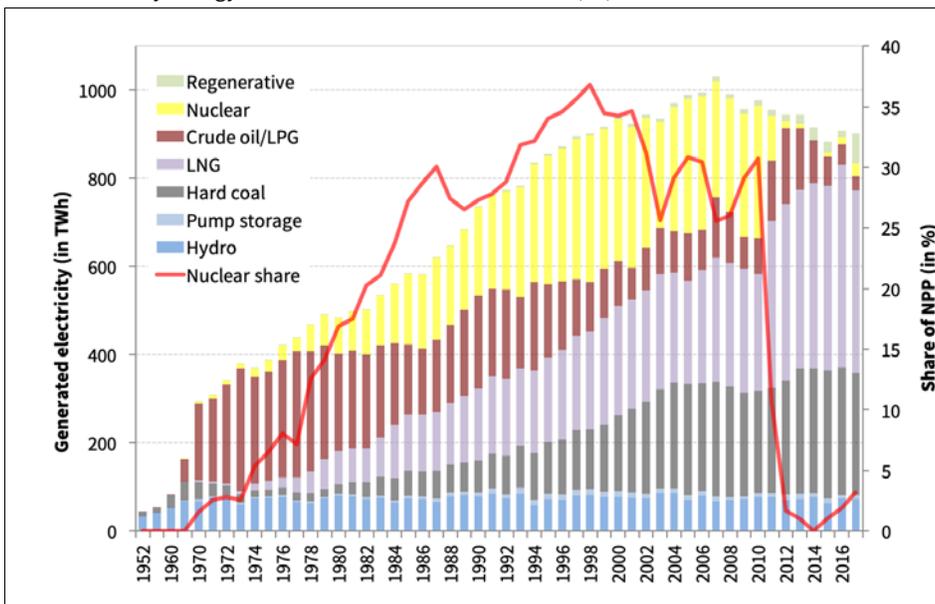
### 3.3 Fundamental Problems of a NPP-Centred Electricity Industry

By the end of the '90s, the share of electricity, generated at NPPs in Japan, increased to one third (charts 3.12a-b), while NPPs accounted for one fifth of the installed capacity of commercial electricity generation (charts 3.5a-b).

#### 3.3.1 Inflexible and Costly Control of Power Supply

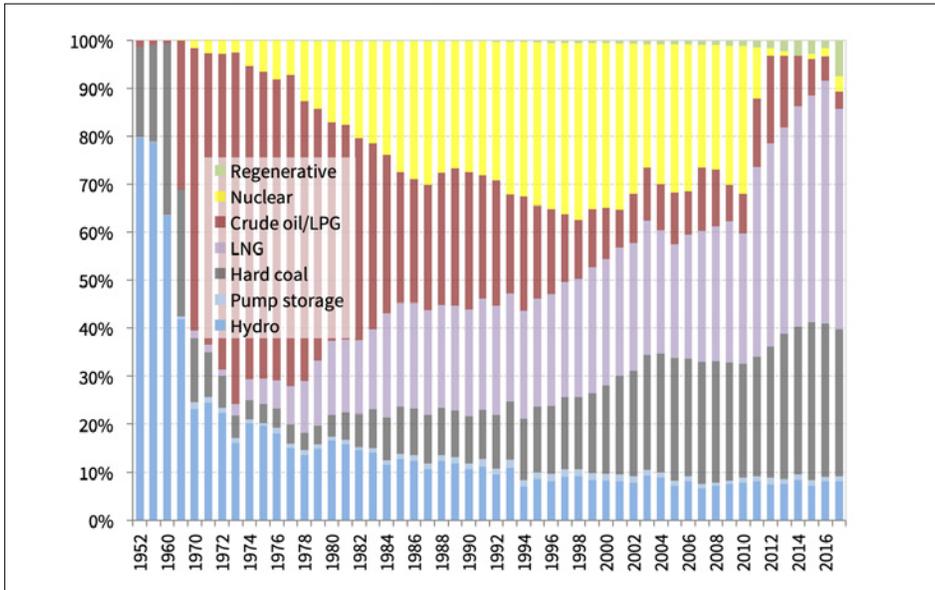
Compared to fossil fuel fired thermal powers plants, the construction costs of NPPs are high, in both absolute and relative terms (see § 3.3.3). Starting and stopping NPPs is expensive and time-consuming. Consequently, NPPs have to run continuously. They are therefore used to cover the base-load. The higher the share of NPPs in the electric power production, the greater the production surplus or oversupply that accumulates during night-time under-load phases, when demand for electricity is low. Costly hydro-pumped storage plants are used to absorb and accumulate the surplus and release it to the grid at peak-load time, when demand for electricity is higher than the continuously available supply, or baseload (fig. 3.3).

Chart 3.12a Annual commercial electricity generation (ex. in-house, including FIT) in Japan by energy source and related share of NPPs (FY)



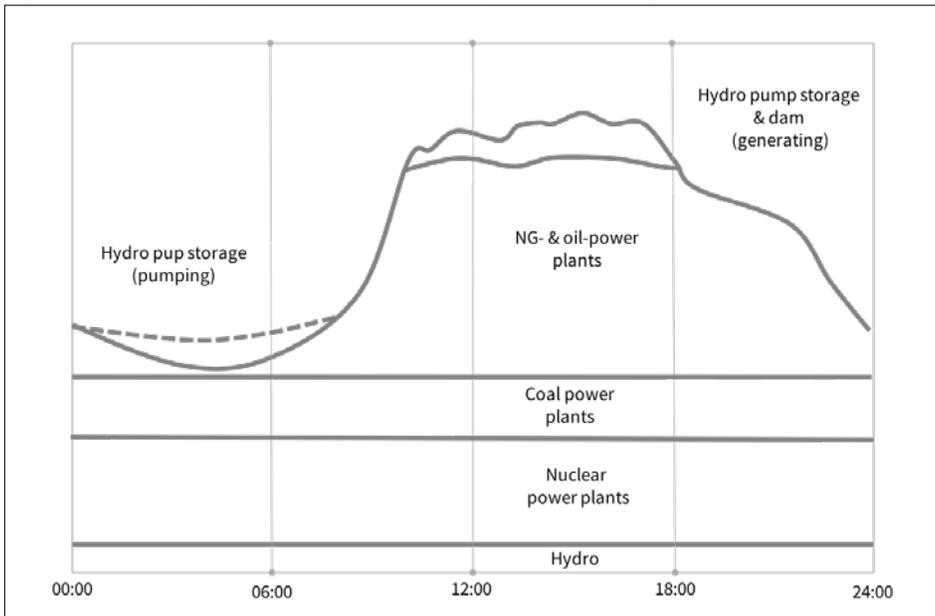
Source: Author, based on METI 2018c; FEPC 2018

Chart 3.12b Composition of commercial electricity generation in Japan by energy source (excluding in-house, including FIT, FY)



Source: Author, based on METI 2018c; FEPC 2018

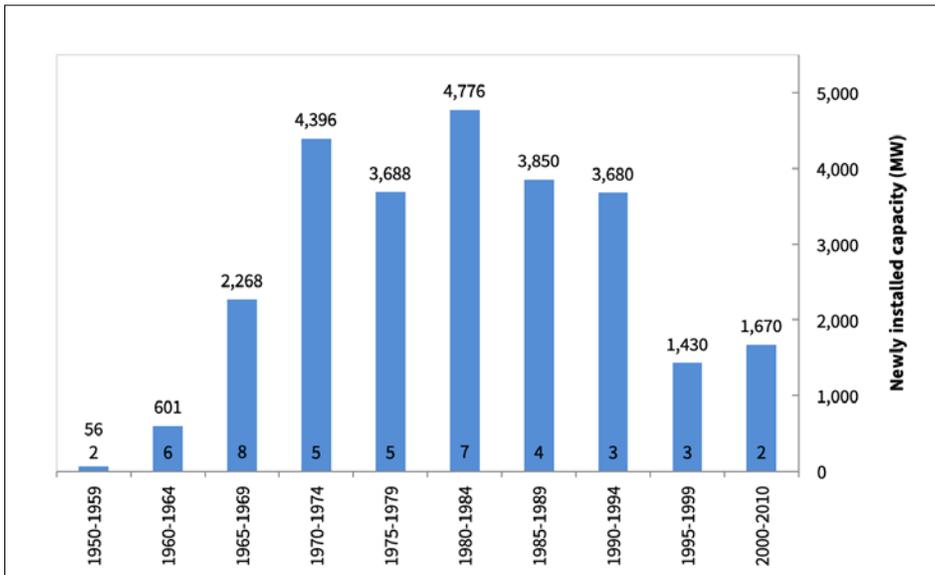
Figure 3.3 Power generation mix Japan by daily hours according to FEPC



Source: Author, based on FEPC 2011

Between 1950 and 2010 hydro-pumped storage power plants with a total generating capacity of 26.4 GW had been installed in Japan (chart 3.13). As of the end of March 2017, METI electricity statistics indicated an installed capacity of even 27.5 GW, at 10% of the total capacity (chart 3.5a). But, actually, these power plants have generated 7.6 TWh or less than 0.85% of all generated electricity in Japan, which means that their utilization rate is less than 3.2%. This explains partly why this type of electricity is extremely expensive.

Chart 3.13 Newly installed capacity and number of hydro-pumped storage plants in Japan by start of operation (CY)

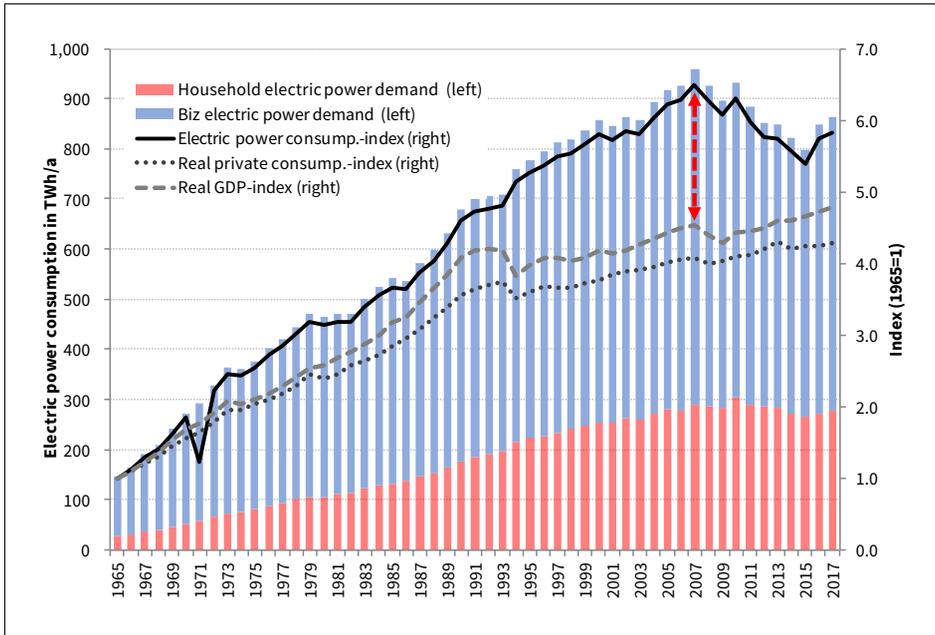


Source: Author, based on JEPOC 2018

However, about 25-35% of the injected electricity is lost during the double-step transformation process. Even with a relatively high single transformation efficiency of estimated 80-85% for each step (pumping and generating), the total energy loss ends up a little bit higher at 28-36%. In addition to high installation cost, low utilization rate and transformation losses, the different generation cost between hydro-pumped storage power plants and oil-fired thermal power plants, otherwise used to cover the peak load, must be considered: 0.70-0.96 JPY/kWh that is to be added

to the cost of NPP-generated electricity.<sup>16</sup> The same applies to the longer electric power lines and additional grid facilities connecting the NPPs with the main electricity consumers. NPPs are built far away from the industrial-urban agglomerations where the demand for electric power is high.

Chart 3.14 Electric power consumption in Japan (excluding self-production)



Source: Author, based on JBHI 2018; METI 2018b, 2018c; CAO 2018a

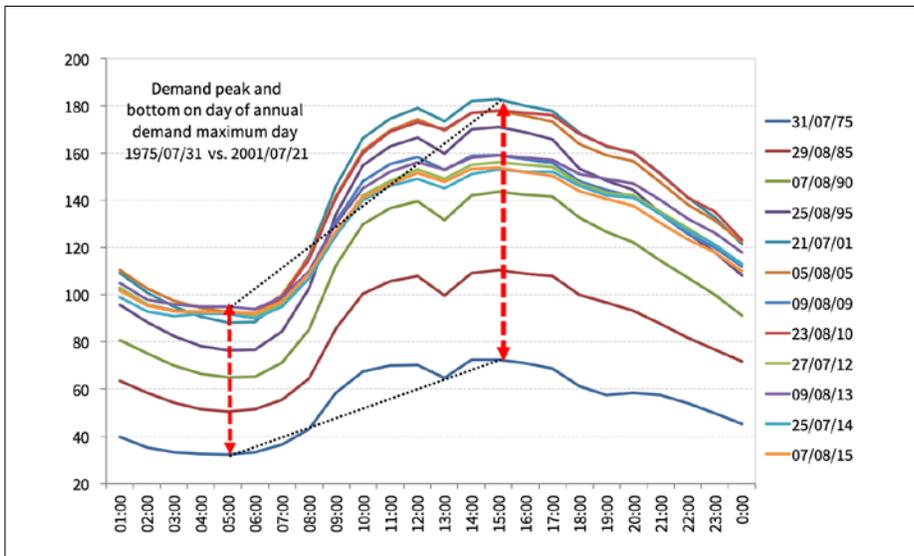
As distinct from standard textbooks assuming a free market economy where supply follows demand, Japan’s electric power industry and the dissemination of NPPs exemplify the reality of an oligopolistic economy: since the rapid expansion of NPP capacity in the ‘70s, electric power consumption in Japan has been boosted faster than real private consumption

**16** For the period from 1970 to 2010, Ōshima (2011c, 112) calculates the producer costs (excluding subsidies) for hydro-pumped storage power plants at 52.04 JPY/kWh (42.79 JPY/kWh for 2000-2007) and 9.87 JPY/kWh for thermal power plants. Akimoto (2011, 16) estimates the costs (2005-2007) for oil-fired thermal power plants at 13.8-23.2 JPY/kWh. The cost difference between hydro-pumped storage and oil-fired thermal power plants is thus 28.84-38.24 JPY/kWh (simple average of 33.54 JPY/kWh for 1970-2010) or 19.59-28.99 JPY/kWh (simple average of 24.29 JPY/kWh for 2005-2007). With 8.74 TWh, generated in hydro-pumped storage plants in 2010, the difference in electricity costs between hydro-pumped storage plants and oil-fired thermal power plants amounted to a total of 212.3-293.1 billion JPY in 2010.

and real GDP (chart 3.14). In other words, supply leads demand, because it becomes critical to increase utilization and fuel demand once expensive and inflexible capacity is installed, and even more so if the installation is heavily subsidised by the state and capital cost can be shifted to consumers as part of the regulated electricity retail price, as was the case until 2016 (see § 3.3.4).

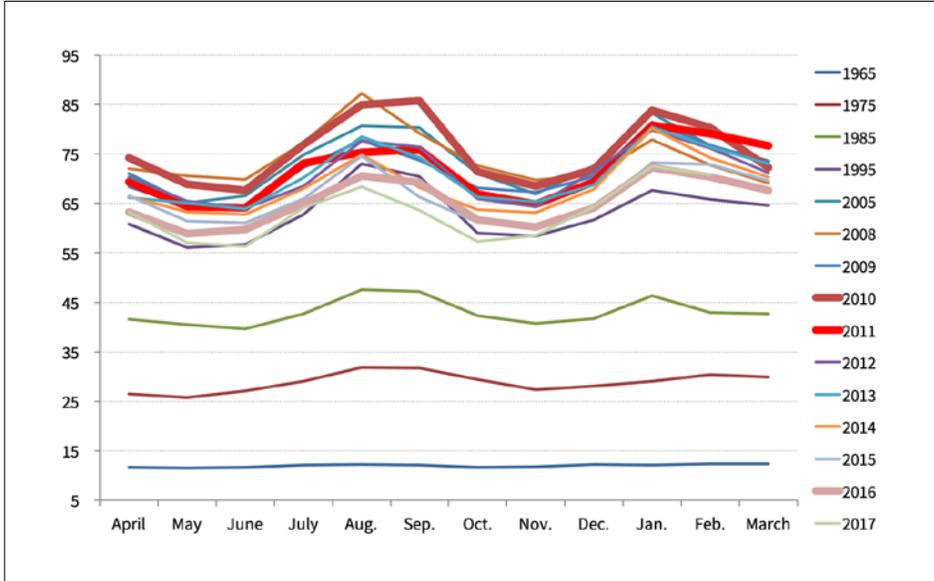
But since the early '90s Japan's economy has been struggling with deflationary stagnation, relocation of industrial capacity abroad and demographic contraction. Under such conditions, the baseload cannot be increased permanently. The electricity companies managed to stimulate electricity consumption with relatively low electricity prices for large corporations and full electrification campaigns for private households until 2007-2008, but this did not elevate the baseload. Rather, seasonal and daily peak loads increased and widened the difference between peak and baseload (charts 3.15a-b).

Chart 3.15a Capacity peaks by maximum day and hours in Japan (regional monopolies/ FEPC, GW)



Source: Author, based on FEPC 2018; METI 2018b, 2018c

Chart 3.15b Sold electric power by month in Japan (regional monopolies/FEPC, in TWh, FY)



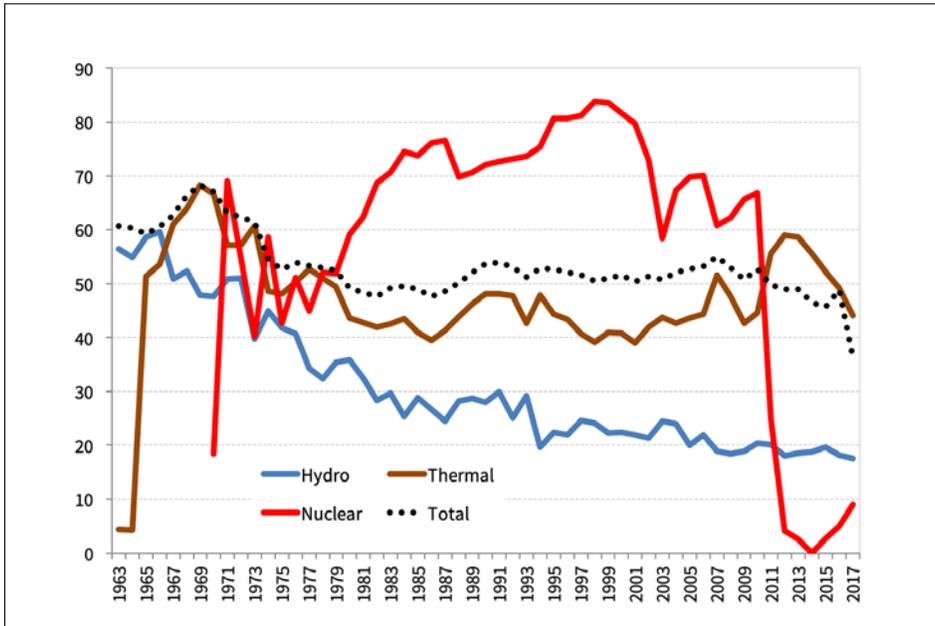
Source: Author, based on based on FEPC 2018; METI 2018b, 2018c

The widening gap between peak and baseload and the large fluctuations in the production and consumption of electricity caused the utilization rate of the entire power plant fleet first to fall and then to stagnate at a low level. This was due to the increased share of NPPs in electricity production and the decreased utilization of hydropower and thermal power plants. In addition, it is noteworthy that the utilization rate of NPPs had been inclined to fall since FY1999, when it reached 84% (chart 3.16). Back then, the total capacity of NPPs amounted to 45 GW. Entering a period of increased seismic activity and aging NPPs, there were more and more accidents and defects that the electric power companies tried to cover up.<sup>17</sup> The low utilization of hydropower and thermal power plants shows

17 In July 2000, a former GE technician who had been commissioned by TEPCO to inspect 13 NPRs at the NPPs of Kashiwazaki and Fukushima-1 and -2 informed METI that TEPCO had hidden cracks in the reactor walls, improper wiring and repair breakdowns. TEPCO denied the allegations, while METI delayed the investigation for more than two years and also released the informant's name to TEPCO. However, in September 2002, after GE had issued official evidence as a nuclear power plant producer on a METI request in November 2001 and after an internal investigation in March 2002 it was publicly conceded that TEPCO had falsified or withheld information related to the self-assessing of 13 NPRs since the '80s, i.e. over a 29 year period (Yoshioka 2011a, 321-5). In April 2003, all TEPCO reactors underwent a special review and were disconnected (*The Asahi Shimbun*, 15 April 2003, 1).

that – contrary to the threats by companies and government that electric power shortages or outages will occur if NPPs are shut down – there are sufficient capacities for non-nuclear electricity generation to compensate for a nuclear phase-out (Uezono 2012, 48-51).

Chart 3.16 Utilization rate of electric power generating capacity by source of energy in Japan (regional monopolies/FEPC, vs. 8760 h/a in %, FY)



Source: Author, based on FEPC 2018; METI 2018b, 2018c

Peak loads could be reduced by introducing tariffs that reward peak power savings. But in reality over-consumption is stimulated by tariffs that lower the price of electricity per unit in the base price category when the total consumption increases. This applies to corporate customers, who consume about 70% of Japan’s total electricity (chart 3.14) and probably more during the annual peak days in summer and winter (fig. 3.3, charts 3.15a-b). Thus, large industrial customers, who want to reduce their unit costs, are pushed to fully exploit the consumption volume allowed by the basic price band, especially in periods of high consumption (Yū Tanaka 2011, 138-9). The cost of building and maintaining power generation capacity

In July 2007, all seven reactors of the Kashiwazaki NPP were severely damaged during the Niigata earthquake (Yoshioka 2011b, 36-7).

is included in the retail price of electricity through depreciation costs and the return on operating assets, recognised by the METI and paid for by private households. Thus, the power companies are not encouraged to be efficient, that is, to install and maintain only those capacities that they can control flexibly and use efficiently. Normally, efforts should be undertaken to reduce peak load demand. It would also be conceivable to draw on surplus electricity from other parts of Japan (in summer from northern, in winter from southern Japan) instead of constantly maintaining own extra peak-load capacity. However, the AC frequencies in Japan differ between East (50 Hz) and West (60 Hz). One would have to (a) adjust the frequencies, (b) switch over to DC grids or (c) expand the transformation capacity, which is currently limited to 1.2 GW. All three alternatives are rejected by the electricity companies with reference to unreasonably high costs. In actual fact, they mean to avoid competing against each other and lowering entry barriers for new competitors.

### 3.3.2 Nuclear Fuel Cycle Unclosed

#### 3.3.2.a Front-End: Expensive and Limited Uranium Enrichment

To operate NPPs, nuclear fuel must be enriched, i.e., the proportion of easily fissile uranium 235 must be increased from only 0.7% in natural uranium. For this, uranium ore is mined, pulverised to yellow cake (U<sub>3</sub>O<sub>8</sub>) with a uranium concentration of 84.8% and then converted to uranium hexafluoride (UF<sub>6</sub>). A centrifuge separates UF<sub>6</sub> into a depleted fraction and an enriched fraction. The latter is converted into uranium dioxide (UO<sub>2</sub>) and processed into uranium tablets (d = 1 cm, h = 1 cm, g = 5-8 g) and fuel rods (h = 4 m, w = 20 cm), 95-97% of which consist of uranium 238 and 3-5% of uranium 235. In a PWR 51,000 fuel rods with 87.0 t UO<sub>2</sub> are used, in a BWR 48,000 fuel rods with 88.6 t UO<sub>2</sub> (1,000 MW output) (NFI). One third of these fuel rods must be replaced annually.

For a long time, Japan had obtained enriched uranium almost exclusively from the US (Suzuki 2006, 195). At the beginning of the '80s, a state-owned company under the umbrella of the State Science Agency commissioned the first small enrichment plant. Afterwards, however, these activities were transferred to the electric power companies, while the State Science Agency (as part of the Ministry for Culture and Education, today's MEXT) focused on reactor research (Yoshioka 2011a, 179-80). Confronted with the consequences of operating NPPs since the '70s (growing fuel requirements and accumulation of radioactive residues) and stimulated by the change from the restrictive anti-proliferation course of the US government under Jimmy Carter to nuclear tolerance under Ronald Reagan (in 1981), METI and the electric power companies began to establish their own capaci-

ties for front-end and back-end: Rokkashomura (Aomori Prefecture) was to become the site for Japanese uranium enrichment, reprocessing and interim storage of nuclear fuels. Between 1988 and 1992, Japan Nuclear Fuel Ltd (JNFL, *Nihon Gennen Sangyō Kabushiki Gaisha*), founded by the NPP operators in 1985, invested 250 billion JPY in the construction of a plant where uranium has been enriched since then. The plant consists of seven cascades with several hundred gas centrifuges each. The lifespan of a cascade is approximately ten years. In 2010, JNFL announced its intention to bring five of the seven cascades with an annual capacity of 1,500 t of uranium separation work (UTA) into operation by 2015 and ten cascades by 2020 (JNFL). In actuality, only one cascade (150 t UTA/year) was in operation by 2010. This one cascade in operation was supposed to produce the 30 t uranium fuel rods (UO) needed for the annual consumption of a 1.0 GW NPR (Yoshioka 2011b, 39; Koide 2011a, 115). Since December 2010, the only operating cascade has also been at a standstill. Japan's NPP operators had to turn again to foreign countries, mainly Canada and Australia, to obtain almost all of their enriched uranium (Yoshioka 2011a, 345).

But what are the usual costs for producing uranium fuel (UOX)? First, the material process of uranium enrichment must be considered: 110,000 t uranium ore yield 250 t uranium ( $U_3O_8$ ) and 310 t  $UF_6$ . From 116 t UTA, 40 t enriched  $UF_6$  (3.5% uranium 235 concentration) are extracted, and finally 30 t uranium oxide (UOX) are produced (fig. 3.4).

