

Economic Growth through the Development Process: the Case of South Korea

Bachelor Thesis
supervised by the

Institute for Empirical Research in Economics (IEW)
at the University of Zurich

Prof. Dr. Fabrizio Zilibotti
to obtain the degree of
“Bachelor of Arts in Wirtschaftswissenschaften”

Author: Katrin Voegeli
Course of Studies: Economics

Abstract

In my bachelor thesis I apply a theory of economic growth through technological catching-up to analyze the development process of South Korea. Acemoglu, Aghion and Zilibotti have designed this model, which relates the strategy in catching-up to the political environment and structure of contractual arrangements. Despite finding some inconsistencies between theory and reality concerning this approach to technology accumulation the main implication they make I find to hold true for the case of South Korea. The influence of the political environment on characterizations of organizational and market structures is illustrated nicely. During the early industrialization which was implemented through government interventions firms and market organized in structures appropriate to the stage of development. The theory predicts that these structures may prevail beyond the point of being adequate. Concurring to this, the Korean *chaebol* experience demonstrates a case that stresses the hindering effect of inappropriate structures and the difficulty inherent in consequent reforming.

The theory allows to classify the relative stage of development in Korea and make a projection on future development.

Contents

1	Introduction	4
2	Economic Growth through the Development Process	5
2.1	Trade-off between imitation and innovation	6
2.2	Organisational forms and market relations	7
2.3	Government policies and reforms	10
3	Imitation and innovation in South Korea's industries	12
3.1	The automobile industry	14
3.2	Consumer Electronics Industry	15
3.3	The semiconductor industry	16
4	Korean organisations and markets	17
4.1	Chaebol corporate governance	20
4.2	Small- and medium-sized enterprises	23
5	Government policies and reforms	25
5.1	Financial market policy	26
5.2	Industrial policy	28
5.3	Corporate policy	33
6	Conclusion	36
7	References	38

1 Introduction

Across the globe and time, economic development has taken various paths in different states. While western nations were leaders in industrialization, many Asian and Latin American countries only emerged from their underdeveloped state since the middle of the 19th century. Economic growth in these uprising economies significantly surpassed concurrent growth rates of the leading nations, what initiated a process of catching-up in economic development. But not all of the newly industrializing nations have shown continuous improvement and a vast number of developing countries, especially on the African continent, have not participated in this economic boom. Despite the regional trends, factors beyond geographical settings have determined development and growth. The importance of natural resources, climate and location has been diminished since the technological revolution. Instead, accumulation and improvement of production technology that increase capacities and performance are the forces that enable growth. It is widely acknowledged that political market interventions are national characteristics that enable, but also hindered this development. Consequently, the observed enormous gaps may be explained through differences in government influence.

There are a number of studies and theories that document and explain the different roles that government intervention might take and their diverse outcome. Acemoglu, Aghion and Zilibotti have discussed economic growth in a series of papers. They have designed a model that describes development as a dynamic process in which nations accumulate technology through imitation or innovation. The main implications for the modeled process of catching-up in developing economies base on the assumption, that far from the frontier higher growth can be attained through imitation and adoption of technology used in advanced industries. But as the country develops and converges to the standard of leading nations, the potential for imitation is exhausted and innovation becomes essential to sustain progress. These two different approaches obviously do not come to hand by chance, but are related to market relations and the political environment. In a cross-country regression Acemoglu, Aghion and Zilibotti show empirical evidence, that supports the relation between political openness and the effectiveness of the chosen approach to technology accumulation. But does the theory hold to explain the path of development in a single economy?