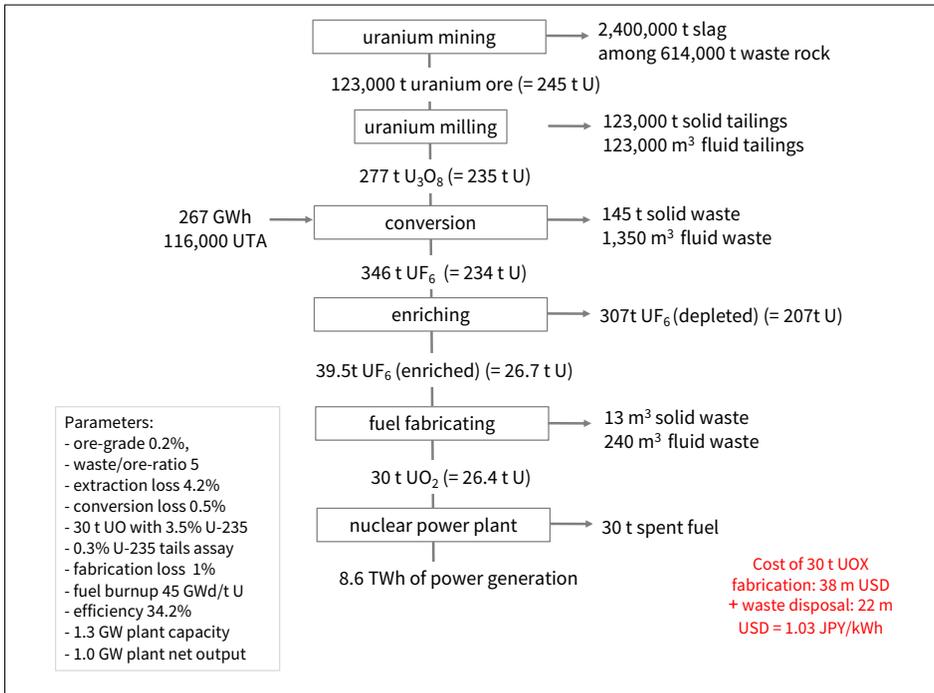
The market price for uranium was 22 USD/kg in 2002, rose to 300 USD/kg in 2007 and stood at 115 USD/kg at the end of 2011. In February 2018, the market price for uranium marked 47 USD/kg (UxC 2018). The market price for enrichment (UTA) rose from 90 USD/kg UTA in 1995 to 162 USD/kg in 2009 and stood at 140 USD/kg at the end of 2011. By February 2018 it had fallen to 37 USD/kg (UCX 2018). Conversion to and from  $UF_6$  cost 8.50 USD/kg at the end of 2011; in February 2018 6.25 USD/kg  $U_3O_8$  and the final production 460 USD/kg U. As of March 2018 the cost of producing 30 t of nuclear fuel (UOX) amounted to 37.8 million USD (2011: 58.4 million USD)<sup>18</sup> plus the cost of 22.2 million USD (2011: 29.5 million USD) for the disposal of 187 t of depleted uranium and 30 t of spent UOX fuel rods.<sup>19</sup> It goes without saying that this process consumes energy, the generation of which results in the emission of  $CO_2$ .<sup>20</sup> If the total front-end cost of 38-60 million USD or 4.0-6.3 billion JPY at 105 JPY/USD (in 2011: 58-88

18 17.9 million USD for  $U_3O_8$  (Natural Uranium) + 1.35 million USD for Conversion + 6.35 million USD for Enrichment + 12.2 million USD for Fuel Fabrication = 37.8 million USD in total.

19 Author's calculation based on WISE Uranium Project 2009a.

20 For the production of 30 t UOX (at a 0.2% uranium ore concentration in the open mining and use of electricity from coal-fired power plants) 55,000 t carbon dioxide are emitted (calculation based on WISE Uranium Project 2009b).

Figure 3.4 Material processing in nuclear fuel production (front-end)



Source: Author, based on Koide 2011a, 115; WISE Uranium Project 2009a, 2009b; OECD 1994, 10-6

million US or 4.6-7.0 billion JPY at 77 JPY/USD) is added to the amount of electricity generated by a 1.0 GW NPR at an annual capacity utilization of 70% (6.132 TWh), the front-end cost is 0.65-1.03 JPY/kWh (in 2011: 0.76-1.15 JPY/kWh). However, the cost of uranium enriched in Japan is several times higher than the international market prices due to high import prices, long transport routes, low economies of scale and highly vulnerable enrichment plants (Yoshioka 2011a, 354; 2011b, 40). Fuel rods and fuel modules have been manufactured in Japan since 1971 – by Japan Nuclear Fuel, a joint venture (JV) of GE, Tōshiba and Hitachi (since 2001 a GNF-J and GE subsidiary), by Mitsubishi Nuclear Fuel Co., Ltd. (JV of Mitsubishi Heavy, Mitsubishi Corporation and AREVA) and Nuclear Fuel Industries (JV of Westinghouse, Sumitomo and Furukawa Electric).

The problematic state of domestic uranium enrichment has not been prioritized in Japan as the government has given the import and enrichment of uranium a subordinate role in its nuclear policy. The aim was to maintain this variant as a second option and entitlement. The primary

goal has always been the production of home-made plutonium to reduce Japan's dependency on foreign countries and keep the foreign policy option of owning nuclear weapons open.

### 3.3.2.b Back-End: Dangerous and Expensive Plutonium Cycle and Unresolved Storage

After a period of 36-48 months, fission products accumulate in the fuel rods and so their reactivity decreases;<sup>21</sup> about one third of the 90 t of fuel (per NPR with a capacity of 1 GW) has to be replaced annually (Strohm 2011, 153). At the time of removal, the fuel rods consist of 93-95% uranium 238, 1% each of uranium 235 and plutonium 239<sup>22</sup> and 3-5% of nuclear fission products. Fuel rods are initially put into so-called spent fuel cooling pools, then stored at interim or permanent disposal sites or reprocessed. Reprocessing is aimed at recovering plutonium and uranium by separating them chemically first from the fission products and then from each other. Uranium can be re-used for the production of uranium (UOX) fuel rods,<sup>23</sup> while most of the plutonium (civil use assumed) can be processed with uranium 238 to form mixed oxide (MOX) fuel rods consisting of uranium and plutonium dioxide (fig. 3.5).

At each stage of the process, radioactive particles (e.g. caesium, krypton, xenon, tritium) remain. Large quantities of contaminated residues are produced, which often escape into the environment (Strohm 2011, 639-46; Suzuki 2006, 81-96). MOX fuels were supposed to be used in so-called fast breeders (FBR). There, fast neutrons are first generated with plutonium 239. Uranium 238 absorbs these neutrons and transforms them, too, into plutonium 239, which is supposed to produce more plutonium 239 in addition to electricity that has to be used. The MOX fuels contain 20-30% fissile plutonium (Pu).<sup>24</sup> So far, however, all FBR programmes worldwide

21 Among more than 200 isotopes these are, for example, caesium, technetium, krypton, strontium, iodine, ruthenium and rhodium (Strohm 2011, 154; Hirose 2010, 205; Kamisawa 2011a, 76).

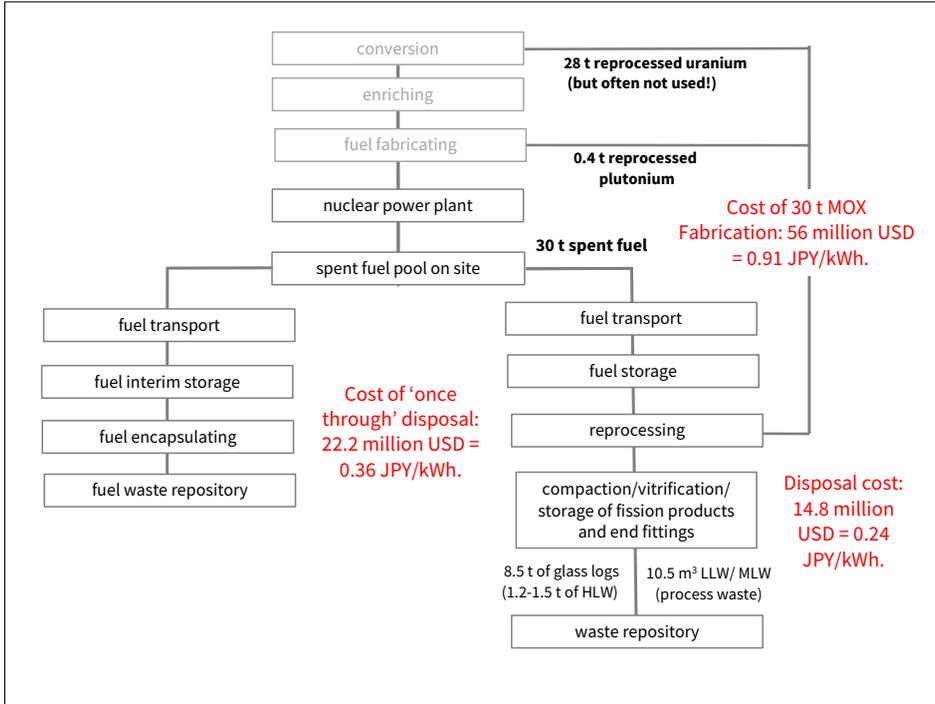
22 Plutonium 239 is formed when uranium absorbs 238 neutrons and transforms into plutonium 239 via uranium 239 and neptunium 239 (Hirose 2010, 250).

23 In fact, this rarely happened because natural uranium had been significantly cheaper than the uranium produced during processing for a long time (Bunn et al. 2003, 3-4). As of February 2018, this price/cost difference still exists, but has shrunken along with the price for reprocessed uranium of 57 USD/kg UTA vs. 47 USD/kg for natural uranium (U<sub>3</sub>O<sub>8</sub>).

24 Bunn et al. 2003, 82; Takubo 2011, 174; Hirose 2010, 250-2; Strohm 2011, 164.

have failed and been discontinued, except in Russia, India and Japan.<sup>25</sup> MOX fuels are now typically used in Light Water Reactors (LWR) with a  $PU_f$  concentration of 4-9%.

Figure 3.5 Disposal/reprocessing of (spent) nuclear fuel (back-end)



Source: Author, based on OECD 1994, 16; MIT 2003, 121; WISE Uranium Project 2009a, 2009b

25 “After spending more than 1 trillion JPY (9 billion USD) on its Monju prototype fast-neutron breeder, Japan’s government finally decided to decommission it entirely in December 2016. Even though the facility had operated only 250 days during its 22-year existence, government ministers still declared that the official policy of developing a fast reactor ‘has not changed at all’ – and even announced a plan to draw up a ‘strategic roadmap’ for fast-reactor development by 2018. The current idea is for Japan to join, as a junior partner, the French programme to design and build a fast reactor called the Advanced Sodium Technological Reactor for Industrial Demonstration on French soil” (Takubo 2017, 182-3).

How much does it cost to produce MOX fuel?<sup>26</sup> If one MOX fuel load for an LWR is to be manufactured as equivalent of 30 t uranium oxide (UOX), 30 t MOX with a  $PU_f$ -concentration of 4.25% result from combining 1.7 t plutonium or Pu (= 1.1 t  $PU_f$ ) and enriched 24.9 t uranium (= 28.2 t  $UO_2$ ). To extract 1.7 t of Pu, normally reprocessing of about 180 t of spent fuel ( $UO_3$ ) is required.<sup>27</sup> In addition to the 1.7 t PU (at a currently estimated cost of 3,300 USD/kg PU), 150 t of uranium reprocessed are to be extracted, 25 t of which are required for MOX production (at currently estimated cost of 57 USD/kg). The remaining 125 t of uranium worth 7 million USD (57 USD/kg) can be used for uranium enrichment. 49 million USD have to be added as cost of fabricating 30 t MOX fuel (WISE Uranium Project 2016-2018: 1,840 USD/kg HM). Thus, the cost of producing 30 t MOX fuel out of spent fuel would currently amount to about 49 million USD.<sup>28</sup> This is almost 70% more expensive than the 'once through' or open cycle of enriching natural uranium and manufacturing UOX fuel rods (29 million USD) (WISE Uranium Project 2009c). If the cost savings are set off against the spent fuel disposal cost of 22 million USD, the cost disadvantage of MOX production compared to the 'once through' or open cycle disappears theoretically. But not taken into account are the huge initial capital costs for building

26 OECD (1994) estimated the reprocessing cost of UOX fuel rods at 860 ECU or USD/kg HM (OECD 1994, 12) and the manufacturing cost of MOX fuel at 1,100 ECU or USD/kg HM (OECD 1994, 41). Bunn et al. (2003) indicated prices (= 20% surcharge on costs) for reprocessing at BNFL (THORP plant in Sellafield, UK) with a range of 1,600 (for 1989) to 2,300 (for 2003) USD and at the French COGEMA (today: AREVA, plant UP3 in La Hague) between 1,700 to 1,800 (for 2003) USD per kg/HM). The cost of the Japanese plant under construction (UP3 replica in Rokkashomura) was estimated at 2,300-4,100 USD (without and with financing cost) per kg/HM (Bunn et al. 2003, 29). The price of MOX production in the US was estimated at 1,900-2,400 USD/kg HM for the '80s and 2,100 to 2,700 USD/kg HM for the '90s. EDF paid an estimated 1,200-1,240 USD/kg HM to COGEMA (MELOX plant in Marcoule) in the '90s (Bunn et al. 2003, 50). Bunn et al. concluded that - even at conservatively estimated cost for the reprocessing of 1,000 USD/kg HM, the disposal of residues of 200 USD/kg HM, the MOX production of 1,500 USD/kg HM, the alternative uranium enrichment of 1,235 USD/kg and the direct interim and final storage of the uranium fuel of 600 USD/kg HM - the processing (or production) of plutonium only becomes cheaper than the immediate final storage and replacement of the fuels via uranium enrichment, when the price for natural uranium exceeds 360 USD/kg (i.e. reaches almost eight times the current market price). Under the same assumptions, it will only become cheaper to use MOX fuels in a fast breeder (FBR) vs. enriched uranium in a light water reactor (LWR) if the price of natural uranium is higher than 340 USD/kg (Bunn et al. 2003, ix). MIT (2013) calculated that, in order to make MOX fuels cheaper than UOX fuels, the price of uranium had to rise to 560 USD/kg, the cost of reprocessing UOX fuel rods had to fall from 1,000 USD/kg HM to USD 90/kg HM, interim and final storage cost for UOX fuel rods had to increase from 400 USD/kg HM to 1,130 USD/kg HM and interim and final storage cost for highly radioactive residues from reprocessing had to fall from 300 USD/kg HM to 100 USD/kg HM (MIT 2003, 148).

27 Author's calculation based on WISE Uranium Project 2009c.

28 7.1 million USD for the source material - 7 million USD surplus reprocessed uranium usable for enrichment/fabrication + 49 million USD for MOX fabrication.

MOX fabrication facilities – currently estimated at about 10 billion USD (DOE 2016, 2) –, the cost of NPR conversion for MOX use, the increased material fatigue and radioactivity during MOX use and the disposal during fabrication and after use. In addition to the technical problems of developing FBR and the high risk and cost of operation, it was also the high cost of using MOX in FBR that led to the discontinuation of FBR development programmes worldwide (with the exception of Russia, India and Japan).

Japan is currently the only country that does not yet have its own nuclear weapons, although being allowed to process nuclear fuels to produce plutonium and to use it for generating electricity.<sup>29</sup> Since the mid-'50s, Japan's government has claimed its own nuclear reprocessing capacities and sought to establish a domestic 'cycle' for the production of plutonium (Suzuki 2006, 190). Initially, the aim was to become independent of uranium imports (Koide 2011a, 124-8). At the same time – contrary to the basic anti-nuclear principles of not producing, owning and stationing nuclear weapons – Japan's government tried to ensure technological control of the related processes, the availability of facilities for the production of nuclear weapons and the supposedly associated prestige in international relations.<sup>30</sup> However, because nuclear reprocessing is complex and costly, Japan's government decided in 1966 to import the technology from France. France granted Japan the right to reprocess nuclear fuels in 1973. The first reprocessing plant went into test operation in Tōkaimura (Ibaraki Prefecture) in 1977. It was operated by the state-owned Power Reactor and Nuclear Fuel Development Corporation (PNC) and planned to have a processing capacity of 210 t per year. The US government allowed Japan a processing volume of only 99 t in two years with respect to uranium from the US (Suzuki 2006, 195-6). But more than ten Japanese NPPs were already in operation in 1976, and another ten were to go into operation at short notice. Thus, a solution had to be found for the back-end problem. Japan's government insisted on processing fuel and not storing it 'once through'. In 1977, the Japanese NPP operators commissioned French COGEMA (now AREVA) and a year later British BNFL to reprocess their spent nuclear fuels until sufficient reprocessing capacities were available in Japan (planned for the late '90s). However, Japan had to take back not only plutonium and uranium, but also all other radioactive residues.<sup>31</sup> In

29 The reprocessing plants in Germany (Hanau) and Belgium (Dessel, operated jointly with France) have been shut down since 1991 and 2006 respectively. Urenco's reprocessing facility in Almelo (Netherlands) and in Gronau (Germany) are enriching uranium, and Areva's nuclear fuel plant in Lingen (Germany) is fabricating LWR-UO fuel (WISE-Uranium 2009d; Buckner, Burchill 2016, 43).

30 Yamaoka 2011, 80-186; Yoshioka 2011b, 41; Suzuki 2006, 83, 192.

31 As of February 2009, Japanese NPP operators had commissioned the reprocessing of a total of 7,100 t spent fuel. From 1995 to 2007, 524 t (in 1,310 glass containers with a pay-

autumn 1987, the Japanese government under prime minister Yasuhiro Nakasone entered negotiations with the US government under Ronald Reagan and obtained the right to reprocess nuclear fuel rods, to possess, use, store and transport plutonium for the purpose of electricity production from 1988 to 2018 (with automatic extension and termination in six months after notice by one of the two sides), i.e. to own and use the plutonium supplied by France and the UK and produce plutonium themselves.<sup>32</sup>

The consequences of the expansion of NPPs in the '70s, the temporary commissioning of foreign companies to reprocess and the related taking back of plutonium from abroad prompted METI and the electric power companies in the early '80s to start planning a domestic 'nuclear cycle'. But to legitimise plutonium production both internally and externally, the prospect of using this plutonium in FBR was needed.<sup>33</sup> In foreign and security policy, Japan's government had to prove that plutonium was used exclusively for civilian purposes. Domestically, it had to prove that production and use of plutonium in Japan would reduce the energy dependency on foreign supply at acceptable costs. Supported by the state, the subsidiary of the electric power companies JNFL was supposed to conduct uranium enrichment, reprocessing and interim storage and to build the necessary facilities in Mutsu and Rokkashomura (Aomori Prefecture, 20 km north of the military training area of Amagamori, belonging to the US Air Force base Misawa). The reprocessing plant was planned to have a capacity of 800 t/y with construction costs of 700 billion JPY and a start of operations in 1997. The construction permit was granted in 1989. Construction itself began four years later in 1993. The reprocessing plant was initially

load of 0.4 t each) were returned to Japan (Atomica 2009). In October 1993, the Japanese government published figures on the total plutonium stock for the first time. According to that report, 680 t of nuclear fuel had been reprocessed and 2.9 t of plutonium recovered at the reprocessing facility in Tōkaimura by the end of 1992. 5,770 t of spent nuclear fuel had gone to UK and France, of which 1,870 t of uranium and 4.8 t of plutonium had been processed. Of these, 1.1 t went from France to Japan in January 1993. In addition, 1.2 t of plutonium had been purchased, so that Japan had 5.3 t of plutonium. Of these, 3.7 t were used for the ABWR Fukugen and FBR Monju and 1.6 t were held in reserve (*The Asahi Shimbun*, 2 October 1993, 3).

32 Yamaoka 2011, 183-6; Yoshioka 2011a, 229-30; Suzuki 2006, 196-7.

33 In 1994, the government published its long-term plan for plutonium supply and demand in Japan (AEC 1994). From 1994 to the end of 1999, the research and test reactors Fukugen, Monju and Jōyō were to consume 0.6 t plutonium annually and the reprocessing plant Tōkaimura to provide 0.4 t per year; cumulatively, the supply of 4 t from the reprocessing plant in Tōkaimura and the return from abroad should be offset by a domestic demand of 4 t. For the decade from 2000 to 2010, the demand of 5 t (3 t MOX use in LWR) per year or 35-45 t cumulatively was to correspond to a plutonium production of 5 t annually or 35-45 t cumulatively from the reprocessing plants Tōkaimura and Rokkashomura. The 30 t of plutonium, resulting from future returns from abroad, were to be processed into MOX fuel abroad and consumed in Japan.

test activated in 2006. 25 years after the start of construction, only 425 t of spent nuclear fuel have been converted into 364 t uranium and 6.7 t HM MOX fuel since then (CCNE 2017, 131). To date and after more than twenty plan corrections, the plant does still not work regularly. Practically, its operation has been stopped for a decade and is now planned to restart in 2021 (reprocessing plant) and 2022 (MOX fuel fabrication). The construction costs were initially (in 1993) indicated with 760 billion JPY, corrected in 1996 to 1.88 trillion JPY and in 1999 to 2.14 trillion JPY. In November 2003, the Federation of Electric Power Companies (FEPC) released an estimation of 11 trillion JPY, consisting of 3.37 trillion JPY for construction, 6.8 trillion JPY for 40-year operation and 2.2 trillion JPY for disposal and decommissioning (Kakujōhō 2018). In July 2017, the Nuclear Reprocessing Organisation of Japan (NURO) released an updated estimation amounting to 13.9 trillion JPY (comprised of 4.55 trillion JPY for construction + 7.4 trillion JPY for operation + 2.5 trillion JPY for disposal and decommissioning after 40 years of operation – 0.5 trillion JPY cost savings through rationalisation). The total project cost of the MOX fuel fabrication facility was estimated at 2.3 trillion JPY (NURO 2017). Originally, METI and the electric power companies tended to task French COGEMA/SGN with building a complete UP3 plant (Yoshioka 2011a, 235). But, Japan's government insisted that the technology for glass melt-sealing of highly radioactive substances should be domestic. Since the domestic technology had caused severe trouble since 2007, new versions were installed and tested until 2013. Presently, JNFL tries to meet the new safety standards for nuclear material facilities, introduced in response to 3/11 at the end of 2013: it has built an earthquake-resistant emergency centre, installed large water storage tanks and increased the seismic shock absorption potential of 1,300 km pipelines from 450 gal to 750 gal (CCNE 2017, 131-2). But severe violations of safety regulations were reported and not only were construction and approval again delayed, but also the general feasibility of starting operation questioned (Sawai 2018, 77-8).

From the late '60s to 1996, the State Science Agency and the PNC spent 1.2 billion JPY on trying to develop their own uranium enrichment, fast breeder and reprocessing technology. These attempts failed more or less, and the implementation plans were postponed several times. At the beginning of related R&D in 1967, the fast breeder was supposed to be ready for operation in the early '80s, whereas the 2005 'Guidelines on Nuclear Policy' stated that the first fast breeder was to start commercial operation in 2050 (Koide 2011a, 130). In addition, several serious accidents occurred in the late '90s in the State Science Agency's area of responsibility. In 2001, the agency was dissolved as an independent ministerial department and its remaining sector, the FBR development, integrated into the MEXT. This put an end to Japan's bipolar organisation of state nuclear policy (split between METI and State Science Agency).

Since then all decision-making power and resources for the control and promotion of nuclear policy have been with METI. However, stopping the FBR development would deprive reprocessing or plutonium production of its justification, at least as long as it is cheaper to enrich natural uranium instead of using MOX fuels and employ it as nuclear fuel in LWR. This explains why, despite repeated accidents and delays, the FBR pilot reactor Monju had not been decommissioned until December 2016. And neither the domestic FRB development programme nor the plan to use FBR commercially, have been abandoned officially. But commercial FBRs cannot be expected to consume most of the expensive MOX fuel in the near future. This raises doubts about commercially operated reprocessing in terms of product and process technology as well as business management (Takubo 2017). Considering the up-front and exit costs of a nuclear reprocessing plant, operators can only switch from test to full commercial operation, if three conditions are met: The existence of short and medium-term demand for MOX fuels, the possibility of shifting cost to electricity price, and the opportunity to set up tax-free provision to the extent that the higher costs for the production and consumption of MOX fuel in LWR are covered and a return on the capital tied up in the construction and operation of the reprocessing plant is secured. Long-term demand for plutonium by the next generation of NPPs must also be guaranteed.

In the '90s, NPP operators tested the use of MOX fuel in LWRs for the first time in order to consume the plutonium coming back from France and the UK. In 1991, the plan was to use MOX fuel in two LWRs until the mid-'90s, in 12 LWRs after 2000 and in 15 LWRs by 2010 (*The Asahi Shimbun*, 18 February 1994, 1). In 1997, METI and the electric power companies decided to use MOX fuel in 16 to 18 reactors by the end of 2010. Their plutonium consumption would have corresponded to the capacity of the Rokkashomura reprocessing plant. However, the use of MOX fuel in LWRs was so difficult and costly<sup>34</sup> that in 2009 FEPC postponed the implementation of the plan by five years (Koide 2011a, 135). In 2004, METI calculated the total cost of reprocessing in Rokkashomura in a way that allowed the

**34** Yoshioka (2011a) reports that severe quality defects were discovered in MOX fuel rods imported from Belgium and the UK, in 1999, and that the MOX deployment had to be postponed until 2009, that is, a time when MOX fuelled operation of the no. 3 reactor at the Genkai NPP was scheduled to start (319). MOX fuel rods were used at the NPR no. 3 at the Fukushima-1 NPP, which exploded in March 2011. Presently, they are used in the NPR no. 3 of the Ikata and Genkai NPPs, and in NPR 3 and 4 of the Takahama NPP. Operational difficulties arise in controlling (starting and stopping) MOX-charged reactors. In addition, a MOX PWR fuel chamber is estimated to cost 50-100 million JPY, which is five to ten times more than its UOX counterpart (Yoshioka 2011a, 320; 2011b, 41). Further, in MOX fuels  $\alpha$  rays are 150,000 times, neutron radiation 10,000 times and  $\gamma$  rays 20 times stronger than in UOX fuels. Finally, after use MOX fuels have such a high heat that they need to be cooled for 500 years before they can be disposed (Hirose 2010, 257-9).

electricity companies to shift the cost of reprocessing onto the electricity price (METI 2004). It was assumed that the plant will run for 40 years from 2006, that a total of 32,000 t or 800 t UOX (fuel rods from 40 reactors) will be processed and 4,800 t MOX fuel (equivalent to 4,300 t U, 900 billion JPY or 7.5 billion USD) will be produced. It was concluded that a total cost amount of 18.8 trillion JPY Yen arises, of which 11 trillion JPY applied to reprocessing (at 32,000 t HM: 343,750 JPY or 2,865 USD/kg HM), 2.55 trillion JPY to the final disposal of highly radioactive residues, 1.19 trillion JPY to MOX production (at 4,800 t HM: 247,917 JPY or 2,065 USD/kg HM) and 1.01 trillion JPY to the temporary storage of the UOX fuel rods used. Converted over a 40-year term, the back-end cost was estimated at 1.23 JPY/kWh and the 'cycle' cost (front-end + back-end) at 1.83 JPY/kWh. Even if one unrealistically assumes that the reprocessing plant in Rokkashomura will be operating at 100% capacity for over 40 years, further capacities would have to be created to reprocess all the spent nuclear fuel of about 1,000 t HM/year produced in Japan's NPPs.<sup>35</sup> Further huge costs loom ahead. An answer to criticism was that without reprocessing, NPPs would have to cease operation and then incur replacement cost that exceeded the additional costs of reprocessing compared with uranium enrichment, one-off use and final disposal (Kikkawa 2011, 148).

The legislation necessary for the start of reprocessing was passed in 2005. The NPP operators had already formed provisions for covering future reprocessing expenses from part of the electricity price or their related sales income since 1982. Amounting to 3.14 trillion JPY by March 2005, these provisions were now released, transferred to the Radioactive Waste Management Funding and Research Centre (RWMC) and called up from there by the NPP operators to pay JNFL until 2016. Thus, JNFL was able to indicate an average annual sales income of about 300 billion JPY, of which 90% were declared income from reprocessing spent nuclear fuel, although reprocessing still did not operate at a feasible commercial scale. In other words, JNFL took related payment from the NPP operators in advance. NPP operators paid (that is, they released provisions out of charges for reprocessing) 500-600 billion JPY/year into RWMC from FY2005 to FY2015. These funds for the reprocessing business, included in the electricity price and therefore finally paid by electricity consumers, amount to ca. 0.50-0.60 JPY/kWh.<sup>36</sup> In 2004 the total back-end costs (including reprocessing) were estimated by the government at 18.8 trillion

<sup>35</sup> Given a consumption of 30 t UOX/a at 1 GW NPR, before 3/11 NPP capacity of 49 GW and NPP utilization rate of 70%, this would result in an annual accumulation of 1,029 t UOX spent nuclear fuel.

<sup>36</sup> Following Ōshima, 600 billion JPY/year divided by sold electricity of 100 TWh/year = 0.6 JPY/kWh (Ōshima 2010, 97).

JPY (METI 2004). But if converted to the total electricity volume of all NPPs installed and operating before 3/11 (49 GW, 40 years running time, 70% utilization: 12,019 TWh), back-end costs (without reactor decommissioning but with final disposal) are actually 1.56 JPY/kWh. However, the construction delays in Rokkashomura and the cost increases to date as well as the lack of considering future expenses suggest that significantly higher costs are to be expected here.

Officially related to the liberalization of the retail market for electricity, this extremely in-transparent provision scheme was changed into a contribution scheme in 2016. Now, the Nuclear Reprocessing Organisation of Japan (NURO), a public corporation, commissions not only reprocessing, but also fuel fabrication and disposal to JNFL, and it is supposed to charge the NPP operators with a contribution fee to cover the cost of commissioning JNFL. Independent critics like the Citizens' Commission on Nuclear Energy (CCNE) regard this new scheme not as a measure to improve transparency and avoid conflict of interest, but as a step towards shifting the responsibility and financial risk for the back-end management to the public, respectively lifting burdens from NPP operators - after all, NURO's responsibilities extend from reprocessing to the complete back-end. Letting the grid operators charge back-end cost after the formal separation of electricity generation and distribution from 2020 onwards, not only NPP operators, but all electric power generators and consumers will have to shoulder these costs (CCNE 2017, 133-4). In order to present reprocessing as being without alternative, the Japanese government has not answered yet to the issue of final disposal. Obviously, it tried to wait until the reprocessing of UOX fuel rods, the production and use of MOX fuel and FBR had started and MOX fuel was used in LBR. However, a continuous investment in plutonium production raises only the cost of an eventual exit. Once the production of fissile plutonium has started, a pressure builds up to use it in NPPs (whether LWR or FBR) and, due to the growing quantity, create further application possibilities in form of new NPPs or the production of nuclear weapons. Conversely, from the perspective of the proponents of reprocessing, the final disposal of highly radioactive substances must not function until reprocessing has started. Otherwise, reprocessing could not be justified as the only feasible and least expensive way of coping with spent nuclear fuel. It is therefore no coincidence that the issue of final disposal is not being proactively addressed, although highly radioactive residues are generated by the running NPPs, returned from France and the UK, and 19 among 57 once operated NPRs (as of 7 June 2018) are already being or will be dismantled.

In 2000, the Nuclear Waste Management Organisation (NUMO) was established, its costs and investments being paid by RWMC from provisions

of the NPP operators.<sup>37</sup> By 2003, five candidate sites were to be nominated and one site was to be selected by 2020 to begin final disposal in 2040. Since 2002, candidate sites have been sought, and municipalities willing to apply for preliminary investigations have been offered subsidies of 9 billion JPY as well as property tax revenues of 2.9 billion JPY per year after start of operations (NUMO [2012] 2018b). According to reports some municipalities considered an application, but so far respective initiatives have failed to secure consent by the majority of their citizens. Consequently, there was no candidate site that could have entered the test drilling phase in August 2011 (Yoshioka 2011a, 353-4). But applicants for the trial wells were to be found by 2015 in order to start the construction of a plant at a depth of 300 m with a capacity of 40,000 containers (150 l/net 400 kg each) at the beginning of the 2030s. In July 2017, with a delay of six months, a 'map of preferred candidate sites based on scientific analysis' was officially released by the government to enhance further promotion by NUMO.

The costs for final storage were estimated by METI in 2004. Converted to the expected volume of electricity (with a 2% discount rate for capital cost) they amounted to 0.14-0.32 JPY/kWh.<sup>38</sup> However, rising construction costs and expected construction delays make the whole thing much more expensive. METI and the electric power companies have so far committed themselves to plutonium production. A disposal site will not be available in the near future. But neither do domestic reprocessing facilities work nor are FBRs in operation. Therefore, old fuel rods must remain in the NPPs' cooling basins, which will soon reach the limits of their capacity (tab. 3.1).

**37** In FY2015, electric power companies paid 68 billion JPY for final disposal vs. 131 billion JPY for reprocessing. Cumulative in-payments for provisions amounted to 1 trillion JPY vs. 5 trillion JPY for reprocessing to RWMC (RWMC 2015).

**38** In order to calculate the final disposal costs, one can refer to the MIT study of 2003 and assume that – as it is currently the case with a one-way cycle and plutonium reuse – UOX and MOX fuels in a ratio of 2.5:97.5 are used, which then – with a current total of 49 GW nuclear power capacity – results in 25 t spent MOX and 820 t spent UOX fuel and as remainings from plutonium production in 123 t separated uranium, 45 m<sup>3</sup> process residues, 15 m<sup>3</sup> glass, 7 t of high-level radioactive waste, plutonium and residual actinide from plutonium production or UOX reprocessing (MIT 2003, 127). MIT (2003) sets the intermediate and final storage costs for used fuel rods at 400 USD/kg HM and for high-level radioactive waste (HWR) at 300 USD/kg HM (MIT 2003, 151). This would have resulted in intermediate and final storage costs of 388 million USD or 45.4 billion JPY (= 338 million USD + 50 million USD, 2007 exchange rate: 117 JPY/USD) per year or 0.15 JPY/kWh. Assuming that all UOX fuels were reprocessed, MOX fuels were used only one time and nuclear power reactors are fueled with both fuels in a 16:84 ratio of MOX to UOX fuel, running 49 GW of nuclear power capacity one year would leave 156 t of spent MOX and as remainings from plutonium production or UOX reprocessing 767 t separated uranium, 287 m<sup>3</sup> of process residues, 94 m<sup>3</sup> of glass, 43 t of highly radioactive waste, plutonium and residual actinide from reprocessing (plutonium production) (MIT 2003, 121). This translates into final disposal costs of 376 million USD or 44 billion JPY (62.4 million USD + 313.5 million USD) or 0.146 JPY/kWh.

Table 3.1 Spent fuel storage capacity (cooling pools) at NPP sites (as of 2017)

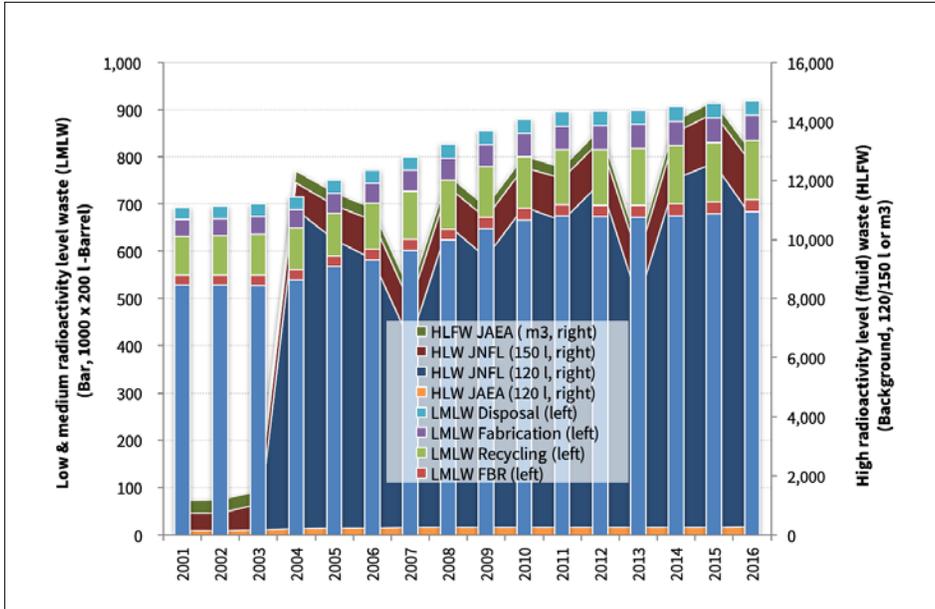
	<b>Loaded fuel (t U)</b>	<b>Annual reload (t U)</b>	<b>Spent fuel stock (t U)</b>	<b>Storage capacity (t U)</b>	<b>Left capacity (years)</b>
Tomari	170	50	400	1,020	<b>9.0</b>
Onagawa	260	60	420	790	<b>1.8</b>
Higashitōri	130	30	100	440	<b>7.0</b>
Fukushima 1	580	140	2,130	2,260	<b>-3.2</b>
Fukushima 2	520	120	1,120	1,360	<b>-2.3</b>
Kashiwazaki	960	230	2,370	2,910	<b>-1.8</b>
Hamaoka	410	100	1,130	1,300	<b>-2.4</b>
Shiga	210	50	150	690	<b>6.6</b>
Mihama	70	20	470	760	<b>11.1</b>
Takahama	290	100	1,220	1,730	<b>2.2</b>
Ōi	360	110	1,420	2,020	<b>2.2</b>
Shimane	100	40	460	680	<b>6.0</b>
Ikata	120	50	670	1,020	<b>5.8</b>
Genkai	230	50	900	1,130	<b>0.0</b>
Sendai	150	50	930	1,290	<b>4.4</b>
Tsuruga	90	30	630	910	<b>6.3</b>
Tōkai 2	130	30	370	440	<b>-2.0</b>
<b>all NPP</b>	<b>4,780</b>	<b>1,260</b>	<b>14,890</b>	<b>20,750</b>	<b>0.85</b>

Left capacity = (Pool Capacity – Fuel Load)/Annual Reload; fuel load and reload based on: METI 2018; spent fuel stock and pool capacity based on: FEPC 2017

In 2011, the electric power companies estimated the shortage of interim storage that had already occurred by 2010 at 4,400 t/U and the total demand for additional capacities 2011-2020 at 7,100 t/U (FEPC 2011, 7-27). Although Rokkashomura is still not in commercial operation, 3,393 t or 13,771 rods of spent UOX fuel have been stored there from July 2009 until the end of March 2018 (JNFL URL). 425 t of these have been test-wise reprocessed (CCNE 2017, 131). The remaining of 3,400 t UOX corresponds to the quantity that is generated in Japan's NPPs under normal operational conditions over a period of three years. Thus, the current storage capacity of 3,000 t at Rokkashomura (final plan: 5,000 t) has been exhausted already. This means that Japan is literally overflowing with spent nuclear fuel and radioactive residues (charts 3.17, 3.18).

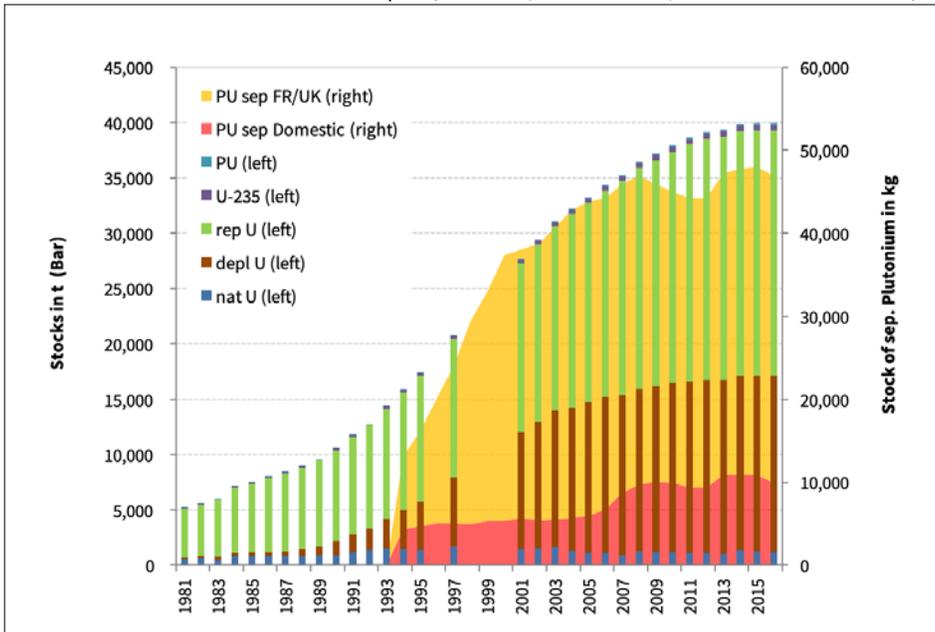
After 16 years of operation, NPPs are depreciated to the residual accounting value of 10% and become more profitable, because depreciation costs do almost not occur anymore. However, the costs for the construction of new NPPs are considerably high, estimated at 440,000 JPY/kW in 2001, but exploding towards 1,000,000 JPY/kW over the last years (Hiro-

Chart 3.17 Volume of nuclear waste in Japan (end of FY)



Source: Author, based on JNES 2004-2011; NRA 2012-2016

Chart 3.18 Stock of nuclear fuel in Japan (end of CY, data for 1996, 1998-2000 not released)



Source: Author, based on AEC 1994, 2018

shi Takahashi 2017, 147).<sup>39</sup> METI and the NPP operators have therefore been trying to extend NPP operating times – first to 40 years, then to 50 years and finally even to 60 years (Takagi 2000b, 172-4).<sup>40</sup> Nevertheless, the GCR reactor (166 MW) at the Tōkai NPP (1998), the ATR reactor (166 MW) Fugen (2003) and the reactors nos. 1 (540 MW) and 2 (840 MW) at Hamaoka NPP (2009) had been closed down already before 3/11. After 3/11, it was decided to decommission 12 more NPRs: nos. 1-6 (4,696 MW) of the Fukushima-1 NPP, no. 1 (460 MW) of the Shimane NPP, NPR no. 1 (357 MW) of the Tsuruga NPP, nos. 1-2 (840 MW) of the Mihama NPP, no. 1 (566 MW) of the Ikata NPP and no. 1 (559 MW) of the Genkai NPP. Additionally, the shut-down of the FBR Monju was decided in December 2016 (CCNE 2017, 157-8). They all have to be dismantled and their radioactive components stored temporarily as well as permanently. Assuming that 100% of the total mass of 500,000 t must be treated as contaminated when dismantling one NPR with a standard capacity of 1 GW, CNIC has estimated the decommissioning costs of one NPR in the late '90s at 632 billion JPY (which corresponds to 150-200% of the then construction cost). By contrast, METI assumed at the same time that 95% of the volume mass could be classified as non-radioactive or low-level-radioactive and therefore disposed of cheaply, so that the decommissioning costs amounted to only 26.3 billion JPY (Takagi 2000b, 284-5). The NPP operators assumed in 2011 that 0.536 million t of residual waste will be produced if a 1,100 MW BWR is dismantled. Of these, 93% (0.495 million t) were said to be non-radioactive concrete, 5% (28,000 t) 'clearance material' (i.e. radioactive to an officially safe extent), only 2% (13,000 t) low radioactive and less than 0.1% (540 t) highly radioactive residual material (FEPC 2011, 9-2).

39 METI estimated these costs in 2015 extremely low at 370,000 JPY/kW, using NPRs built before 2011 as reference (CCNE 2017, 222; Matsuo, Nei 2018, 33). The costs for ongoing or recently stopped construction of APR 1000 NPRs in the US are said to have doubled in current projections towards 1,150,000 JPY/kW or 11,000 USD/kW excluding financing cost and 1,300,000 JPY/kW or 12,500 USD/kW including financing cost (Cooper 2017). The total cost projection (as of July 2017) for EDF's NPP at Hinkley Point C in the UK (3.2 GW, to be completed in 2025) amounts to 994,000 JPY/kW or 6,500 GBP/kW (*The Guardian Online*, 03 July 2017). Current estimations are reported to have resulted in 1.13 million JPY/kW as of July 2018 (*Tōkyō Shimbun Online*, 14 July 2018). By referring to building permission related data, Matsuo and Nei support METI's current cost estimations. They maintain that capital costs of NPR differ considerably by country, that these costs have risen only slightly in Japan, reflecting general increase of labour cost, and are fundamentally lower than in Europe and the US due to economy of scale (building multiple large NPR) even if taking into account additional safety cost. But they concede that a longer construction (lead) time might result in considerable cost increases (Matsuo, Nei 2018, 27, 33).

40 The average lifespan of the 130 NPRs that were shut down worldwide right after 3/11 was 22 years (as of April 2011), while that of the 437 NPRs still in operation at the same time was 26 years (Schneider 2011; Schneider et al. 2011, 11). The respective data as of July 2017 are 25.2 years for 169 NPRs shut down and 29.3 years for 403 NPRs operating (Schneider et al. 2017, 37-9).

Since 1989, decommissioning costs in Japan have been paid by consumers as part of the electricity price and retained by producers as provisions. In 2007, the decommissioning costs for a BWR with 1.1 GW were estimated at 65.9 billion JPY (60,000 JPY/kW) and for a PWR of the same capacity at 59.7 billion JPY (54,000 JPY/kW) (FEPC 2007). This translates into 0.22-0.25 JPY/kWh converted to the volume of generated electricity to be expected in 40 years at a 70% capacity utilization. However, cost estimates for NPRs already being in the process of dismantling are considerably higher in Japan.<sup>41</sup> In the US and the UK, decommissioning costs were estimated before 3/11 to be two to four times higher than in Japan, that is, at a range between 1,000 USD/kW (117,000 JPY/kW) (Moody's 2008) and 1,750 USD/kW (204,750 JPY/kW) (British Energy 2008).

Apart from the continuing inoperability, unreliability and danger of key elements of the so-called nuclear cycle in Japan, this section demonstrated that the costs for the front-end can be estimated at 0.76-1.15 JPY/kWh<sup>42</sup> and for the back-end at 2.36-2.80 JPY/kWh.<sup>43</sup> At 3.12-3.95 JPY/kWh, these costs are 1.29-2.12 JPY/kWh higher than the 'cycle costs' of 1.83 JPY/kWh officially reported since 2004 for the reprocessing variant that METI and the NPP operators pursue. However, not all costs are taken into account, especially not those that occur afterwards and will affect future generations.

### 3.3.3 Actual Costs of Nuclear Power Generation: Complex, Hidden and High

Japan's government and NPP operators have been claiming that NPPs are the most cost-effective form of electric power generation. But how much does nuclear power generation actually cost? The costs of electricity production are converted into the amount of electricity generated and are thus heavily dependent on running time and capacity utilization. They consist of fixed and variable costs or of costs for capital (depreciation, interest, share of costs for joint investment, taxes on fixed assets), fuel, operating and maintenance. An important point in calculations and comparisons is which costs to take into account and how to define their individual components. Cost components as well as their share in and their impact on the total cost differ according to type of power generation: in thermal power plants, fuel and CO<sub>2</sub> emission costs are high, so that fuel price changes have a major

<sup>41</sup> The dismantling of the GCR reactor (166 MW) at the Tōkai NPP will cost 88.5 billion JPY (*Bloomberg News*, 30 March 2011). Chūbu Electric Power (CEP) estimates 100 billion JPY for each of NPR nos. 1 and 2 of the Hamaoka NPP (*The Yomiuri Shimbun*, 31 March 2011).

<sup>42</sup> UOX with 0.65 JPY/kWh, MOX with 1.95 JPY/kWh (UOX/MOX: 97.5/2.5 or 84/16).

<sup>43</sup> Decommissioning: 0.50 JPY/kWh, reprocessing: 1.56-2.00 JPY/kWh, disposal: 0.30 JPY/kWh.

impact on the total cost. In the case of nuclear and hydroelectric power plants, the construction and capital costs are so high that the risk and return expectations of capital providers reflected in the discounting rate, depreciation, and the lifespan and utilization of assets play a major role.<sup>44</sup>

The costs of electricity generation by power plant type are determined either deductively by means of the so-called model power plant or inductively and retrospectively on the basis of the cost data in the financial reports of the electric power companies. The deductive method has the advantage of equating all external factors with the influence on the total cost and objectifying the comparison. The disadvantage is to be dependent on the setting of the model conditions; that is, why projections do not necessarily reflect the actual costs incurred. Assuming optimistically correct data reporting and consistent methodology, the advantage of the inductive method is that it empirically captures the costs, their components and their changes in the past. Extrapolations are possible only under the extremely restrictive assumption that the past continues linearly into the present and the future.

The deductive projections compiled in table 3.2a have in common that they often refer to a maximum of a 40-60 year lifespan and do not take into account systemic or social costs (e.g. government subsidies and guarantees). In these projections the costs of nuclear power are heavily dependent on how the costs of capital (construction and financing) are calculated and what discount rate is applied: normally, 3%, 5% and 10% risk premium are indicated. But NPP proponents, namely, government, NPP operators and their allies, tend to report only costs that are based on the lowest discount rate. Thus, the cost of NPP-generated electricity appears lower compared to all other power plant types at lower discount rates (Takemori 2011, 12-48).<sup>45</sup> METI and OECD apply this discounting method

**44** The 2015 OECD report indicates the ratio of capital, fuel, CO<sub>2</sub> and operating costs of conventional power plants in Japan (2013) by generation type at a 3% discount rate as follows: (a) NPP = 34% capital + 23% fuel + 44% operations, (b) coal-fired power plants = 16% + 64% + 20%, (c) gas-fired power plant = 7% + 86% + 7%, (d) large hydropower plants = 78% + 0% + 22% (OECD 2015, 47-55). In the 2010 OECD report edition, the data for conventional power plants in Japan (2009) were indicated as follows: (a) NPP = 48% capital + 19% fuel + 33% operations, (b) coal-fired power plants = 26% + 63% + 11%, (c) gas-fired power plants = 26% + 63% + 11%, (d) large hydropower plants = 76% + 0% + 24% (OECD 2010, 59-62). The OECD projection of 2004 (2005 edition) did not take CO<sub>2</sub> emission costs into account, which reduced the share of fuel costs: (a) NPP = 45% capital + 25% fuel + 30% operation, (b) coal-fired power plants = 42% + 40% + 18%, (c) gas-fired power plants = 28% + 63% + 9%, (d) large hydropower plants = 78% + 0% + 22% (OECD 2005, 52, 61).

**45** In its 2015 edition the OECD report indicates also cost data for a 7% and 10% discount rate, reflecting a deregulated or restructured market environment respectively and a 10% discount rate reflecting a high investment-risky environment. At a discount rate of 10%, the total cost median of NPPs for all covered countries becomes higher than that of CCGTs or coal-fired thermal power plants. For Japan, the projected cost advantage of NPPs at a

uniformly to all types of power plant; risks or investment characteristics specific for a certain type of electricity generation or power plant are not taken into account. Applying a lower or the lowest discount rate creates also the impression that the Japanese government takes on all relevant NPP-related risks.

Table 3.2a Deductive projections of electricity costs by power plant type

	MIT 2003	UC 2004	UC 2004	METI 2004	CNIC 2005	OECD 2005	MIT 2009	OECD 2010	METI 2011	OECD 2015	METI 2015	EIA 2017
Region	US	US	US	Japan	Japan	Japan	US	Japan	Japan	Japan	Japan	US
Price base	2002	2003	2003	2002	2003	2003	2007	2009	2010	2013	2014	2017
Operation	40	40	40	40	40	40	40	60	30/40/50	60	40/60	30
Load	85	85	85	80/40	80/45	85/45	85	85/45	80/70/45	85/45	70/80	87/90
Discount rate	11.5/ 9.6	12.5/ 9.5	12.5/ 9.5	0/1/3/4	3.5/6.3/ 4.2/2/0.3	5/10	11.5/ 9.6	5/10	0/1/3/5	3/7/10	3	4.5
¥/\$	-	-	-	122	104	119	-	103	86	103	105	
Nuclear build cost	2.0k \$/kW	1.5k \$/kW	1.5k \$/kW	279k ¥/kW	286k ¥/kW	2.51k \$/kW	4.0k \$/kW	3.0k \$/kW	350k ¥/kW	4.3k \$/kW	370k ¥/kW	5.9k \$/kW
Coal build cost	1.3k \$/kW	1.2k \$/kW	1.2k \$/kW	272k ¥/kW	224k ¥/kW	2.35k \$/kW	2.3k \$/kW	2.7k \$/kW	293k ¥/kW	2.6k \$/kW	250k ¥/kW	5.6k \$/kW
Oil build cost	-	-	-	269k ¥/kW	199k ¥/kW	1.5k \$/kW	-	1.5k \$/kW	220k ¥/kW	-	200k ¥/kW	2.1k \$/kW
Gas build cost	0.5k \$/kW	0.3k \$/kW	0.3k \$/kW	164k ¥/kW	153k ¥/kW	1.29k \$/kW	0.9k \$/kW	1.5k \$/kW	137k ¥/kW	1.3 k \$/kW	120k ¥/kW	1.1k \$/kW
Hydro build cost	-	-	-	732k ¥/kW	757k ¥/kW	7.0k \$/kW	-	8.4k \$/kW	700k ¥/kW	9.7k \$/kW	640k ¥/kW	
Nuclear power cost	6.7 c/kWh	5.4 c/kWh	5.4 c/kWh	5.3 ¥/kWh	5.73 ¥/kWh	4.8 c/kWh	8.4 c/kWh	5.7 c/kWh	8.9-10.2 ¥/kWh	6.3 c/kWh	10.1 ¥/kWh	9.0 c/ kWh
Coal power cost	4.4 c/kWh	3.3- 4.1 c/kWh	3.3- 4.1 c/kWh	5.7 ¥/kWh	4.93 ¥/kWh	4.9 c/kWh	6.2 c/kWh	8.8 c/kWh	9.5-10.6 ¥/kWh	9.5 c/kWh	12.3 ¥/kWh	11.9 c/ kWh
Gas power cost	4.1 c/kWh	3.5- 4.5 c/kWh	3.5- 4.5 c/kWh	6.2 ¥/kWh	4.88 ¥/kWh	5.2 c/kWh	6.5 c/kWh	10.5 c/kWh	10.7- 11.4 ¥/kWh	13.3 c/kWh	13.7 ¥/kWh	4.8 c/ kWh
Oil power cost	-	-	-	10.7 ¥/kWh	8.76 ¥/kWh	-	-	-	20.8- 26.7 ¥/kWh	-	30.6 ¥/kWh	-
Hydro power cost	-	-	-	11.9 ¥/kWh	7.20 ¥/kWh	14.3 c/kWh	-	15.3 c/kWh	10.6 ¥/kWh	11.0 c/kWh	11.9 ¥/kWh	-

Source: Compiled by Author

3% discount rate evaporates almost completely in comparison to coal-fired power plants (OECD 2015, 14, 27-8).

Nevertheless, the small differences raise doubts. Already in 2005, CNIC took the inductive approach to check the assumptions: using the power plant costs of 1993-2003 as indicated in the financial reports, they found significant differences in relative construction costs. CNIC came to the conclusion that NPPs in Japan (as in the US) are not the least expensive type of power plants, but far more expensive than coal or LNG fired power plants (CNIC 2005, 8/9, 13). The OECD 2010 and 2015 projections, like MIT's sub-scenarios of 2003 and 2009, took into account the cost of CO<sub>2</sub> emissions from coal and gas-fired thermal power plants, but assumed a lifespan of 60 years for NPPs and a 85% utilization (OECD 2010, 43, 45; OECD 2015, 30-1).

As early as 1985, Kumamoto criticised the METI projections of 1984 - and later those of 2004.<sup>46</sup> He showed that equalizing the degree of utilization of NPPs and coal-fired power plants is unrealistic and renders the costs of nuclear power unreasonably low.<sup>47</sup> Furthermore, he pointed out, that one cannot assume electricity to be produced in the so-called best mix (i.e. the combined use of different types of production for different demand times and levels) but concurrently (a) abstract from it the cost comparison of different types of production, (b) assume equal utilization levels and (c) claim nuclear power to be the cheapest. It is also important whether the costs relate to the start of operation, the statutory depreciation period or the entire investment life, because production types with a high fixed or capital cost component appear to be cheaper the longer the period under consideration.<sup>48</sup> Based on the historical average of utilization levels of different generation types, nuclear power is more expensive than that produced in coal and gas power plants (Kumamoto 2011, 74-103). The actual utilization rate of NPRs in Japan was 66% during 1970-2010 and 58% during 1970-2017 (vs. 85% assumed by OECD and 80% assumed by METI (2004)).<sup>49</sup> The same applies to the lifespan of the power plants, which most projections by METI set at 40 years, OECD projections even at 60

46 METI (2004) is actually a projection submitted by FEPC (2004), which has been referenced by government committees (METI/AES) to justify the government's energy and nuclear policies, particularly with regard to the nuclear fuel cycle (front-end and back-end).

47 Both power plant types are used in the so-called baseload coverage are relatively capital-intensive. However, coal-fired power plants are technologically mature, less prone to failure and of a much higher capacity utilization than NPPs (85% vs. 60%).

48 Critics of nuclear power usually counter the running-time-related cost projections with the start-up costs that the NPP operators specified in the '70s and '80s to apply for planning permission (Datsugenpatsu nyūmon kōza 2011; Genshiryoku kyōiku o kangaeru kai 2008). This is legitimate insofar as these initial costs enter into the electricity price calculation as such and have to be paid by the customers.

49 For the actual trend of the average NPP/NPR utilization rate in Japan, see chart 3.16.

years.<sup>50</sup> The average lifespan of the 15 NPRs closed down in Japan was 36 years. In this respect, cost calculation should be realistically limited to the statutory depreciation period of 20 years. In December 2017, CNIC reviewed the METI cost projection of 2015 (based on a 2014 model plant) and undertook a correction, reflecting (a) the decline of fuel prices from 2014 to 2016 for coal (−0.99 JPY/kWh) and LNG (−5.14 JPY/kWh), (b) the currently admitted increase of NPR-decommissioning cost (+0.16 JPY/kWh) and 3/11-related damage compensation cost (+0.28 JPY/kWh) and (c) the total damage recovery cost estimated by the Japan Center for Economic Research (JCER), which amounts to 50-70 trillion JPY (and translates into +1.1 or +1.72 JPY/kWh). Furthermore, METI set the capital cost for NPRs extremely low at 400 Billion JPY/NPR or 370,000 JPY/kW, compared to currently reported 1 trillion JPY/NPR or 926,000 JPY/kW<sup>51</sup> and reduced the probability of a severe accident (SA) and related costs from 1 SA per 2,000 NPR running years to 1 SA per 4,000 running years. Based on the 2017 projection data for NPR capital cost by the International Energy Agency (IEA) and the foreign currency exchange rate of 2016, the capital cost for NPRs increases actually by 2.5 JPY/kWh. SA-related cost for risk provisions (+0.3 JPY/kWh), decommissioning and damage compensation (+0.28 JPY/kWh or +1.77 JPY/kWh) actually doubles. Consequently, the electricity costs for NPRs rise from projected 10.1 JPY/kWh to 12.26-15.14 JPY/kWh, while those for coal-fired power plants fall from 12.34 JPY/kWh to 11.35 JPY/kWh and those for LNG fired power plants from 13.72 JPY/kWh to 8.58 JPY/kWh (Matsukubo 2017). In view of such realistic assumptions for a deductive cost projection, NPP-generated electricity was considerably more expensive than electricity generated by coal or LNG fired power plants in 2016.

50 For the worldwide average lifespan of previously decommissioned NPPs, see § 3.3.2b.

51 EDF indicated the cost for the Flamanville site (1.63 GW) in France with 6,300 €/kW (794,000 JPY/kW) in 2017. The cost for Olkiluoto-3 (1.63 GW) in Finland were estimated at 5,220 €/kW (540,000 JPY/kW) in 2012 (*Reuters Online News*, 9 October 2017). Hitachi and the British and Japanese governments are reported to design a finance scheme for the Wylfa site (2.7 GW), covering 3 trillion JPY, which translates to 1,111,000 JPY/kW (*Sentaku*, February 2018, 68-71). Hitachi-CEO Hiroaki Nakanishi is reported to have asked the British prime minister Theresa May on 2 May 2018 to inject capital into the project, otherwise Hitachi might withdraw due to exploding cost (*Tōkyō Shimbun Online*, 3 May 2018). The cost estimation for the Sinop site (4.4 GW) in Turkey with participation of MHI was currently corrected from 550,000 JPY/kW to 1,000,000 JPY/kW (*The Asahi Shimbun Online*, 15 March 2018). General trading company Itochū declared its exit from the project, fearing cost and time budget overruns (*Tōkyō Shimbun Online*, 3 May 2018). For further examples see § 3.3.2b.

Table 3.2b Inductive estimations of electricity costs by power plant type before 3/11

	Ōshima 2010		Ōshima 2011	Matsuo et al. 2011
Covered period	1970-2007	2000-2007	1970-2010	2006-2010
Included cost	Public subsidies for promotion, public R&D-programmes (in brackets)			-
Nuclear	<b>10.68</b> 8.64 + (0.40 + 1.64) JPY/kWh	<b>8.93</b> 7.29 + (0.46 + 1.18) JPY/kWh	<b>10.25</b> 8.53 + (0.26 + 1.46) JPY/kWh	<b>7.2</b> JPY/kWh
Thermal	<b>9.90</b> 9.80 + (0.02 + 0.08) JPY/kWh	<b>9.02</b> 8.90 + (0.11 + 0.01) JPY/kWh	<b>9.91</b> 9.87 + (0.03 + 0.01) JPY/kWh	<b>10.2</b> JPY/kWh
Hydro	<b>7.26</b> 7.08 + (0.06 + 0.12) JPY/kWh	<b>7.52</b> 7.31 + (0.10 + 0.10) JPY/kWh	<b>7.19</b> 7.09 + (0.02 + 0.08) JPY/kWh	-
Hydro ex. PS	<b>3.98</b> 3.88 + (0.06 + 0.04) JPY/kWh	<b>3.59</b> 3.47 + (0.07 + 0.05) JPY/kWh	<b>3.91</b> 3.86 + (0.01 + 0.04) JPY/kWh	-
Pump storage	<b>53.14</b> 51.87 + (0.34 + 0.94) JPY/kWh	<b>42.79</b> 41.81 + (0.38 + 0.60) JPY/kWh	<b>53.07</b> 52.04 + (0.16 + 0.86) JPY/kWh	-
Nuclear + PS	<b>12.23</b> 10.13 + (0.42 + 1.6) JPY/kWh	<b>10.11</b> 8.44 + (0.47 + 1.21) JPY/kWh	-	-

Source: Author, compiled from Ōshima 2010, 2011c; Matsuo et al. 2011

Table 3.2c Breakdown of nuclear power cost estimations

	<b>Ōshima 2010</b>	<b>Matsuō 2011</b>	<b>METI 2011</b>	<b>JREF 2012</b>	<b>METI 2015</b>	<b>CNIC 2017</b>	<b>JCER 2017</b>	<b>CCNE 2017</b>
<b>Coverage period</b>	1970-2007	2006-2010	Model plant 2010	Model plant 2010/12	Model plant 2014	Model plant 2014	Model plant 2014	1970-2010
<b>Method</b>	Inductive	Inductive	Deductive	Inductive/deductive	Deductive	Inductive/deductive	Inductive/deductive	Inductive
<b>Nuclear power total</b>	<b>12.23 ¥/kWh</b>	<b>7.2 ¥/kWh</b>	<b>8.9-10.2 ¥/kWh</b>	<b>11.2-17.1 ¥/kWh</b>	<b>10.1- ¥/kWh</b>	<b>12.3-15.1 ¥/kWh</b>	<b>14.7 ¥/kWh</b>	<b>13.3 ¥/kWh</b>
<b>Capital cost</b>		1.9 ¥/kWh	2.6 ¥/kWh	3.0 ¥/kWh	3.1 ¥/kWh	5.6 ¥/kWh	6.4 ¥/kWh	8.5 ¥/kWh
<b>Operational cost</b>		2.7 ¥/kWh	3.1 ¥/kWh	3.1 ¥/kWh	3.3 ¥/kWh	3.3 ¥/kWh	5.0 ¥/kWh	
<b>Front-end cost</b>		0.6 ¥/kWh	1.4 ¥/kWh	1.4 ¥/kWh	1.5 ¥/kWh	1.5 ¥/kWh	1.5 ¥/kWh	
<b>Back-end cost</b>		1.8 ¥/kWh						
<b>Decommission</b>		0.3 ¥/kWh	-		-	In safety/ Risk/		
<b>Pump storage</b>	1.49 ¥/kWh	-	-		-	-		
<b>Subsidies R&amp;D</b>	2.10 ¥/kWh	-	1.1 ¥/kWh	1.8 ¥/kWh	1.3 ¥/kWh	1.3 ¥/kWh	1.3 ¥/kWh	1.7 ¥/kWh
<b>Safety/risk/damages</b>	-	-	0.2+(0.4-1.9)¥/kWh	1.8-6.9 ¥/kWh	0.9- ¥/kWh	0.56-3.44 ¥/kWh	0.4- ¥/kWh	3.1 ¥/kWh

Source: Compiled by Author (JPY=¥)

In case of an inductive and retrospective calculation, the results differ only as to whether include systemic (pumped-storage power plants) and external costs (public settlement subsidies, development programmes) (tab. 3.2b). Taken into account these costs, NPPs loose their cost advantage.<sup>52</sup> Table 3.2c

52 Matsuo et al. (2011) criticise Ōshima (2010) for unjustifiably adding the costs of hydro pumped-storage power plants to nuclear costs and not just the difference between hydro pumped-storage power plants and oil-fired thermal power plants (Matsuō et al. 2011, 19). Following this difference, 0.70-0.96 JPY/kWh have to be added to the nuclear power costs of 2010.

shows which components are included in the costs of NPP-generated electricity. Besides the recently escalating, but notoriously underestimated capital costs, the total cost of nuclear power depends on whether and to what degree risk and costs of a severe accident are considered. The related provisions are a function of what has to be covered by these costs (impact or damage scale and scope) and how the probability of a severe accident is estimated.

In October 2011, the government's Atomic Energy Council (AEC) estimated the total loss related to the Fukushima severe accident (SA) at 3.9 trillion JPY (damage compensation: 2.6 trillion JPY, NPP-related losses and decommission cost: 1.3 trillion JPY), under the presumption of a model NPR with 1.2 GW, a 60/70/80% capacity utilization and a 40-year lifespan. The risk and damage-related costs amounted to 1.1 JPY/kW, estimating the continuous wider cost (indirect damages or losses) for the following five years at 3.26 trillion JPY, assuming an SA occurrence probability of 0.2% (representing Japan's historical tracking record with one SA at every 498 NPR running years and 3/11 counted as three) and a NPR load of 70% (AEC 2011b). In the same year, the Committee for Examining Electricity Costs in the National Project Staff of the Government (NPU) projected the damages to be compensated at 5.7 trillion JPY. It converted the related compensation cost to 40 times the nuclear power production of 2010 and assumed that a severe accident occurred only every 40 years or 2,160 NPR running years.<sup>53</sup> This led to additional costs of only 0.5 JPY/kWh (NPU 2011).

However, already by applying a retrospective SA probability of 0.2% and a then stock of 50 NPRs, additional costs of about 2 JPY/kWh arise. In order to estimate the total cost for decontamination, which had not or only slightly been taken into account in 2011, the model by Yukio Hayakawa can be used (Kamisawa 2011b, 417-9). This model assumes, that at least the area within a radius of 50 km around the Fukushima-1 NPP was exposed to a radioactive contamination of more than 1  $\mu\text{Sv/h}$  or 680,000 Bq/m<sup>2</sup> caesium 137 ( $= 3.14 \times (50 \text{ km})^2/2 = 3,925 \text{ km}^2$ ) (Hayakawa 2011) and therefore must be decontaminated.<sup>54</sup> The decontamination of a rural settlement area costed about 3.6 billion JPY/km<sup>2</sup> in 2012.<sup>55</sup> Consequently, the

53  $1 \text{ SA}/54 \text{ NPRs} \times 40 \text{ running years} = 1 \text{ SA}/2,160 \text{ NPR running years} = 0.05\% \text{ probability}$  in contrast to Japan's tracking record:  $1 \text{ SA}/1,494 \text{ NPR running years} = 0.07\% \text{ probability}$  (counting 3/11 as one SA) or  $1 \text{ SA}/498 \text{ NPR running years} = 0.2\% \text{ probability}$  (counting 3/11 as three, because the fuel cores of NPRs nos. 1, 2 and 3 at the Fukushima-1 NPP melted down).

54 This account applies to about half the area of the so-called Urgent Protective Action Planning Zone (UPZ) with a radius of 30 km around the damaged Fukushima-1 NPP, i.e. 1,413 km<sup>2</sup>.

55 The following large-scale decontamination contracts became publicised by 2011 and 2012: Kawamata-chō: 62 ha/3.2 billion JPY, Tamura-shi: 33 ha/1.7 billion JPY, Hirano-chō: 114 ha/3.19 billion JPY, Fukushima City: 10 ha/1.5 billion JPY. This totals to 9.59 billion JPY for 2.19 km<sup>2</sup> or 4.4 billion JPY/km<sup>2</sup>. In addition, decontamination costs for private houses were indicated at 0.75-0.88 million JPY/house (*The Asahi Shimbun*, 31 January 2012, 9). The

decontamination costs for an area of 3,925 km<sup>2</sup> amount to 14.1 trillion JPY.<sup>56</sup> If one subtracts a decontamination budget of 1.1 billion JPY, which was already included in the AEC's and other official estimations, additional cost of 13 trillion JPY has to be considered. Due regard should be given to treatment and compensation costs for those who develop cancer or are born with genetic damage as a result of radioactive contamination over the next 10 to 50 years (Kodama 2011). An estimate of the consequences of the Fukushima multiple Maximum Credible Accident (MCA), based on the model used by the European Committee on Radiation Risk (ECRR),<sup>57</sup> leads to a total of 223,000 cancer cases over the next decade alone.<sup>58</sup> Assuming a non-lethal outcome for all these cases and applying the human capital method with a ten-year income loss as cost equivalent (Ewers, Rennings 1992), medium term illness-related costs amount to 11 trillion JPY.<sup>59</sup> Considering these officially ignored or underestimated additional costs of decontamination and illness treatment, the total amount of losses should be estimated at least at 30-35 billion JPY.<sup>60</sup>

city of Minami-Sōma decided on a large-scale decontamination of its inhabited urban area of 14 km<sup>2</sup> over two years at 40 billion JPY (*The Asahi Shimbun*, 2 February 2012, 38). With a population density of 166 persons/km<sup>2</sup> (as of January 2012) and an average household size of three persons, this meant 55 households/km<sup>2</sup> or 22,000 households in the area in question. If one assumes a single-family house rate of 80% and withdraws the approximately 6,000 destroyed houses, 11,600 residential buildings remain. With decontamination costs of 0.75-0.88 million JPY/house, the decontamination costs of all residential buildings in Minami-Sōma amount to 8.7-10.2 billion JPY, which have to be added to the decided budget of 40 billion JPY for large scale decontamination. This again results in decontamination costs of 48.7-50.2 billion JPY for the area of Minami-Sōma or an average of 3.6 billion JPY/km<sup>2</sup>. These data included an adjustment of the average decontamination cost estimate to 3.6 billion JPY (= 58.3 billion JPY/16.2 km<sup>2</sup>). A 2013 cost estimation by AIST for decontaminating 300 km<sup>2</sup> (at 5 cm soil replacement) results in 1.02 billion JPY/km<sup>2</sup> without storage cost and 4.6 billion JPY/km<sup>2</sup> with storage cost (AIST 2013).

**56** Kamioka and Oka used Iidatemura's decontamination cost rate (7.1 billion JPY/km<sup>2</sup>) and calculated the total national cost at 28 trillion JPY (Kamioka, Oka 2012, 193).

**57** In contrast to the ICRP model, the ECRR model considers not only external but also internal radioactive exposure (Busby 2011a, 2; 2011b).

**58** Over the 50 years after 3/11, the ECRR expects a further doubling of the number of cases (Busby 2011a, 10-11; ECRR 2010). Recent critical reviews of available data on thyroid cancer incidents in the Fukushima region lean on the results of the first screening round conducted from October 2011 to April 2015 and showing a thyroid cancer incident rate for both sexes of those who were 0-18 years old in 2011, which is 79.4 times higher than the respective nationwide data collected before 3/11 (Hiranuma 2017). Based on data from the first, second and third screenings, Tsuda identifies a significant increase in thyroid cancer incidents in the Fukushima region, even though 2,700 patients under observation (partly with already treated cancer or positive indications) had been excluded from the screening survey (Tsuda 2018).

**59** 11.15 billion JPY = 10 years × 5 million JPY/year and household × 223,000 cases of illness.

**60** Considering the human (ICRP model) and material damages and calculating them at a discounting rate of 3% for capital cost, Park estimated the total economic loss, which would

In December 2016, METI came up with a new cost estimation and revised its previous one to 21.5 trillion JPY (8 trillion JPY for decommissioning, 7.9 trillion JPY for compensation, 4 trillion JPY for decontamination, and 1.6 trillion JPY for intermediate storage) (METI 2016a). Against the backdrop of the liberalization of Japan's electricity retail market (started in April 2016), the revision was not intended to admit previous downplaying of how expensive nuclear power actually is. It was aimed at backing the government's decision (made eleven days after the release of the new cost estimation) about how to cover these costs while protecting the NPP operators. At face value, 15.7 trillion JPY were to be paid by TEPCO drawing on future profits (but are actually financed by government bonds and guarantees amounting to a total of 13 trillion JPY) and future capital gains from converting preferred TEPCO shares at a conversion price of 30-300 JPY per share into standard shares and selling the latter at a higher price than the conversion price actually paid.<sup>61</sup> 1.6 trillion JPY for intermediate storage and 0.2 trillion JPY for decommissioning support were to be paid directly by the central government, 3.7 trillion JPY by all other former regional monopolies and NPP operators and 0.24 trillion JPY by 'new power companies' without NPR/NPP. But, actually, after 2020, 2.44 trillion JPY for increased compensation (consisting of 1.2 trillion JPY to be paid by TEPCO, 1.0 trillion JPY by the other former regional monopolies/NPP operators and 0.24 trillion JPY by the 'new power companies') will be shifted to all electricity consumers (including those of new electric power suppliers) in form of a surcharge for transmitting electricity through the networks owned by the NPP/NPR operators and former regional monopolies (Kakugi kettei 2016). This surcharge will amount to 600 billion JPY per annum over 40 years. In March 2017, the Japan Center for Economic Research (JCER) released a cost estimation of 49.3 trillion JPY, with decontamination of sea water release excluded and 70 trillion JPY with decontamination of sea water release included (11 or respectively 32 trillion JPY for decommissioning, 8 trillion JPY for damage compensation, 30 trillion JPY for decontamination). The costs of nuclear power add up to 14.7 JPY/kWh and are thus obviously higher than electricity generated in coal and LNG fired power plants at 12.3 JPY/kWh and 13.7 JPY/kWh, merely by doubling the capital cost of a current NPR of 370,000 JPY/kW (METI's low assumption of FY2014) to 740,000 JPY/kW and disregarding the price fall for fossil fuels from 2014 to 2016 (JCER 2017).

A probability of one SA occurring every 2,000/1,494/498 NPR running years (0.05/0.067/0.5%), a running NPR fleet stock of 50 NPRs and

occur in case of MCA at NPR no. 3 of the Ōi NPP in the much more densely populated Kansai region, at 62-279 trillion JPY (Park 2005).

<sup>61</sup> However, assuming a conversion price of 300 JPY/share, the TEPCO stock price has to be 1,500 JPY (compared to the actual stock price of 450 JPY as of 18 April 2018) to realise the expected capital gain of 4 trillion JPY.

271.3 TW of electricity generated by all NPPs (FY2010) and an assumed total damage of 30-35 trillion JPY result in a risk premium of 2.76-3.23/3.70-4.32/11.10-12.95 JPY/kWh for nuclear power generated electricity to be added to the cost of capital and operating. Estimating the total damage at 40-70 trillion JPY, the risk premium of nuclear power generation amounts to 3.69-6.45/4.93-8.64/14.80-25.91 JPY/kWh respectively. Some say that it is inappropriate to base cost estimates on the retrospective occurrence rate of 0.5% (3 SA in 1,494 NPR running years). But this is not convincing, as NPPs cannot be made resistant against most powerful earthquakes.<sup>62</sup> Consequently, private insurance companies refuse to insure NPR/NPPs beyond the upper limit of 120 billion JPY (Shinagawa 2011). This threshold demonstrates the dubiousness of SA probabilities that proponents of nuclear power assume in their cost estimations at a rate lower than the tracking record of one SA per every 498 or 1,494 NPR running years (tab. 3.2d).

Table 3.2d Projections of nuclear power costs for SA-related damages and compensation

<b>Running NPR stock of 50 NPR, 271.27 TWh of electricity by NPR/year (FY 2010)</b>	<b>Losses of 21.5 trillion JPY (METI 2016)</b>	<b>Losses of 30-35 trillion JPY</b>	<b>Losses of 40-70 trillion JPY (JCER 2017)</b>
3 SA/1,494 or 1 SA/498 NPR operating years = probability 0.5% (tracking record of Japan)	7.96 JPY/kWh	11.10-12.95 JPY/kWh	14.80-25.91 JPY/kWh
1 SA/1,494 NPR operating years = probability 0.067% (tracking record of Japan)	2.65 JPY/kWh	3.70-4.32 JPY/kWh	4.93-8.64 JPY/kWh
1 SA/2,000 NPR operating years = probability 0.05% (assumption by METI)	1.98 JPY/kWh	2.76-3.23 JPY/kWh	3.69-6.45 JPY/kWh
1 SA/10,000 NPR operating years = probability 0.01% (target by IAEA, NCR)	0.40 JPY/kWh	0.55-0.65 JPY/kWh	0.74-1.29 JPY/kWh

Source: Compiled by Author

Thus, the costs of nuclear power generation are by no means the lowest. Considering realistic utilization rates and operating lifespans as well as discounting rates and largely socialised costs, such as back-end, state subsidies for settlement, R&D programmes, risk premiums or compensation – insofar as they are calculable and can be fully taken into account – nuclear power generation is to be acknowledged as most expensive.

62 For earthquakes with a magnitude of more than 8, gravitational accelerations of up to 1,000 GAL occur vertically and horizontally. Complex industrial plants cannot be made resistant against such earthquakes, because gravitational pull may exceed 980 GAL (Hirose Takashi 2010, A15).

### 3.3.4 Liberalising Japan's Electricity Market: Making Nuclear Power a Defensive Wall

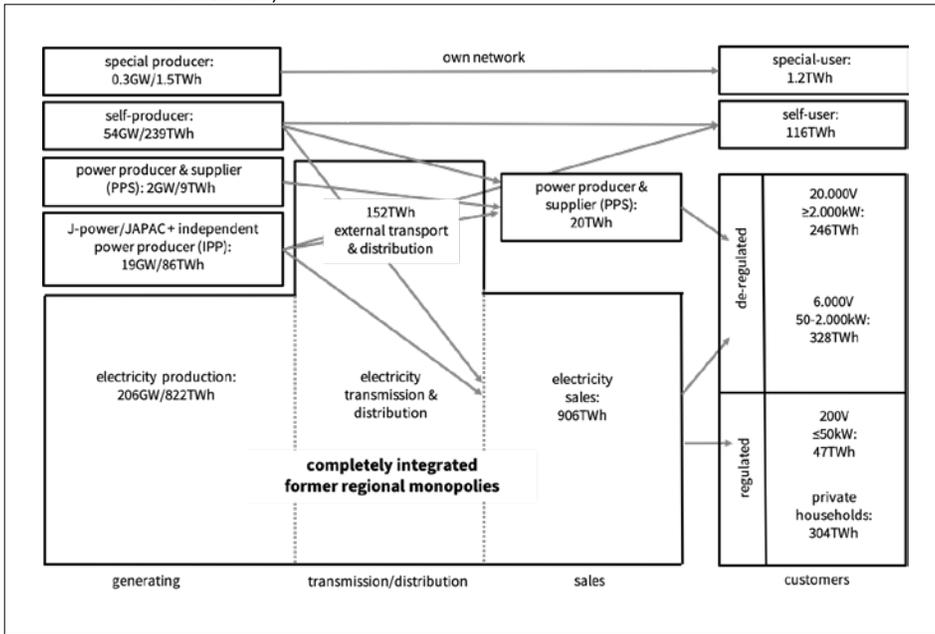
In the early '90s, Japan's attempt to meet the return requirements of accumulated capital through lowering interest rates and boosting asset inflation, leverage and related consumption failed. To prevent a systemic implosion, the state emerged as debtor and demand-generating investor. Capital owners and creditors wrote off losses, companies reduced their liabilities and costs. As a result, Japan's economy has been in a so-called deflationary crisis. In the mid-'90s, when hope for quick fixes faded, the neoliberal triad of deregulation, privatisation and welfare cuts gained popularity. In this context, calls to liberalise also the electricity market after rail traffic and telecommunications and to break up regional monopolies became louder. Hopes for lower electricity prices to result from free competition arose. Decentralised and cost-effective technologies such as heat and power co-generation and micro gas turbines were expected by experts to spread faster, a more flexible supply control (Kumamoto 2011, 20-1) and demand-driven investment behaviour were anticipated to replace political interventions as well as the non-transparent approval process for electricity cost prices and capacity building (Anayama 2005, 193-4). The regional monopolists argued that only a vertically integrated, centralised system of generation and transmission as well as economies of scale based on large-scale technology would enable a stable and cost-effective supply. Liberalization was also feared to set off a reckless race for the lowest price and to allow speculative exploitation of discrepancies between supply and demand. The power crisis in California and the bankruptcy of Enron in 2001 seemed to confirm these reservations against deregulation.<sup>63</sup>

The first retail market segment for ultra-high voltage users (large scale factories, department stores and buildings) was liberalised in March 2000, followed by another one for small and medium scale factories and buildings, which was opened for so-called Power Producers and Suppliers (PPS) in March 2005. In March 2016, the last remaining segment, the one for low voltage users, i.e. private households and small retailers, was liberalised. As of April 2018 electricity can be purchased from 468 registered electricity retail suppliers, depending on their respective regional coverage zone. Existing standard price schemes will remain unchanged until 2020, while new and special price menus can be freely set.

In response, former regional monopolists and NPP operators concentrated their resistance on preventing the neutralisation of onward and outward electricity flows, that is, equal access for all suppliers to the electricity grid. As a matter of fact, they have succeeded in introducing expensive transmitting

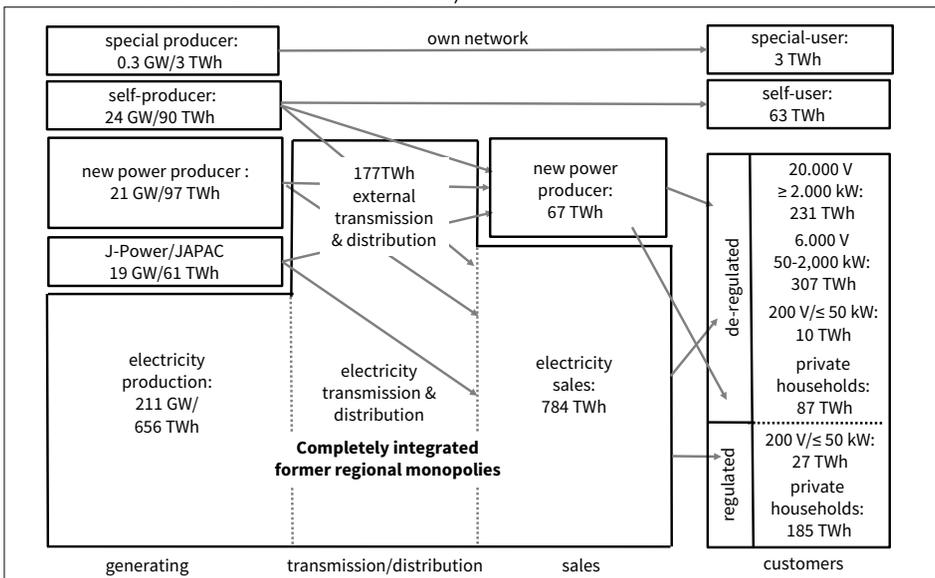
63 Mitsuharu Itō 2011b, 174-5; Kikkawa 2011, 145-6; Hiroshi Takahashi 2011, 156-68.

Figure 3.6a Structure of the electricity market in Japan as of FY2010 (before retail liberalization)



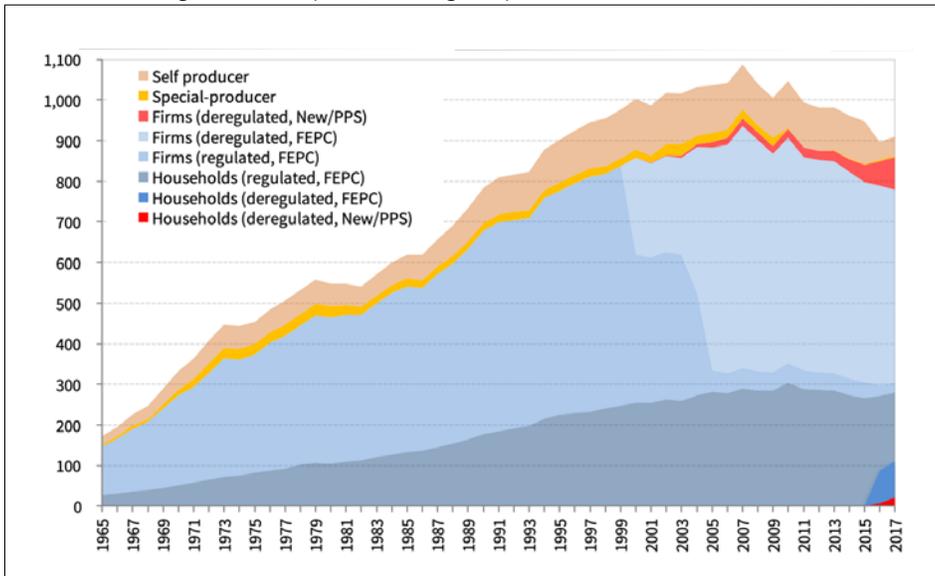
Source: Author, based on METI 2018b

Figure 3.6b Structure of the electricity market in Japan as of FY2016 (after start of liberalization of retail market)



Source: Author, based on METI 2018b

Chart 3.19 Electricity demand by provider and customer groups and state of regulation in Japan (including self-production and self-user, TWh/a, FY)



Source: Author, based on JBHI 2018; FEPC 2018; METI 2018b

and imbalance fees (Kumamoto 2011, 48-53). Thus, the impact of liberalization on Japan’s electricity market structure was actually limited with regard to change in market shares (figs. 3.6a-b). Theoretically, independent electricity producers (the so-called PPS) have been allowed to serve the entire high-voltage segment (from 6,000 V/50 kW) since 2005, which represented more than 60% of the total electricity demand. But they are charged tremendously high fees by the regional monopolists for the transmission in the ultra-high (over 2,000 kW/20,000 V) and high-voltage segment (50-2,000 kW/6,000 V), ranging between 2.59-5.19 JPY/kWh in 2004, 1.88-3.47 JPY/kWh in 2010, 1.62-5.20 JPY/kWh in 2015/16. PPSs also have to pay a maximum of 48 JPY/kWh (three times the standard cost price) as compensation for any gap between actual electricity supply and demand over 3% that they cannot balance within 30 minutes (as of 2008-2016) (Kumamoto 2011, 51).<sup>64</sup>

The market share of the so-called new electricity producers (or former PPS) in the price-sensitive ultra-high and high voltage segments has grown from

<sup>64</sup> The big electric power companies charge all other sellers not only shortage but also surplus (both from 3% upwards) in addition to the standard cost price. As of 2016, these balancing charges amount to a national average of 14.3 JPY/kWh and a maximum of 21.82 JPY/kWh (METI 2017d).

5.2% in FY2014 to 7.6% in FY2015 and 10.9% in FY2016 to remarkable 14.7% in FY2017 (METI 2018b). But the former regional monopolies are losing market share only slowly; they are still dominating the market (chart 3.19).

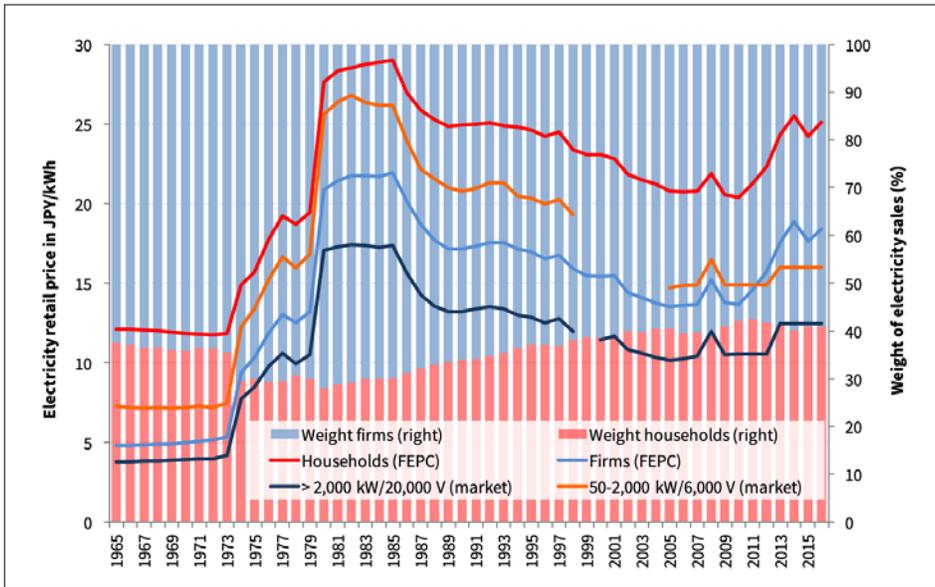
The former regional monopolies and NPP operators have been able to protect their dominant position particularly in the high margin low-voltage segment. Here, the new entrants' market share reached 2.6% in FY2016 (the first year of liberalization) and has – though remaining still single-digit – grown to 6.9% in FY2017. This is mainly due to prohibitively expensive transmitting fees of 7.81-9.93 JPY/kWh (as of 2015 and 2016 respectively), which the owners of the grid charge to the electricity sellers. These charges represent 31-36% of the electricity retail price for low voltage/private households (25 JPY/kWh as of FY2016). Finally, the private households are to pay the relatively high margin of the big electric power companies and subsidise the lower margin as well as the relatively cheap purchasing price of large corporate electricity consumers: although the share of private households among the total electricity sold by the big electric power companies is only 33.6% (as of FY2016), the big electric power companies generate 40.8% of their sales turnover from selling electricity to them (chart 3.20a).

Dividing the shares of total electricity sales turnover by the shares of electricity consumption of firms and private households reveals that the degree of privileging the corporate sector has not changed since the early '80s, despite all partial measures of liberalization. On the contrary, compared with 1980, it had even slightly increased until the 'liberalization' of the low voltage/private household segment in FY2016 (chart 3.20b).

Before April 2016 private households could not freely choose their electricity provider and therefore had to pay the electricity retail prices of the regional monopolists. In turn, the latter offered large corporate users electricity as cheaply as possible in the already deregulated market segment, which represented two thirds of the total electricity consumption.<sup>65</sup> The regulated electricity price, applied to the then regulated low voltage market segments

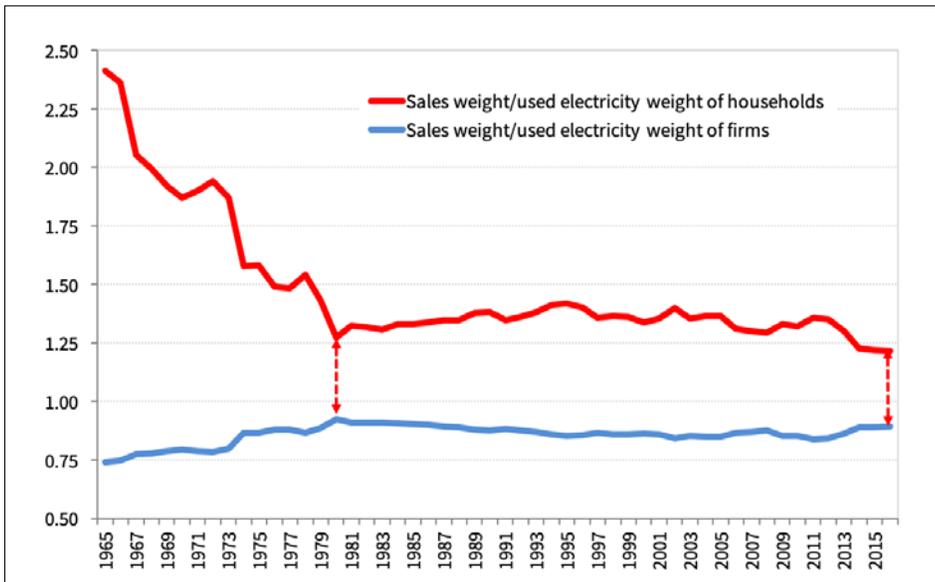
<sup>65</sup> Before the partial liberalization a hidden cross-subsidisation (violating the principles of total cost approach, reasonable profit and equal treatment of customers) was supposed to be prevented by the allocation of costs and electricity consumption to each user segment in the process determination of the electricity price. Different supply costs, demand or load patterns and shares of customer costs of the respective power consumption are relatively easy to determine. In addition, it is important how much of the fixed costs of electricity generation and transmitting are attributed to which user segment. High in total, these costs are to be borne by all, although they are not specified according to user group. Their allocation has been based on the share of the respective demand group in the maximum power output during the annual peak load day, the annual consumption amount and the peak load in the ratio of 2:1:1 (Anayama 2005, 51-5, 93-8, 196). Liberalization was intended to prevent cross-subsidisation of the deregulated by the regulated sector within an electricity company through controlling the annual revenues and expenditures in the respective segments (Anayama 2005, 198; Ōshima 2010, 63). But such controls have been depending on the financial reports by the electric power companies themselves, which used special

Chart 3.20a Electricity retail prices and sales by firms and households (FY)



Source: Author, based on FEC 2018; METI 2018b

Chart 3.20b Electricity sales weight and electricity consumption weight of private households and firms in Japan (FY)



Source: Author, based on METI 2018b

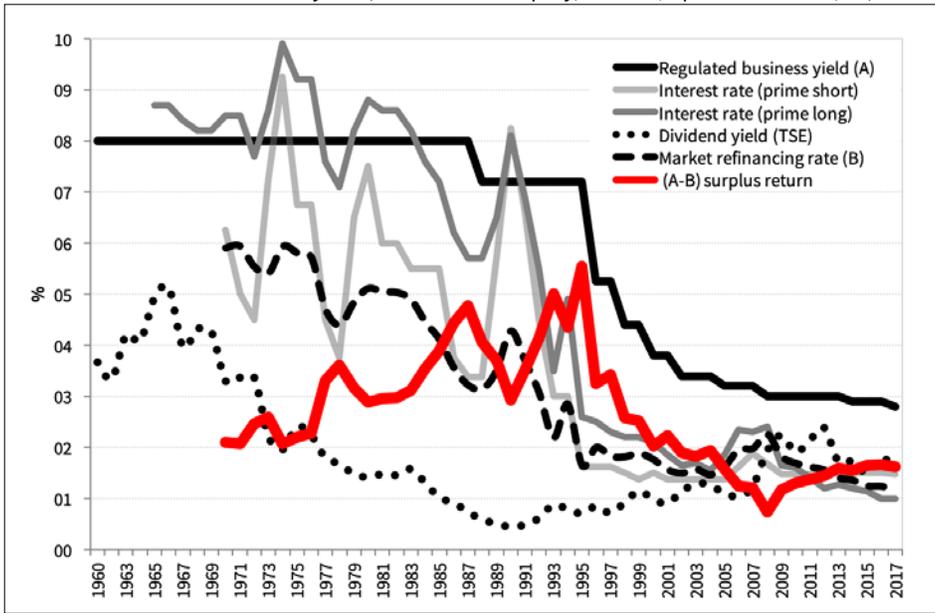
and scheduled to be abandoned in April 2020, has been calculated as the sum of the current operating costs (including fuel and depreciation) and reasonable interest on the assets required or used in the electricity business (facilities in operation and under construction, nuclear fuel rods or fuel stocks, investments in raw material development, R&D expenditures and 1.5 monthly working capital). This sum is divided by the amount of electricity generated. Thus, the regional monopolists have been exempted from short- and medium-term refinancing risks. Furthermore, the regulated return on business (*jigyō hōshū*)<sup>66</sup> has exceeded the market average of refinancing costs for external (loans) and internal (equity) capital in a range of 1-4%, allowing the regional monopolists to pay the difference to their shareholders as increased dividend or to retain these 'regulated margins' as profits, as long as actual refinancing costs are close to or lower than the market rate (chart 3.21).

Under these conditions, regional monopolists have been inclined to expand their generation capacity and invest into large-scale power plants as well as generation technologies. Once these capacities were built, the companies tried to achieve economies of scale by offering and selling to large customers as much electricity as possible at low prices. However, these capacities are inflexible, which remains without financial consequences as long as the additional costs of equalizing the difference between basic and peak load can be absorbed by the relatively high electricity prices in the regulated sector (i.e. private households). If regional monopolists have to cope with set prices but are guaranteed the integration of the costs for running and refinancing their assets into the regulated price, they will primarily seek to increase their asset volume, sales turnover and absolute profit amount through borrowing, as long as the interest and dividends do not exceed the regulated return on business. The trend of main financial indicators at the large electric power companies from 1970 to 1999 (chart 3.22a) confirms this: apart from price increases during the oil crises of 1973 and 1979 and the subsequent reduction in fuel costs due to the appreciation of the JPY, the regional monopolists boosted their total asset volume faster than the sales turnover through finan-

accounting rules (e.g. excluding NPP-related capital provisions and externalising these costs) (Kanamori 2016, 1148-50).

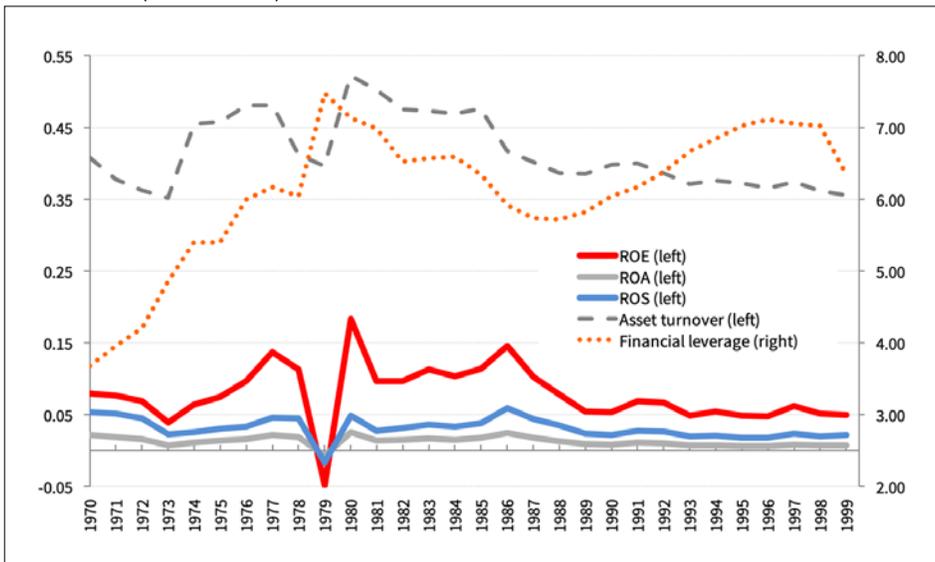
**66** Actually, in the cost calculations for FY2013-2016, approved by METI, the so-called return on business is higher (at an average of around 5%) than the officially indicated and regulated return rate of 2.8-2.9% as it includes the actual refinancing costs. Before 3/11 electric power companies as regional monopolists were supposed to be low-risk or almost risk-free borrowers and therefore able to raise external capital at relatively low cost. Consequently, the refinancing costs of their total amount of liabilities are still relatively low (at around 1%). And electric power companies are still rated as highly credible (A) except TEPCO (BBB), issuing 5/10/20-year corporate bonds at a nominal interest rate of clearly less than 1% per annum. However, refinancing costs are set and approved by METI as an element of the regulated electricity price at a higher rate and added to the indicated regulated return rate on business.

Chart 3.21 Regulated business yield (A), market-based refinance rate (B), average interest rate and dividend yield (until 1995: 50 equity/50 debt, up from 1996: 30/70)



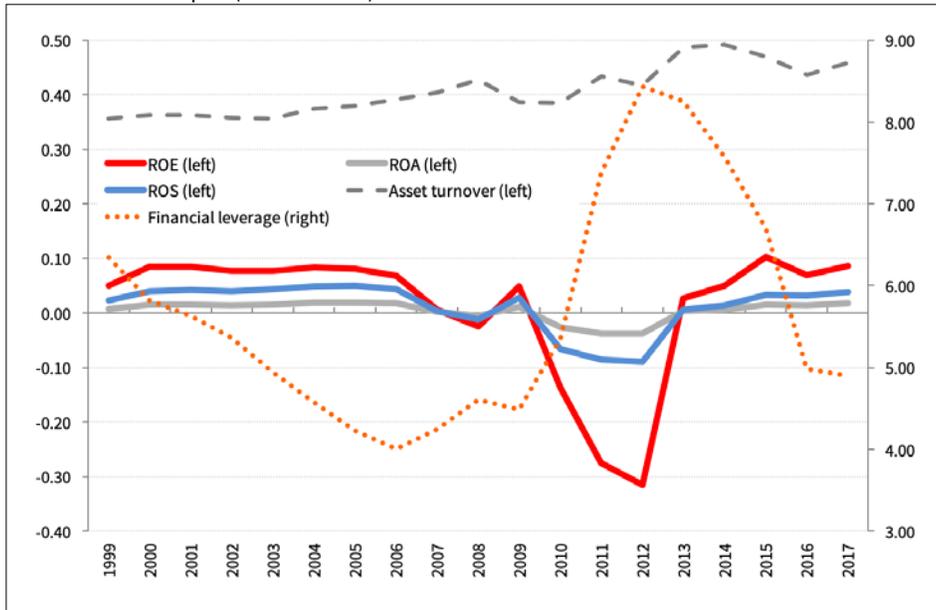
Source: Author, based on BOJ 2018; JPX 2018; METI 2018

Chart 3.22a ROE drivers for FEPC-member firms (regional monopolies) in Japan (FY1970-1999)



Source: Author, based on FEPC 2018, IR-Reports

Chart 3.22b ROE-drivers for FEPC-member firms (regional monopolies) in Japan (FY1999-2017)

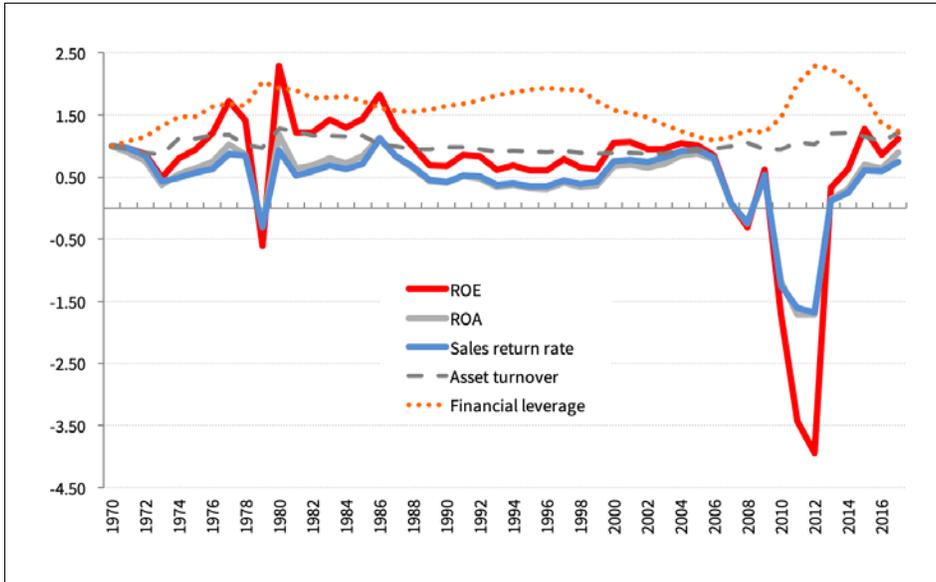


Source: Author, based on FEPC 2018, IR-Reports

cial leverage, which is why the asset turnover rate has dropped.<sup>67</sup> However, if regional monopolists are exposed to competition in supply and price within a stagnant market, they will have to lower their prices and costs to avoid losing market share. They will reduce capacity investment and financial leverage, making better use of their fixed assets. The trend of financial data from 2000 onwards (charts 3.22b-c) indicates exactly this: leverage fell until 2006, while the total volume of assets increased only slightly. Besides the financial crisis, the slump in sales, net assets and return on equity in 2008 is attributable also to the fact, that the rise of the oil price in a partially deregulated market could not anymore be absorbed easily by a general raise of the electricity prices. Passing on these additional costs almost entirely to customers in the regulated market segment could have triggered demands for extending market liberalization to the private household segment.

67 The return on equity (ROE) can be calculated as the product of return on assets (ROA; how much profit was generated from investing into and utilising assets?) and financial leverage (how much are assets refinanced with debt?):  $ROE = ROA \times leverage$ . Further, ROA can be broken down into the return on sales (ROS; how much profit was generated from sales?) and the asset turnover rate (ATR; how much sales was generated from utilising assets?). Therefore,  $profit/equity (ROE) = profit/sales (ROS) \times sales/assets (ATR) \times assets/equity (leverage)$ . It is now possible to determine which of the factors affects the return on equity to what degree.

Chart 3.22c ROE-Drivers for FEPC-member firms (regional monopolies) in Japan (1970 = 1, FY)



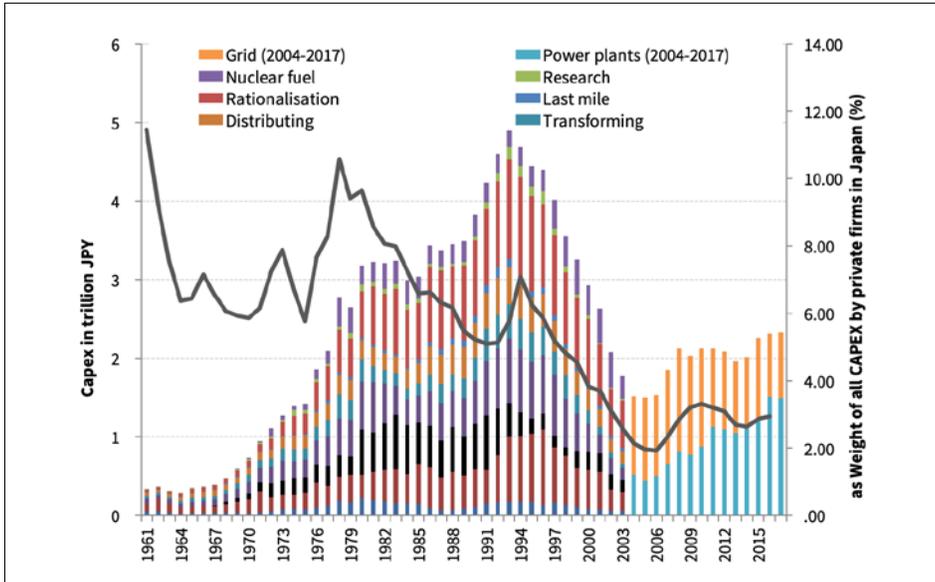
Source: Author, based on FEPC (2018), IR-Reports

This would have been incompatible with the capital-intensive maintenance and expansion of the NPP fleet. Furthermore, it does neither suit the interests of government and bureaucracy, whose industrial scheme of keeping nuclear technology and fuel stock as political option and power tool would have been jeopardised by market liberalization. Encouraged by the Nuclear Renaissance in the US, it was decided in 2004-2005 to halt market liberalization and prioritize nuclear power generation in Japan’s energy and industrial policy (Kikkawa 2011, 146-9).<sup>68</sup> As a result, the regional monopolists did not only defend their dominant market position, but also attempted to make themselves less vulnerable. Eventually, they managed to keep the power grids under their control and erect barriers against new entrants (Yoshimatsu 2011, 288-95). The government’s commitment to the nuclear cause was reason enough for the regional monopolists to slightly increase capital investment again until 3/11 (chart 3.23).

However, to avoid further demands for market liberalization, internal pressure on the operational cost at electric power companies was kept high. This had particularly dangerous consequences for NPPs: lifespan

68 See also § 3.2.3 in this chapter.

Chart 3.23 Capital expenditures (CAPEX) of FEPC-member firms (FY)

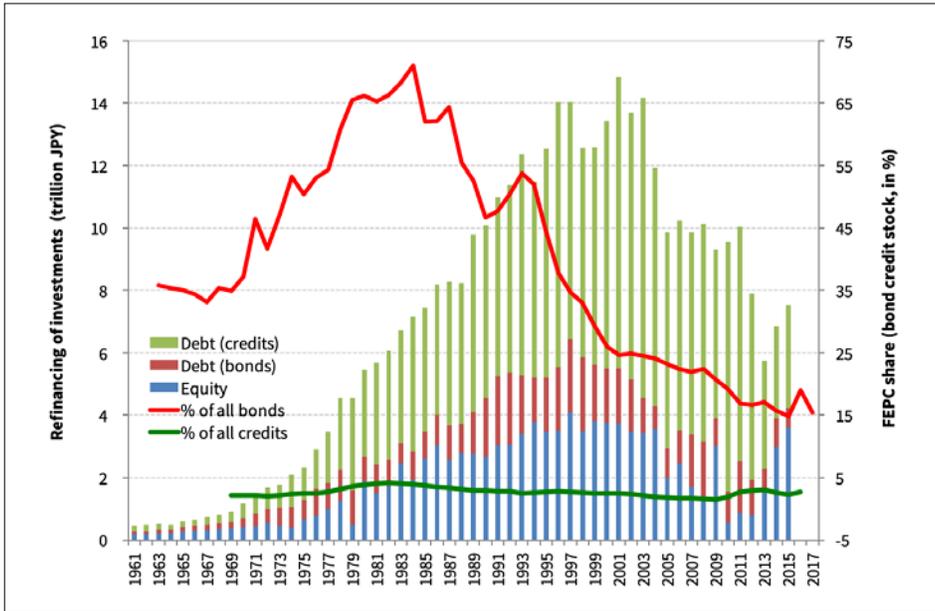


Source: Author, based on JBHI 2018; FEPC 2018; CAO 2018a

and operating intervals of older NPRs were extended and – as in the case of the damaged Fukushima-1 NPP – safety-related but costly conversions and retrofits were voided or delayed (*The Asahi Shimbun*, 6 April 2011, 2).<sup>69</sup> Japan’s government as well as the electric power industry could rely on the strong support from large corporations, main industries and their lobbying organisations: in the first half of the ‘80s, fixed investment in the electricity industry accounted for more than 7% of all investments made by Japanese private companies. Although their share had fallen to below 3% in the early 2000s, electricity companies are more important customers than ever before in the face of declining public investment and business for the heavy, plant and construction industries (chart 3.24).

<sup>69</sup> In its ruling of 17 March 2017, the regional court of Maebashi confirmed that in May 2008 TEPCO was aware of the relatively high occurrence probability of a M8 earthquake, estimated at 20% in the coming 20 years and at 30% in the coming 30 years, as well as the danger of tsunamis, caused by such an earthquake and putting vital safety facilities like emergency power generators out of function. But even though, TEPCO did not take necessary counter measures in order to avoid additional costs and further screenings by regulation authorities (Nobuaki Takahashi 2017b, 456).

Chart 3.24 Refinancing of investments by FEPC-firms (flow) and FEPC-firms share of corporate bonds and credits in Japan (Stock) (FY except 2017)

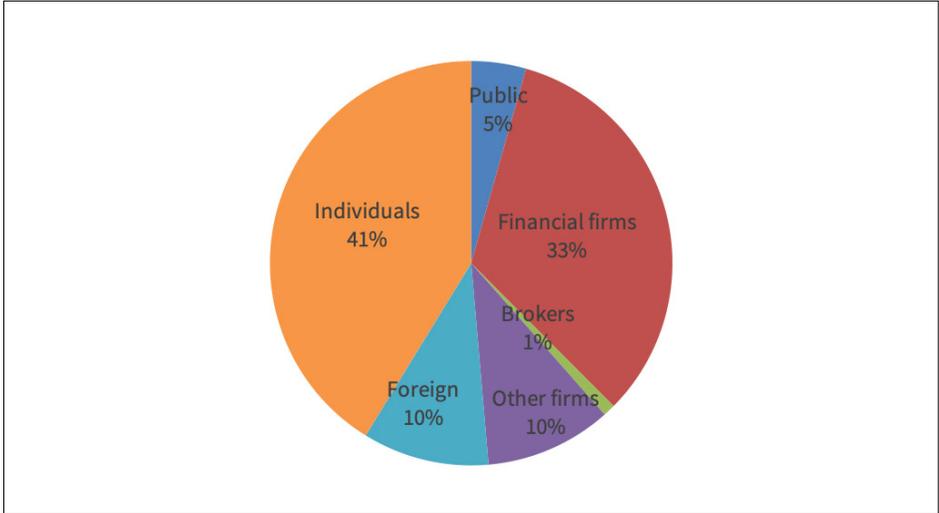


Source: Author, based on JBHI 2018; BOJ 2018; JSDA 2018; FEPC 2018

The electric power companies have been extremely important customers also for the financial industry: valued as low risk debtors (before 3/11: AA+) with huge refinancing demand due to their untouchable position as regional monopolies, stable cash inflows and major capital investments, the electricity companies have been raising external capital not only in the form of loans, but also through issuing long-term bonds. In the late '70s and early '80s the latter accounted for two thirds, as of March 2017 for about 20% of all outstanding corporate bonds (including short-term redemptions) issued by Japanese private companies apart from the financial industry. Outstanding long- and short-term loans, accounted as liabilities in the balance sheets of the large electric power companies, represent 3% of all outstanding corporate loans provided by Japanese banks (as of March 2017). Thus, the single amount of credits given by Japanese banks to each of the large electric power companies is so big and the related credit risk so concentrated that lenders have a strong interest in avoiding a default of these debtors - writing-offs would be huge and affect the financial health of the lender immediately (chart 3.24).

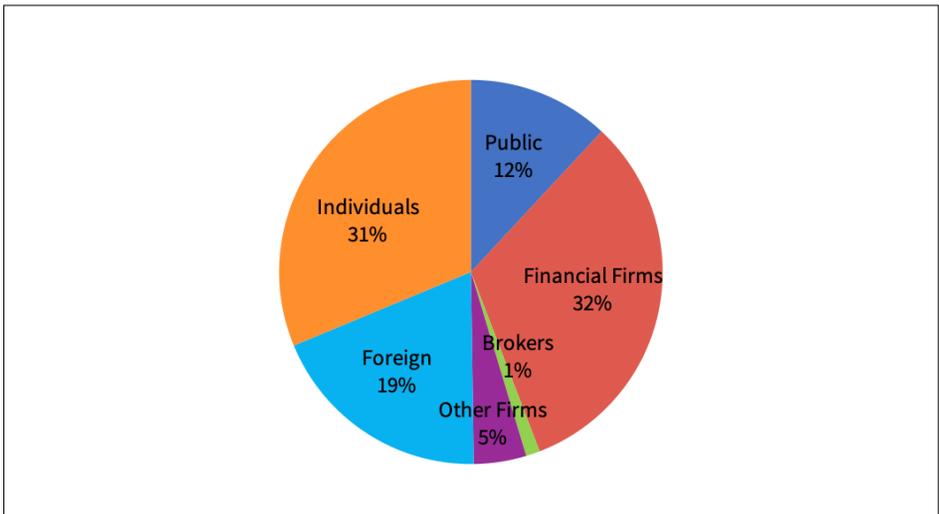
Before 3/11, the shareholder structure of the large electric power companies and NPP operators was characterised by two investor groups: individuals and financial institutions (chart 3.25a). Shares in electricity companies were considered to be defensive or counter-cyclical stock investments because of their relatively high dividend yield (compared to the low return on savings deposits) and the stable earnings situation (due to the lack of price competition). Financial institutions and large corporations had the blocking minority with more than one third of the voting shares (43% as of March 2011), while the high proportion of individuals with small holdings and the fragmentation of their total holdings had left the top executives of power companies with a relatively large amount of discretionary scope as long as the interests of METI, ruling politicians and bureaucrats were met. After 3/11, financial institutions maintained their share, whereas public and foreign investors raised their respective weights, in contrast to domestic individuals and other firms, who reduced theirs. As a result, domestic financial institutions and public investors (mainly the central government through its 55% stake in TEPCO and some municipalities such as Tōkyō and Ōsaka) hold controlling stake of 44% in the stock-market listed big electric power companies and NPP operators (chart 3.25b). The commitment by the central government and METI to TEPCO – their ongoing financial and administrative support and promotion of nuclear power – has reduced the risk for domestic institutional investors considerably and provided risk-tolerant foreign institutional investors (hedge funds) with an opportunity to realise big capital gains by taking a long position (buying based on the expectation that the value of their stock holdings will rise).

Chart 3.25a Shares in 10 regional monopolies by investors as of 31 March 2011 (weighted with market capitalisation as of February 2012)



Source: Author, based on IR-Reports

Chart 3.25b Shares in 10 regional monopolies by investors as of 31 March 2018 (market capitalisation weighted as of April 2018, government’s holding of preferred TEPCO stocks included)



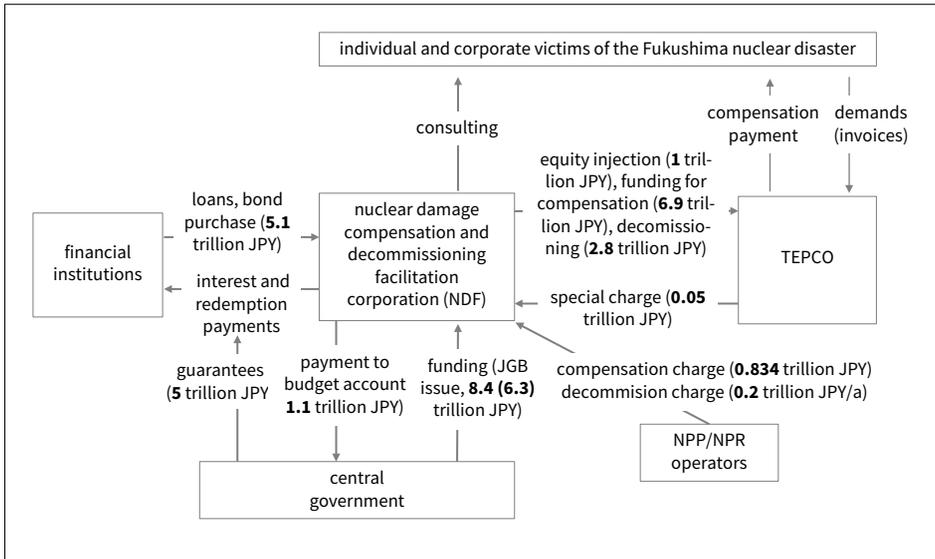
Source: Author, based on IR-Reports

Another factor for the ongoing commitment to NPP operators like TEPCO is their interdependency with Japan's financial industry. While being the main shareholder besides individuals, Japan's financial industry has been highly exposed to the heavily leveraged regional monopolies and NPP operators as lender. On the other side, the NPP/NPR business with its huge amount of fixed cost and fixed assets has been relying on the financial industry for stable and low-cost funding. Japan's government provided huge public funds to rescue both TEPCO and the financial industry. There are (a) government guarantees for the bonds issued to raise capital for compensation payments and decommissioning by the Nuclear Damage Compensation and Decommissioning Facilitation Corporation (NDF) (13.5 trillion JPY planned, 1.4 trillion JPY issued by June 2018), (b) government guarantees for loans from private banks for compensation payments and decommissioning by NDF (3.7 trillion JPY called by June 2018), (c) equity capital injection/underwriting TEPCO shares (1 trillion JPY), (d) subsidies for decommissioning and public funding of intermediate storage (2 trillion JPY), (e) a raise of the regulated electricity price by 8.5% in 2012 alone and another 16% until 2014 and additional transmitting charges (2.4 trillion JPY). While the government provides such tremendous public, NPP operators<sup>70</sup> take less burden. They have to pay 0.834 trillion JPY (among them 0.294 trillion JPY by TEPCO) as general burden charge (shifted to electricity consumers through price surcharge) to NDF. TEPCO pays 0.05 trillion JPY from operating income as special burden charge to NDF. And all NPP operators pay annually about 0.2 trillion JPY from decommissioning provisions, also originally charged by the electric power companies to the electricity consumers. Finally, Japan's government has allocated about 13 trillion JPY and raised 11.4 trillion JPY (as of the end of FY2016) to provide TEPCO with funds to pay its liabilities related to 3/11 damage compensation, decontamination and decommissioning (fig. 3.7).

Initially, the government had planned to redeem the outstanding public funds of expected 9.1 trillion JPY over the 25 years from 2015-2039, by paying interest of 1.0 trillion JPY out of its general budget, taking 4.4 billion JPY from electricity price surcharges and 1.3 trillion JPY from TEPCO future profits and realising 2.5 trillion JPY from expected capital gains of selling TEPCO shares purchased on loan and held by NDF. Following this projection, TEPCO shareholders would have to bear 14%, while taxpayers and electricity consumers would have to shoulder 11% and 48% respectively (Saitō 2015, 36-41). But by the end of 2016, the government had to admit that assuming 11 trillion JPY as total cost does not hold and that instead a funding of at least 21.5 trillion JPY is necessary (see § 3.3.4). This sum was supposed to be covered by 1.6 trillion JPY from the general

70 10 FEPC member firms plus JAPC and JNFL.

Figure 3.7 Refinancing scheme of 3/11 damage compensation, costs of decommissioning and decontamination (accumulated as of end of FY2016)



Source: Author, based on METI 2016d; Saitō 2015, 26-41

budget, 7.8 trillion JPY from electricity price surcharges (over 40 years), 8.1 trillion JPY from future TEPCO profits (over 30 years) and 4 trillion JPY from expected capital gains of selling TEPCO shares (Kakugi kettei 2016; METI 2016b).

The principle of ownership responsibility would have called for TEPCO’s insolvency and delisting, thereby reducing shareholder capital to zero.<sup>71</sup> As in other insolvency cases of large public corporations, for example Japan

**71** As of the end of March 2010, TEPCO’s shareholder capital was indicated at 2.5 trillion JPY. By March 2011, TEPCO’s liabilities (amounting to 23.2 trillion JPY = 13.2 trillion JPY of bonds, loan and others plus 10 trillion JPY, consisting of the then estimated cost for decommissioning of 5 trillion JPY and for damage compensation of 5 trillion JPY) had exceeded its total assets of 14.8 trillion JPY by 8.4 trillion JPY (Saitō 2015, 20-5). Under the assumption that a company can survive with negative equity as far as its cash flows are sufficient to serve all current demands, and even in consideration of a rich operating cash flow of 832 billion JPY and operating profits of 192 billion JPY (both annual average FY 2006-2010), a negative equity, amounting to 8.4 trillion JPY or 57% of total assets, could have been hardly ignored by banks in their decision on new loans for TEPCO, because the past cash flows had been inevitably linked with the highly leveraged balance sheet, in other words, with permanent refinancing and redemption of existent loans and bonds. Banks remained reluctant about providing new loans to TEPCO directly, despite government guarantees for new funding through NDF, which has been keeping TEPCO solvent and the banks demands alive (Saitō 2015, 312-8).

Airlines (JAL), lenders and bond holders, too, would have been forced to write-off their demands, which amounted to 6.7 trillion JPY as of March 2010 (Saitō 2015, 318-23; Nobuaki Takahashi 2017a, 274). Then, TEPCO's assets (valued at 6.7 trillion JPY as of 31 March 2011) could have been used to refinance at least partly the NPR decommissioning, decontamination and compensation of damages incurred by 3/11 and estimated at 22-70 trillion JPY at least in part.

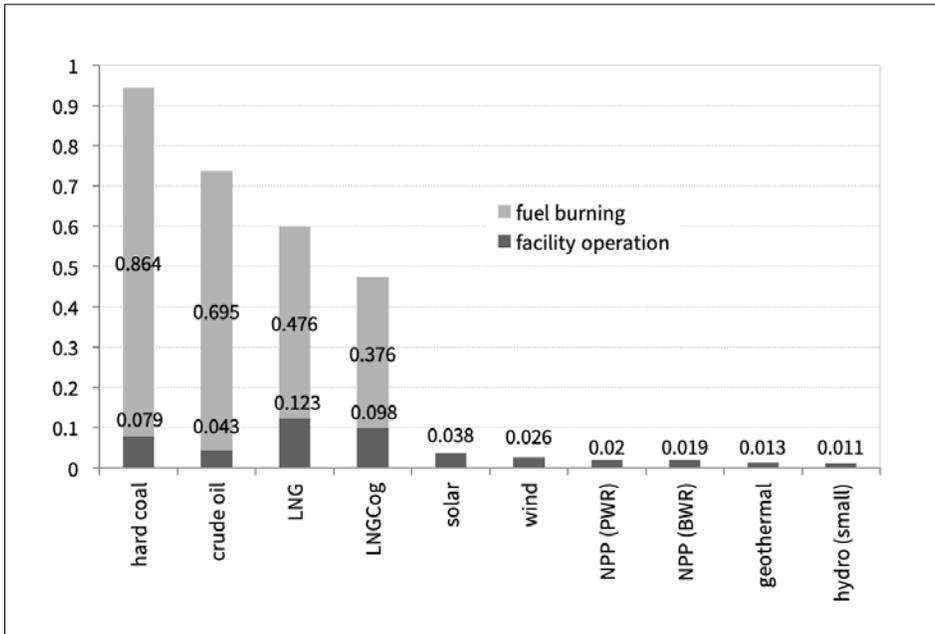
As Koga (2017) has pointed out, by keeping TEPCO alive through injecting huge public funds, METI was able to protect its position and its control of public budgets against harsh criticism and calls for an independent regulation of NPP-related businesses. Furthermore, METI has established a precedential case and administrative scheme for rescuing NPP operators, assuring them, their investors and debtors, that almost all risks will be minimised at the expense of taxpayers, non-NPP competitors and electricity consumers (Koga 2017, 356). In addition, Japanese experts expect METI - following the UK model - to introduce a Feed-in-Tariff (FIT) for NPR/NPPs to be paid by all electricity consumers and/or taxpayers (Ōshima 2014, 154-61; Hiroshi Takahashi 2017, 149-51). This would allow NPP operators not only to keep running, but to replace or even enlarge the existing fleet. NPPs could be re-established as a source of extra rent and the foothold of a centralised electric power system. Nuclear power generation would serve as a bulwark against further market liberalization and decentralisation.

### 3.3.5 Nuclear Power as a Rescue from Global Warming?

Japan's government, the electric power corporations and their pundits in mass media and academia have claimed that NPPs cause little or no CO<sub>2</sub> emissions (chart 3.26) and, therefore, are not only indispensable, but central to a sustainable energy policy.<sup>72</sup> Section 3.3.2 demonstrated how much energy is spent and how many natural resources are needed to produce and store nuclear fuel for NPPs. Experts agree that the CO<sub>2</sub> emission level

<sup>72</sup> A current example is the proposal for the Fifth General Energy Plan by a METI sub-committee from 27 April 2018, affirming METI's earlier projection of Japan's energy mix in 2030 (METI 2015c) and arguing once more that the indicated 20-22% share of NPP in electricity generation (1,065 TWh/a) is needed in 2030 to fulfill Japan's commitment to the reduction of emissions that cause global warming, by 26% until 2030 and by 80% until 2050 (both compared to 2013) (METI 2018e, 3). Following this proposal, the 5th General Energy Plan was approved by the government on 3 July 2018. Further restarts of NPPs and the increase of nuclear power generation share from 1% in FY2013 to 20-22% in FY 2030 were declared as projective goal in order to raise the share of zero emission power generation from 12% in FY2013 and 16% in FY2016 to 44% in FY2030 and Japan's energy self-sufficiency rate from 20% in FY2010, 6% in FY 2013 and 8% in FY2016 to 24% in FY2030 (METI 2018g, 4, 10, 12).

Chart 3.26 CO<sub>2</sub> emissions in power generation by source of energy or plant type in Japan (by CRIEPI as of 2009, kg/kWh)



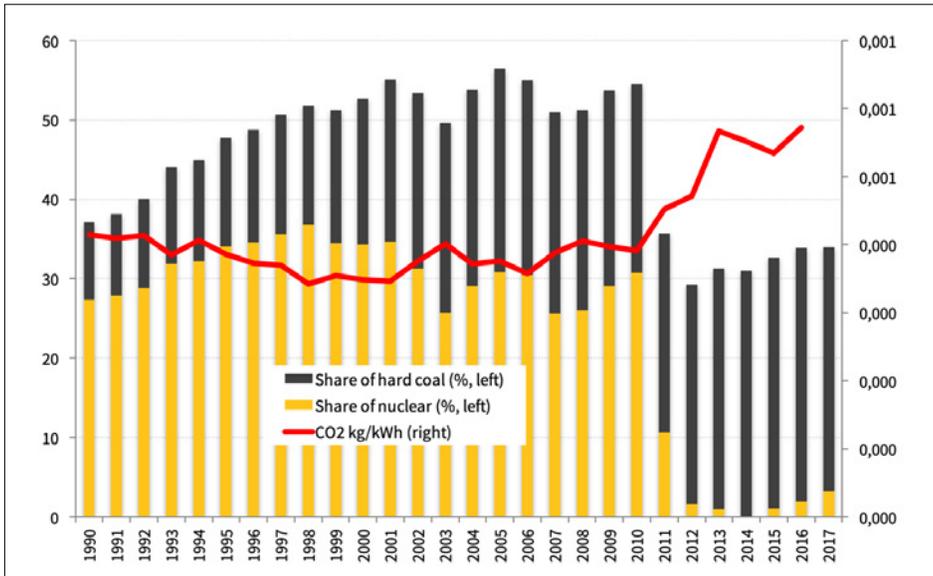
Source: Author, based on Imamura et al. 2016

of nuclear power significantly increases if calculations include emissions caused by interim and final storage of nuclear fuel and contaminated materials (Koide 2011b, 199).<sup>73</sup> Besides, NPPs achieve an energy efficiency of only one third, since two thirds of the energy are released via the cooling water, which is heated by up to 7°C (given a volume of 70-80 t/s or 6.9 million t per day at an NPR with 1 GW output). Thus, NPPs contribute to global warming by raising the sea water temperature without the detour of CO<sub>2</sub> emissions (Koide 2011a, 118-21; Saitō 2011, 26-9).

Nuclear power generation needs fossil fuel fired power plants as backup and complement to keep the total output responsive to demand changes. After 3/11, CO<sub>2</sub> emissions increased despite a decline in electricity generation: load, output and weight of hard-coal and LNG-fired power plants had been raised to replace previous NPP capacity. Already 1990-2010, the CO<sub>2</sub> emissions from electric power generation and their share of Japan’s total

<sup>73</sup> According to the calculation model of the WISE-Uranium project (2009b), the production of 30 t UOX fuel causes an energy consumption of 292 GWh and 314,337 t CO<sub>2</sub> emissions. This translates into 53.8 g CO<sub>2</sub>/kWh, converted to the annually generated electricity volume of a 1 GW reactor with 70% utilization minus the energy consumed for operation.

Chart 3.27a CO<sub>2</sub>-emissions of electric power generation after credits and their weight on total CO<sub>2</sub>-emissions of Japan (CY)

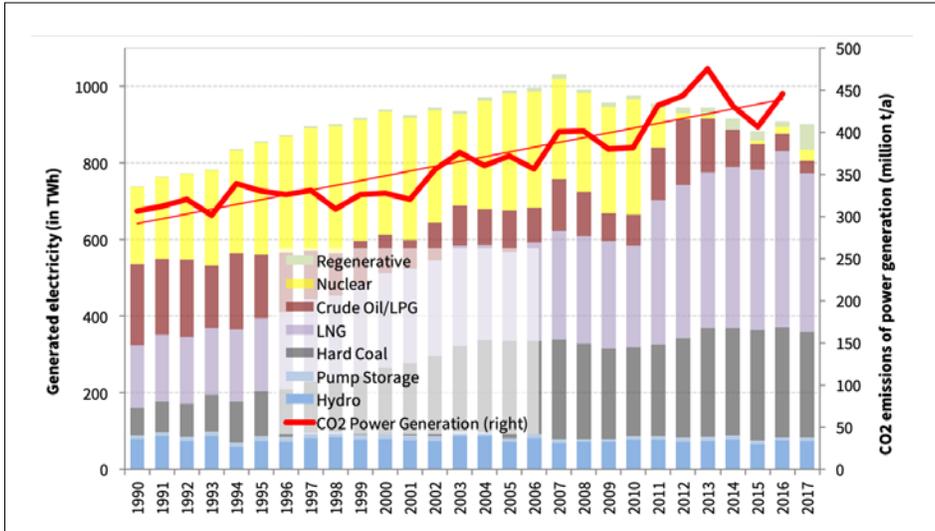


Source: Author, based on METI 2018b, 2018c; GIO 2018

emissions showed a trend that contradicted the common claim, that nuclear power is vital for the fight against global warming. Both parameters, CO<sub>2</sub> emissions from electric power generation and their share of Japan's total emissions, increased due to the increase in total volume and composition of electricity production, namely, the combination between nuclear power generation and coal-fired power generation (charts 3.14, 3.27a-b).

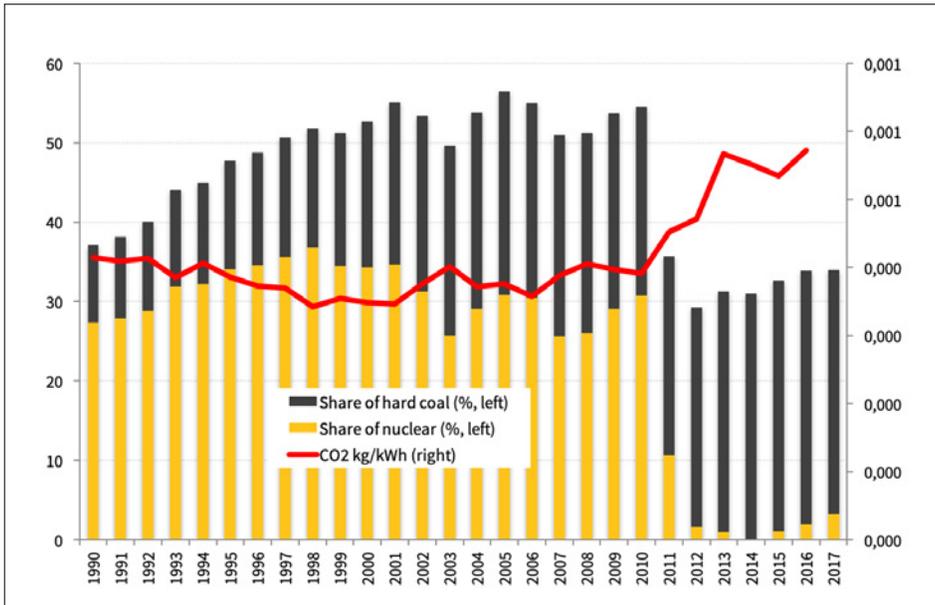
In other words, the CO<sub>2</sub> emissions per unit of total electricity generated had not fallen significantly. By the end of the '90s, the share of nuclear power in electricity generation had risen to more than 35%. Despite the simultaneous increase in the share of coal-fired power plants, CO<sub>2</sub> emissions per unit of electricity generated declined slightly in the beginning. However, entering a new phase of increased seismic activity and troubles, utilization rate and share of NPP/NPR in power generation fell. In response to that, the load of coal-fired power plants rose. The partial liberalization of the electricity market in the high voltage segment led to a further increase in the share of cheaper coal-fired power plants until 2003. Due to the high load of coal-fired power plants CO<sub>2</sub> emissions per unit of electricity generated went up again (chart 3.28). This was effected by the structural entwinement of nuclear power and coal power as the main form of centralised power gen-

Chart 3.27b Annual commercial electricity generation (excluding in-house) by energy source and its total annual CO<sub>2</sub> emissions after credits in Japan



Source: Author, based on METI 2018b, 2018; GIO 2018

Chart 3.28 Share of nuclear and hard coal power generation and CO<sub>2</sub> emission/generated electric power after credits in Japan



Source: Author, based on METI 2018b, 2018c; GIO 2018

eration: The commercial use of nuclear power inheres a tendency towards expanding electric power production (and consumption), whereas coal-fired electric power generation tends to be used as baseload complement to absorb demand increase, as long as coal price and CO<sub>2</sub> emission rights are cheap. Hirata estimated, that the volume of CO<sub>2</sub> emission by all planned new 40 coal-fired electric power stations in Japan (as of 2018) is equivalent to 10% of Japan's total CO<sub>2</sub> emissions in FY2014 (Hirata 2018, 42).

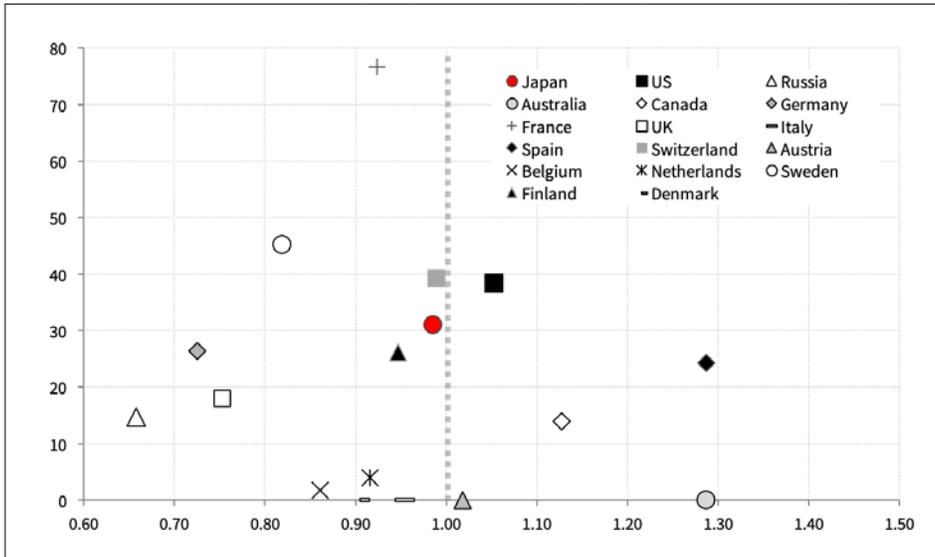
An international comparison of the weight of nuclear power in total electricity generation and the reduction in CO<sub>2</sub> emissions for the period from 1990 to 2009 demonstrates that a high proportion of nuclear power does not necessarily lead to significant CO<sub>2</sub> reductions (Yoshioka 2011b, 56-8). It is no coincidence that – in addition to countries with abundant fossil fuels such as Australia and Canada – Japan and the US performed poorly in reducing their CO<sub>2</sub> emissions despite a relatively high share of nuclear power generation before 3/11 (charts 3.29a-b). And it is no coincidence either that both Japan and the US have been promoting a Nuclear Renaissance. After all, they host the headquarters of five out of six NPP builders in the Western world (Tōshiba, Hitachi, MHI, GE and WH). These builders formed three global alliances in the mid-2000s: Tōshiba with WH, Hitachi with GE and MHI with AREVA. They have since been pushing their governments to provide them with business domestically and abroad.

It is precisely the combination of both nuclear and coal-fired power generation in the supply portfolio of Japan's former regional monopolies that is preventing a fundamental reduction of electricity consumption and the conversion of electricity supply to regenerative decentralised forms. In July 2012, Japan's government introduced a Feed-in Tariff (FIT) for renewable power generation (solar, wind, small hydro, biomass and geothermal power plants) at the relatively high level of 42 JPY/kWh (under 10 kW) and 40 JPY/kWh plus tax (over 10 kW) applying to 20 years for solar generated power and 10 years for all others.<sup>74</sup> The existing electric power producers, suppliers and retailers have also increased their renewable power generation capacity from 0.65 GW installed as of June 2012 (0.3% of their capacity) to 9.1 GW as of March 2017 (3.3%). Thus, the total capacity of renewable power generation has risen to 39.1 GW as of September 2017, which represents 13% of Japan's total power generating capacity (300.1 GW).<sup>75</sup> The respective volume of electricity production has changed from 13.3 TWh (1.4 %) in FY2011 to 58.6 TWh in FY2016 (6.4% of total production). 13.7

<sup>74</sup> This FIT system was designed to reach a purchasing price of 24-26 JPY/kWh for under 10 kW over 10 years and 18 JPY (kWh) + VAT for 10 kW-2,000 kW over 20 years (METI 2018f).

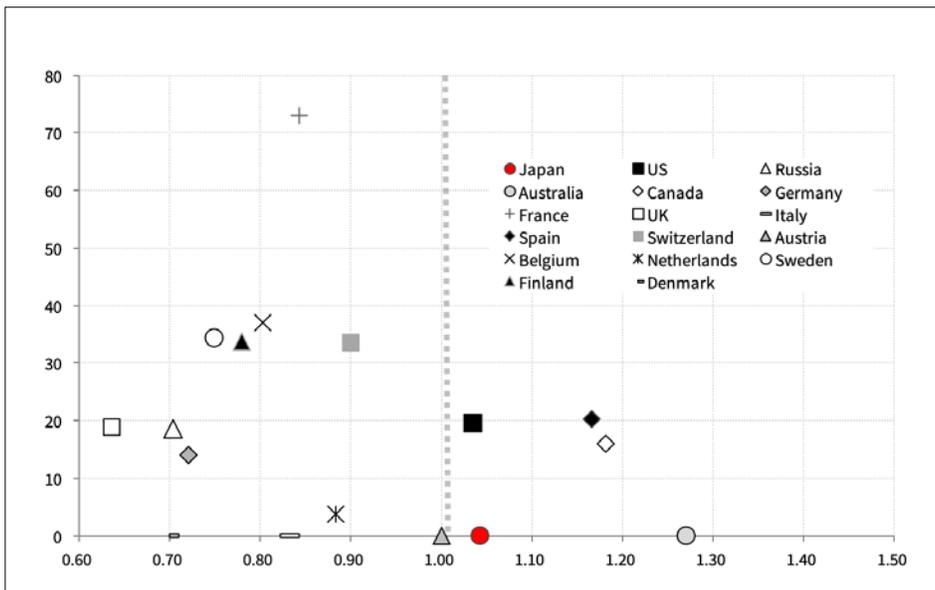
<sup>75</sup> At the same time, a capacity of renewable power generation, amounting to 92.5 GW, was approved. This means that only 42.3% of the approved renewable capacity has been installed (METI 2018f).

Chart 3.29a Nuclear share in power generation (vertical, average 1990-2009 in %) and Green House Gas (GHG) emissions 2009/1990 (horizontal, 1 = 1990)



Source: Author, based on UNFCCC 2018; IAEA 2018b

Chart 3.29b Nuclear share in power generation (vertical, 2015 in %) and GHG emissions 2015/1990 (horizontal, 1 = 1990)



Source: Author, based on UNFCCC 2018; IAEA 2018b

TWh (1.5%) were generated by retail power suppliers and 44.9 TWh (4.9%) by others.<sup>76</sup> This means that renewables with a capacity share of 13% and a production share of only 6.5% have had an extreme low utilization rate, which is not only due to their dependence on volatile prime energy sources. They have also been systematically discriminated. Being denied grid access capacity, they are confronted with output restrictions – unlimited for solar power suppliers with more than 10 kW and limited for solar power suppliers with more than 50 kW. And they are charged high fees for upstream connection, transmission and unbalance absorption by the grid owners, i.e. the former regional monopolists (Wakeyama 2018, 31, 35).

Finally, it is noteworthy that 3/11 – the cooling system’s malfunction, the meltdown of three NPRs and the ongoing aftermath – caused not only tremendous harm to humans,<sup>77</sup> but a substantial increase in energy and water consumption<sup>78</sup> and CO<sub>2</sub> emissions. These ‘after-effects’ include irreversible damages to human health and natural environment. In summary, it can be stated, that NPPs are an extremely dangerous,<sup>79</sup> inflexible and expensive way of producing electricity, and they do not provide a viable solution either for the global climate problem or for the increasing depletion and scarcity of natural resources.

### 3.4 Future Scenarios: Politics, Market and Technology

In Japan, too, the rise of nuclear power generation had rested on the interweaving of the state’s industrial policy with the economic interests of an oligopolistic electricity industry. Initially, NPPs became part of companies’ production portfolio because the state in general and the central government and METI in particular covered all the associated costs and risks as well as R&D. The industry was particularly interested in running its expensive equipment at a high utilization rate, while keeping variable costs as low as possible. In response to the fuel prices, it shifted its production

<sup>76</sup> Calculation based on METI 2018b.

<sup>77</sup> At least 80,000 persons and 28,600 families were forced legally to give up their homes; and another 440,000 persons left their homes to escape from radioactive pollution (Saitō 2015, 104, 111).

<sup>78</sup> According to TEPCO and METI, 1 million m<sup>3</sup>/t of tritium, strontium and cesium contaminated water is stored in tanks at the Fukushima-1 NPP site (increasing by 150 t per day), 50,000 m<sup>3</sup>/t of highly contaminated water is still remaining in the underground of the NPRs, both as of July 2017 (TEPCO 2017).

<sup>79</sup> The only rational justification for the leverage rate of tax-financed subsidies to construct power generation capacities would be that it represents a risk premium for NPP/NPR locations, being set at seven for NPPs, five for hydropower plants five and three for fossil fuel-fired power plants (Kumamoto 2011, 137).

portfolio from hydropower to coal in the '50s and from coal to oil in the '60s. It was only after the oil price shocks of 1973 and 1979 that nuclear power gained momentum. Nuclear power was expected to warrant independence from crude oil imports and, thus, to ensure electricity production at supposedly low cost. Its alleged role was tied to the ideology of growth and expansion. Since the late '90s the expansion of nuclear power generation has become a central matter of survival for the former regional monopolists and their centralised electric power system, especially in view of the global shift towards renewable and decentralised power technologies, liberalization and new business models. In this process, the dependency of the electricity companies on the state has increased, as they are part of the 'nuclear complex' that consists of the central government bureaucracy (METI and MEXT), state regulation and control commissions (AEC, NRA), NPP/NPR operators and their association (FEPC), NPP/NPP builders (organised as JAIF), financial institutions (commercial banks, brokerages or investment banks, insurance companies) and general trading companies, political parties and members of parliament, municipalities, universities, mass media and international institutions (IAEA, UNSCEAR). This complex serves the interests of its members aiming at immunity against economic competition and democratic control<sup>80</sup> – which raises the issue of options. To understand the potential scope of decisions and actions, compact scenarios about how to handle the aftermath of 3/11 and the problematic structure of power generation in the future, can be conceived as follows:

#### Scenario A: “Fukushima 2.0: Japan is sinking”<sup>81</sup>

Responsibilities for 3/11 remain unquestioned and violations of existing laws unprosecuted. The costs are not borne by those who cause them. They are socialised but only insofar as they are officially recognised as costs. Beyond that, the victims are left alone. TEPCO will not go bankrupt and stay listed at the stock market, maintained by means of public funding and electricity price increases. Lenders and shareholders of TEPCO will not be charged for the liabilities of 3/11. Supported by Japan's big corporations, the FEPC member companies and the state continue to interlock with each other, nuclearising the power industry and affecting Japanese society under the label of state security until the next nuclear disaster occurs.

80 Takagi 2000a, 33-5, 47-67, 98-121, 124-56; CCNE 2017, 281-3.

81 Hirose 2012a.

### Scenario B: 'Political Turn: Local Initiative from the Bottom, Followed Nationally from the Top'

Common awareness of the total costs and risks of nuclear power generation is growing together with a critique of the plutocratic execution of political power by the nuclear complex. Readiness to bear the temporarily additional costs for an exit from nuclear power generation is increasing. The anti-nuclear movement assumes the form of an open network and joins the professionally organised movement for democratisation and environmentalism, allied with NPO/NGOs and businesses from new industries. Reform-minded regional leaders push for decentralisation, opposing the state bureaucracy as well as established political parties with regards to energy policy. This movement becomes so influential that political coalitions start to implement the phasing out of nuclear energy against the interests of the state bureaucracy and large parts of Japan's traditional big business.

### Scenario C: 'Economic Evolution: Selection by Market Liberalization and Free Competition'

The costs of nuclear power generation are increasingly included in a still regulated electricity price ('Nuclear FIT'), and consumer prices, sensitive to electricity, are rising to such an extent that a fundamental liberalization of the electricity market with equal starting conditions for all participants can no longer be prevented. The ownership of the power grid is separated from the electricity companies and consequently the access is neutralised. As a result, the share of independent local power generators and non-nuclear alternative offers grows, benefitting from falling costs for renewable power generation, energy storage and network technologies. The subsidisation or socialisation of the costs of nuclear power generation is losing ground, and its scope is declining. NPP-centred electricity companies are ultimately too cost-intensive to be still competitive.

In reality, these three scenarios will most likely intertwine, absorbing, trading-off or boosting each other. The crux of the problem, however, is what Crouch (2011) described as the very nature of neoliberalism: to put state and market not in stark contrast, as it appears to be, but in close interdependence, which allows large corporations to exploit both of them at the expense of wide sections of the working population, consumers, democratic control, society and nature (Crouch 2011, ix). Neoclassical theory assumes the following conditions for markets to be efficient in allocating resources and evaluating outcomes of economic activities:

- a. prices are comparable;
- b. resources and products are tradeable;
- c. market entry and exit are free from obstacles;

- d. a large number of sellers and buyers are optimally informed and ensure a high transaction volume through their interactions;
- e. economy and politics are separated from each other.

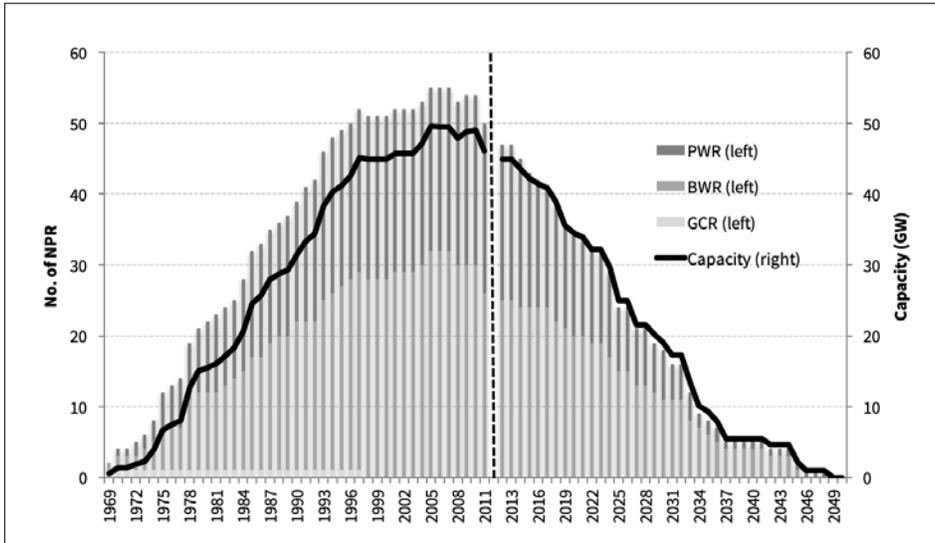
However, today, structural deviations from these conditions, i.e. market failures, are the rule: important costs of offers, their production and corporate failures are externalised or more precisely, socialised. Supply competition is restricted or prevented by barriers to market entry and exit. So are the choices for consumers. Critical product features and parameters as well as costs and prices are kept non-transparent. The interests of large corporations increasingly influence political and state action (Crouch 2011, 34-48).

Thus, the pure economic logic alone – fundamental market liberalization (following scenario C) – will not be sufficient to denuclearise Japan’s electricity industry. Equal access for market participants and prevention of centralisation require political intervention into existing ownership rights as well as public rules for economic activities, which go far beyond the symbolical avoidance of ‘over-exploiting’ economic power in single cases. However, the current course of response to the problems in Japan shows that the nuclear complex is still able to protect the interest of its members, that is, to cope with the 3/11 disaster and the new stage of liberalization; it is socialising the costs caused by its own conduct (following scenario A). In September 2012, the then acting Japanese government decided to begin reducing the dependency on nuclear power generation by (a) decommissioning all NPRs that were older than 40 years, (b) restarting only those younger NPRs that passed the NRA security check and (c) not increasing the existent capacity, for example, by building new NPRs. Pushed by critical public opinion, the government went even a small step further and declared its aim to phase out nuclear power generation before 2040 (Enerugi kankyō kaigi 2012, 6) (charts 3.30a-c).

But the election of December 2012 was won by the conservative Liberal Democratic Party, led by right-winger Shinzō Abe – with 43.0% of votes (by 24.7% of all eligible voters) given to direct candidates and 27.6% of votes (by 16% of all eligible voters) given to the central candidate lists (MIC 2018f). Assuming the reins of government the LDP annulled all measures and laws that promoted the exit from nuclear power generation. Scenario A prevailed over scenario B. Reversely, the examples of Taiwan and South Korea, where centre-left governments declared their intention of exit, evince how much nuclear power generation depends on state protection and public funding, which makes it extremely vulnerable to political change. For such change a countervailing force is needed including grassroots, political, religious, civil and consumer rights, non-profit and professional movements in an alliance that restricts state and economic power and their entanglement (Crouch 2011, 162-80).

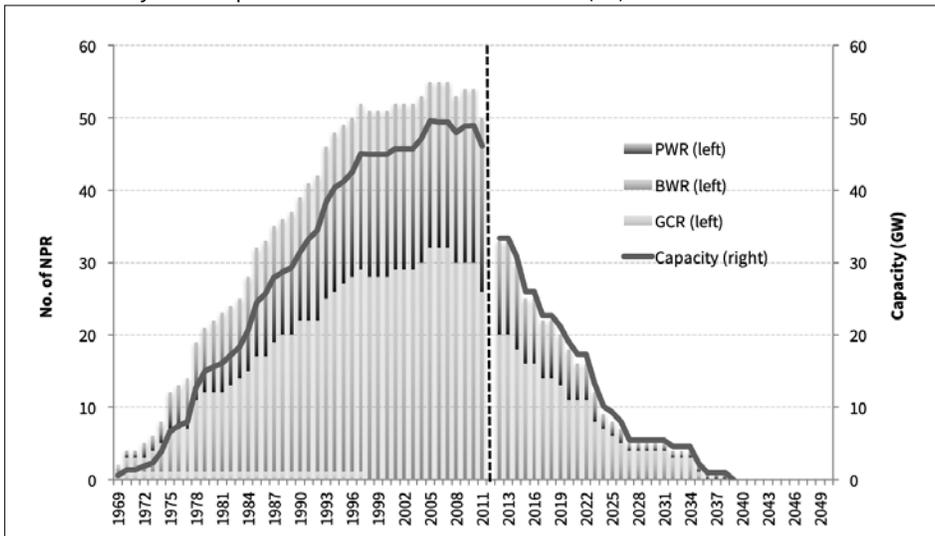
Among the respondents to opinion polls conducted by the newspaper *The Asahi Shimbun*, an obvious majority has been against nuclear power gen-

Chart 3.30a Number of commercial NPRs and capacity until 2011, decommissioning after 40 years of operation and without new reactors (CY)



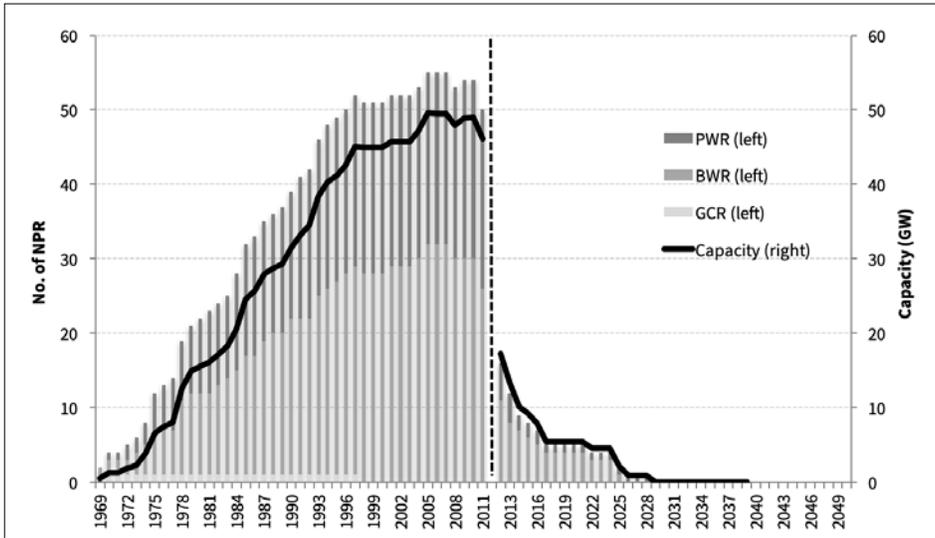
Source: Author, based on JNES 2013

Chart 3.30b Number of commercial NPRs and capacity until 2011, decommissioning after 30 years of operation and without new reactors (CY)



Source: Author, based on JNES 2013

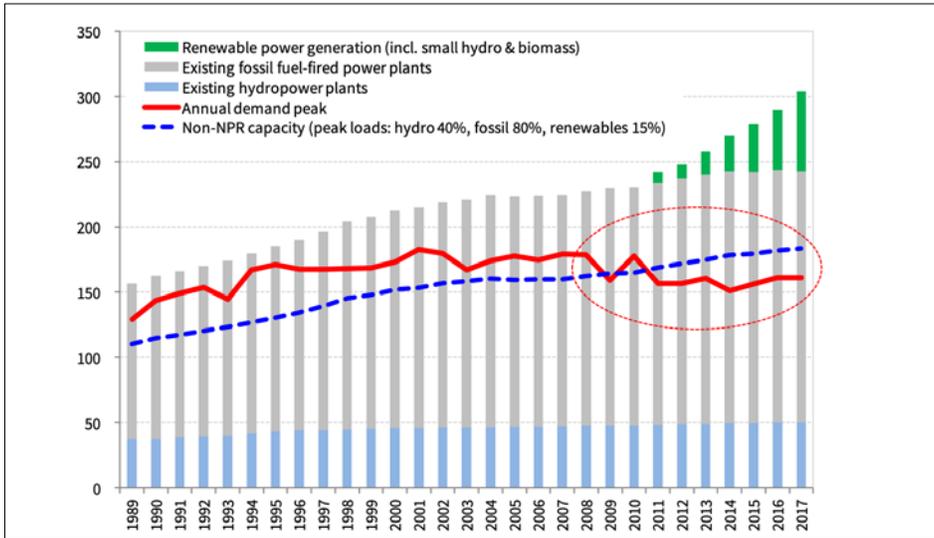
Chart 3.30c Number of commercial NPRs and capacity until 2011, decommissioning after 20 years of operation & without new reactors (CY)



Source: Author, based on JNES 2013

eration since May 2011, in favour of an exit from nuclear power in the near future since January 2014 and disapproving of NPP/NPR restarts since June 2011 (Tsuda, Kojima 2017, 12-3). However, acting prime minister Shinzō Abe and the ruling LDP have won a clear seat majority in two more parliament elections since 2012. In the election in December 2014, LDP secured 48.1% of votes given to direct candidates (by 24.5% of all eligible voters) and 33.1% of votes given to the central candidate lists (by 17.0% of all eligible voters). In November 2017, LDP obtained 47.8% of given votes to direct candidates (by 25.0% of all eligible voters) and 33.3% of votes given to the central candidate lists (by 17.4% of all eligible voters) (MIC 2018f). Not surprisingly, these election results have been interpreted also as approval of LDP’s policy of promoting nuclear power. But, in actual fact, a negative perception of nuclear power generation prevails among Japan’s population, particularly woman, which can be deduced from the fact that most opposition parties have made the future exit from nuclear power generation part of their political agenda. Furthermore, candidates for governors in prefectures with NPP locations, who claim the same or are cautious about restarts, have won prefectural elections with relatively large margins over nuclear power proponents, such as in Kagoshima (July 2016) and Niigata (October 2016) (CCNE 2017, 287). Former prime minister Junichirō Koizumi, who was a strong proponent of nuclear power during his time in office (2001-2006),

Chart 3.31 Installed non-NPR capacity (incl. self-producers, FIT) and demand peak in Japan (FY, GW)



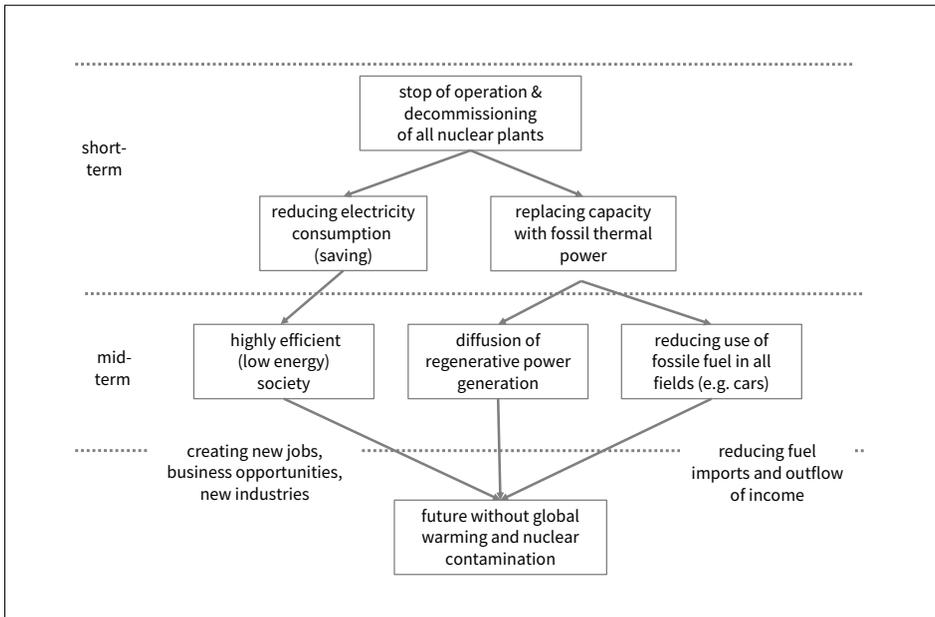
Source: Author, based on METI 2018b, 2018c

has turned into a critic of the government’s energy policy since 3/11, urging for an early exit (Koizumi 2017). Even among acting LDP politicians, parliament members and cabinet ministers, there are outspoken critics of the current government policy in favour of the nuclear complex, such as Tarō Kōno.<sup>82</sup> The central question is how to integrate the demand for an early exit from nuclear power into a strategy for a fundamental reform of social and economic policy, creating an attractive platform to join forces against the nuclear complex and mobilising the silent, not voting majority.

Japan has shut down all NPPs without suffering from a severe and chronic shortage of electricity supply. Contrary to allegations and campaigns by electricity companies, government, business associations and right-wing mass media, demand reduction through energy savings had already been realised in the summer of 2011 and the following winter, when private households, industries and businesses decreased their electricity consumption by 15-20% (Nagatomi 2013). As proven back then, it is sufficient to run temporarily all installed fossil fuel-fired plants with a 80% peak load, hydropower plants with a 40% peak load and renewables power plants with

82 URL <https://www.taro.org/category/policy/energy> (2018-10-24)

Figure 3.8 Logic of exit from nuclear power in Japan



Source: Author, based on Kamioka, Oka 2012, 7

a 15% peak load<sup>83</sup> in order to cover the annual peak of electricity demand without any NPP/NPRs (chart 3.31).

As of March 2017, the installed capacity of renewable power generation has not only expanded to 46 GW, but additional 70 GW (both including small scale hydro and biomass) have been approved and are waiting to get installed, connected and operated or have applied for approval. Obviously, it is possible to decentralise production, distribution and consumption of electricity and even to reduce operating costs, after an investment peak for building a flexible network with new energy storage facilities in order to replace NPPs and hard coal fired power plants as baseload capacity, absorbing supply volatility. Producers and consumers can move to modes

**83** During the demand peak periods in summer 2011 and the following winter, KEPCO, with 40.8% (9.76 GW) of its total generation capacity (23.93 GW) most heavily dependent on NPP/NPRs (as end of FY2010), expected for its supply area a temporary shortage of electricity supply. But the decrease of supply by NPR/NPP taken out of service (minus 6.0-8.4 GW) was compensated mainly by reducing demand (voluntary savings), increasing load of fossil fuel power plants and providing surplus capacity temporarily from the regional monopolists in the neighbouring areas and self-producers (KEPCO 2011).

of production, mobility, transport and consumption based on an efficient and regenerative use of energy resources, instead of relying on the expansion of electricity production. Decentralisation would ignite an industrial and societal change that leads out of the deflationary spiral of cost and price reduction, social degradation and destruction of nature (fig. 3.8).

In 2012, Takashi Hirose, veteran thinker of the anti-nuclear movement in Japan, made a proposal with regard to how political movement and economic policy could be linked, namely, by turning consumer power towards generating a practical alternative for NPP operators. He suggested withdrawing almost all savings from the large banks, the big lenders to KEPCO (which was the frontrunner in restarting NPRs after 3/11) and deposit the funds in savings accounts at banks that support the replacement of nuclear power by renewables such as the Jōnan Shinkin Bank (Jōnan Shinyō Kinkō). He called also for voluntarily accepting electricity price raises, if the surplus were used for paying the additional cost (mainly for fossil fuel) incurred from replacing nuclear power with other supply capacity (chart 3.32a), and buying out all NPP assets from the electricity companies (chart 3.32b), thereby taking NPPs out of service (Hirose 2012b).

Fearing financial losses, shareholders, lenders, managers, employees, unions and vendors of NPP operators have been pushing for a quick restart of NPRs. Their fears need to be released, by making their business sustainable in alternative ways. For that, all electricity consumers should agree to pay the extra cost for alternative power supply and additionally donate the funds needed to buy out the NPP assets at book value (charts 3.32c-d).

Hirose (2012b) estimated that the additional expenses to be paid by every household in Japan would be bearable, that is, at a level of 500 JPY/month or one cigarette package. Actually, by now, most of the additional fuel costs are already included in the post-3/11 raise of the regulated electricity price and thus charged to the private households anyway. However, assuming (a) a replacement supply composition of 75% LNG and 25% hard coal, (b) a 20% nuclear share in electricity production (which was the average 1970-2016) and (c) an equal participation of all electricity consumers (corporations and private households, ultra-high, high and low voltage, regulated and non-regulated) in the donation campaign for buying out all NPP assets at book value, the additional expense would amount to about 2.5 JPY/kWh<sup>84</sup> for a period of five years. For private households with an average electricity consumption of about 370 kWh/month, this would create bearable additional cost of less than 1,000 JPY/month or two packages of cigarettes. Yet, Hirose's proposal

84 (A) 1.3 JPY/kWh for additional non-nuclear fuel cost + (B) 1.2 JPY/kWh for NPP asset buyout = 2.5 JPY/kWh; A = [(7.1 JPY/kWh - 1.2 JPY/kWh) × 0.75 = 4.425 JPY/kWh] + (5.6 JPY/kWh - 1.2 JPY/kWh) × 0.25 = 1.1 JPY/kWh] × 0.2 = 1.325 JPY/kWh (chart 3.32a); (B) = Sold electricity weighted average raise of electricity price over five years (chart 3.32d).

for immediate action has been ignored by the mainstream mass media and political organisations.

Another way of replacing nuclear power is to systematically save energy and install renewable power capacity (fig. 3.8). As Hiroshi Takahashi (2018) has shown (tab. 3.3), this would be not just a functional, but a systemic shift from a monopolistic industry, a centralised, hierarchical and scale-driven business model and an economy dominated by large corporations and the nation state to its opposite, that is, an open-structured industry with various players and organisations, decentralised, diverse business models and an economy of regions and communities based on network collaboration and market competition.

Table 3.3 Chart of energy shift

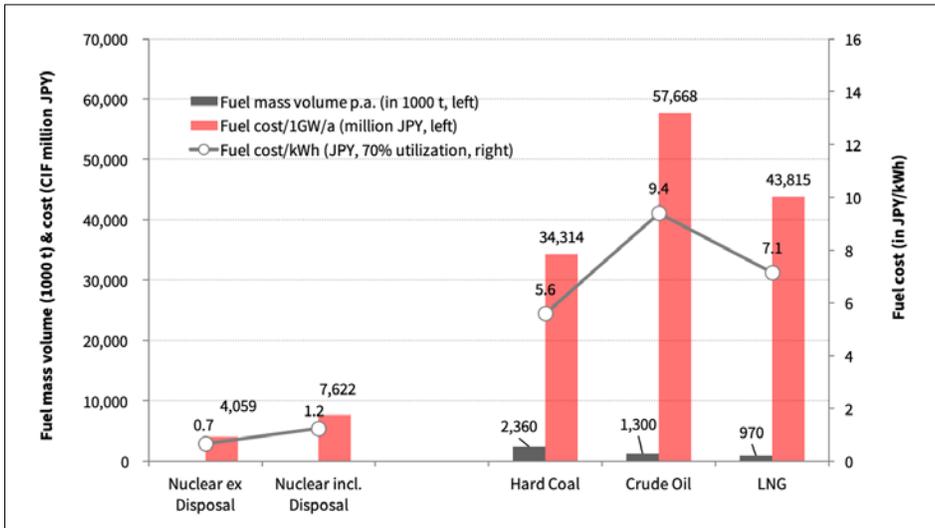
	<b>Centralised energy system</b>	<b>Decentralised energy system</b>
<b>Energy power source</b>	Centralised: nuclear, hard coal thermal	Decentralised: renewables, co-generation, energy saving
<b>Main business actor</b>	Large corporations as monopolies	Various regional and local firms and NPOs
<b>Main policy actor</b>	Central state	Municipalities and central state
<b>Economic principle</b>	Monopoly/plan: economy of scale	Competition and market, autonomy and collaboration
<b>Network logic</b>	Central administration, hierarchy	Decentralised, dispersed, open, mesh: fitting
<b>Role of consumers</b>	Passively, limited	Active and diverse: prosumer
<b>Environmental fit</b>	Low: restricting waste and pollution	High: low carbon, safety, harmony with nature
<b>Regional link and fit</b>	Low	High
<b>Experience, history</b>	Long, certainty	Short, uncertainty

Source: Hiroshi Takahashi 2018, 57, based on Ōshima et al. 2016

According to the Sustainable Zone Report, the number of municipalities in Japan that can meet their demand for electricity solely by means of renewable sources in their region rose from 84 in 2012 to 136 in 2017. In the same period, the number of municipalities that can cover both heating and electricity demand by own renewable supply increased from 50 to 82. The rate of regional renewable energy supply, indicated as share of the total regional energy demand, went up from 3.8% to 10.5% (Kurasaka, ISEP 2018, 8) (chart 3.33).

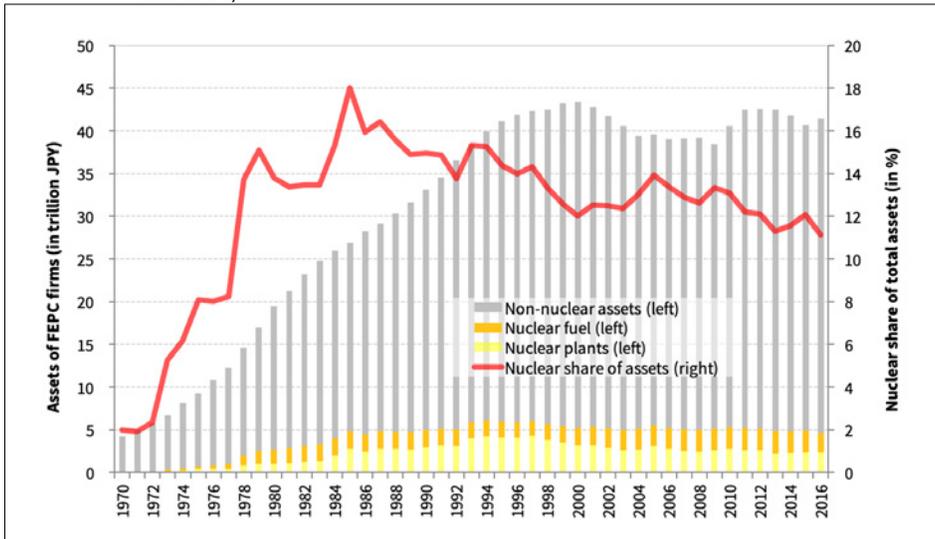
At present, the ancient regime resists this fundamental change. Electricity consumers, and particularly private households, have to pay increasing electricity prices without being liberated from the costs and risks of nuclear power generation. Neoliberal redistribution of wealth, favouring the members of the nuclear complex, is still dominant. But earthquakes do not

Chart 3.32a Fuel mass volume and fuel cost for 1 GW/a at prices as of March 2017



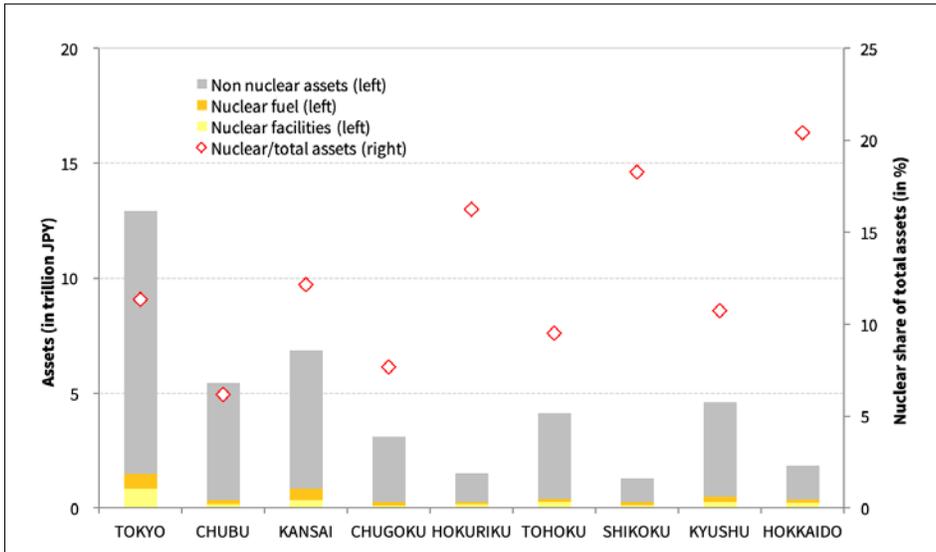
Source: Author based on RIST 2005; WISE Uranium 2009a, 2009b, 2009c; Japan Customs 2018

Chart 3.32b Book value of nuclear plants and fuels as share of total assets at FEPC firms (excluding Okinawa’s electric power and Japan’s atomic power company, end of FY)



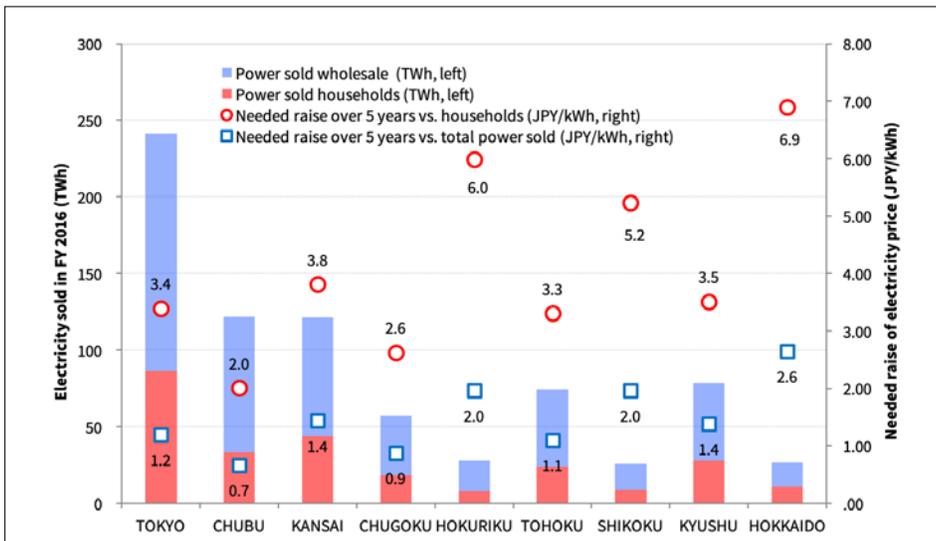
Source: Author based on IR-Reports, FEPC (2018)

Chart 3.32c Nuclear plants and fuels as share of total assets by FEPC firms (excluding Okinawa’s electric power and Japan’s atomic power company, as of end of FY2016)



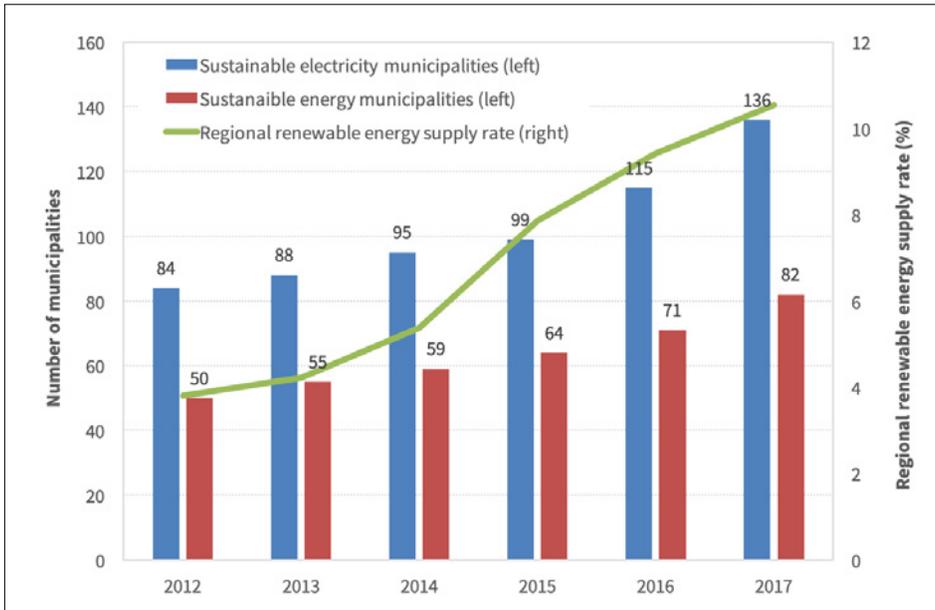
Source: Author, based on IR-Reports for FY2016

Chart 3.32d Sold electricity (households/wholesale) and price raise needed to buy out and write off all nuclear assets over 5 years by FEPC firms



Source: Author, based on METI 2018b; IR-Reports for FY2016

Chart 3.33 Number of municipalities with sustainable electricity and energy in Japan



Source: Kurasaka, ISEP 2018, 8

wait. Thus, the high probability persists that ‘Fukushima 2.0’ (scenario A) occurs. The citizens’ right to a life without deprivation calls for structural changes in industries, business models and the economy at large. This involves a fundamental cultural shift.



## **J-Economy, J-Corporation and J-Power since 1990**

From Mutual Gain to Neoliberal Redistribution

Enno Berndt

### **Epilogue**

In class, I frequently ask my Japanese students what kind of corporate governance and management system they expect to be dominant in Japanese corporations in the near future. Being offered three options to choose from, most of them prefer the balanced stakeholder system (supposed to be representative of Scandinavia) or the shareholder centred system (supposed to be representative of the US and UK). The first group of students seems to hope that a somehow harmonious system will prevail, while the latter group opts for realism, taking into account allegedly global trends. Asking both why they have not chosen the third option, that is, the revival of the traditional Japanese system, they point to the state promotion of shareholder centred governance, and they also refer to the work ethics shown by young Japanese in the last two decades, that is, a growing preference for an enjoyable life and economic well-being over enhancing oneself or serving the common good. Asked about how they want to work, an increasing number of young respondents say, that they prefer following the mainstream, doing what others do, but not going beyond that.

These indications from the upcoming generation of business persons and managers in Japan seem to go hand in hand with the current changes in J-Economy and J-Corporation. Since 1990 both have encountered two fundamental challenges: how to deal with the aftermath of the burst of the asset bubble, and how to cope with the shift from industrial mass production and economies of scale towards a post-industrial, i.e. knowledge-based system and constant innovation. The latter challenge is amplified by the ongoing diffusion of network-based information and communication technologies. These technologies facilitate new products and business models, developed with less initial capital investments and in shorter timespans. Here, financial capital is not anymore the most critical resource and, therefore, its providers do not deserve privileged treatment over other stakeholders. But these technologies inhere a contradicting potential: they can enhance network-based decentralisation of economic activities, self-determined production and consumption and new levels of variety and creativity, and they can also facilitate centralised business models, aiming at monopolistic domination and control.

J-Economy and J-Corporation have dealt with the burst of the asset bubble mainly by cutting cost and keeping existent business models working, i.e. selling their products at lower price to secure sufficient cash inflows,

without investing into new products or forms of production. They have continued this corporate saving, even though their balance sheets and equity capital base have become stronger than ever before. And still large corporations are benefitting from institutional privileges such as lower taxation, increased public subsidies and legally limited liability, which they were granted to invest into new business and take related risks. Meanwhile, Japanese employees face the consequences of the chronic decoupling of productivity and profit growth from their incomes. J-Economy has not overcome its stagnation, despite an expansive fiscal policy to stimulate private investment and an expansive monetary policy that keeps interest close to zero to fuel liquidity into the financial markets. Instead of the actual goal, public funds are spent for dubious mega-projects. Financial liquidity flows into assets markets or is used together with retained profits to buy back shares or finance large scale mergers and acquisitions.

Against this backdrop, the attitude of my students towards work is realistic. They seem to sense the neoliberal redistribution of wealth, even if they do not necessarily understand it or would call it this way. And they seem to have no illusions about a possible return to the traditional Japanese system, which supposedly served the mutual gain of corporations and employees. A severe consequence of all this is that the challenge of how to cope with the transition towards a knowledge-based economy remains unaddressed. Without enhancing network-based decentralisation, economic self-determination or participatory management and utilising the revolutionary potential of new technologies, J-Economy and J-Corporation will not be able to create new business models and products. J-Power, referring to electricity generation as well as the role of the state, provides a striking case for how costly and dangerous it is to adhere to a system that protects the interests of a well-organised oligopolistic complex at the expense of all others. Alternatives will arise probably not from the inside and neither from the top. They can be developed only from the bottom by reuniting ownership and management as comprehensive employee participation, utilising the potential of new technologies for decentralised networks and providing innovative business models and products to solve nowadays urgent social and ecological problems.

## J-Economy, J-Corporation and J-Power since 1990

From Mutual Gain to Neoliberal Redistribution

Enno Berndt

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# **J-Economy, J-Corporation and J-Power since 1990**

From Mutual Gain to Neoliberal Redistribution

Enno Berndt

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Once hailed as superpower and benchmark of Post-Fordism management, Japan's economy and its corporations are taken as negative example of insufficient compliance to neoliberalist policies. This book demonstrates that the problems of Japan's economy and corporations are more universal: encountering the limits of mass-industrialised production and consumption, large corporations fail to ignite innovation by decentralisation and bottom-up participation. Instead, they increase their returns by ongoing cost reduction and centralization, adhere to large-scale technology, fuel profits into M&A to defend their traditional business models and privilege capital providers and top executives.



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