One of the most successful newly industrialized economies is South Korea. Beginning in the 1960s, the nation has been the fastest growing economy in the world, averaging 8% real GDP growth from 1971 until 1996 and after a quick recovery from the Asian

financial crisis 6% from 1999 until 2007 (OECD.Stat, accessed 10.06.2009). The case of South Korea, henceforth just Korea, is especially interesting in this context because of the strong government influence that directed development and its interrelation with dominant market actors. The analysis of development in the Korean economy from the point of view of Aghion, Acemoglu and Zilibotti's model will be build up as follows:

First an overview of the model is given that presents the main implications and focuses on the modifications, which are relevant for the Korean development. Then the fast industrialization in Korean is summarized, observing the dynamics between imitation and innovation. Three important industries, automobile, consumer electronics and semiconductors are presented in more detail since they show variable developments that provide an informative and diverse basis for comparison. The subsequent analysis of market and corporate structures as well as government policies focuses on the theoretically predicted relation to the technological approach. Findings of the theory-reality comparison are diverse, but allow making a statement about the stage of development of the Korean economy and making predictions about further growth.

2 Economic Growth through the Development Process

The model of economic growth on which I build my analysis was developed by Acemoglu, Aghion and Zilibotti (2002, 2006a, 2006b), henceforth referred to as AAZ. They present a path of economic development dependent on organizational and political structures. In this framework, the speed at which backward nations develop and catch-up to industrialized countries depends on their institutional environment.

Economic growth is achieved through improving technological capabilities, what can be attained two different approaches: imitation and innovation. This theory is based on the important observation that at different stages of development, different approaches to technology accumulation are taken. In countries more distant to the world technology frontier growth is driven by accumulation through imitation and adoption from advanced nations. But as an economy improves its standards and technological capabilities, just copying existent technology bears less potential. Innovation becomes more important at this stage, driving growth and further convergence to the technology frontier. Since imitation and innovation ask for different structures in organizations and markets, the theory predicts that the evolution of institutional settings is closely linked to the stage of development. Consequently economic performance depends on the appropriateness of market conditions and organizational structures, making their implementation “(. . .)

in part an equilibrium phenomenon” (Zilibotti, 2008, p. 326).

One main implication this theory presents is that arrangements and market structures adopted and fostered at a certain time may become inappropriate along the process of economic development. To prevent such arrangements from prevailing and turning into drawbacks on growth the ability to restructure and promote economic reforms becomes essential. Based on these assumptions and observations a model is developed, relating technological convergence interdependent to the evolution of micro- and macroeconomic settings (AAZ, 2006b; Zilibotti, 2008). In the following review of the model I focus on the main implications that build the basis to my analysis. I will refer to the original literature as well as to an overview of the work presented in Zilibotti’s paper “Economic Growth through the Development Process”(2008).

2.1 Trade-off between imitation and innovation

The model by AAZ (2002, 2006a, 2006b) designs economic growth as a development resulting from technological progress which enhances productivity. Improvement in technological capabilities leads to better economic performance and sustainable growth. Especially in backward economies where there is a large potential for productivity upgrade high growth may be achieved. The underdeveloped nations approach the technology level of industrialized states in a catching-up process. To model these dynamics we first define the level of productivity reached in leading nations as the world technology frontier, \bar{A}_t . Continuous development of technology through innovation in these countries generates productivity growth at the rate g , determining the path of technological development at the world frontier to be $\bar{A}_t = (1 + g)\bar{A}_{t-1}$.

Productivity in a particular economy is defined by $A_t \equiv \int_0^1 A_t(i)di$, where $A(i)$ describes the level of productivity in industry i . Since the focus is on a process of catching-up and convergence to the technology frontier, $A_t \leq \bar{A}_t$ is maintained throughout the modifications. Advances in productivity and subsequent growth are attained through technology accumulation. Such improvement in sectoral productivity is denoted by an increase in $A_t(i)$. The following equation defines the path of development:

$$A_t(i) = \eta\bar{A}_{t-1} + \gamma A_{t-1} + \epsilon_t(i),$$

where $\eta > 0$ and $\gamma > 0$ and $\epsilon_t(i)$ is a random variable with mean zero, capturing differences across sectors. The increase in $A_t(i)$ can stem from either of the two dimen-

sions that drive technological progress: imitation or innovation. The two approaches are assumed to be complementary. The term $\eta\bar{A}_{t-1}$ stands for improvements in productivity through imitation and adoption of existing technology. Therefore the term is dependent on the level of technology at the world technology frontier, \bar{A}_{t-1} . Advances through innovation are captured in the term γA_{t-1} , building on the pre-existing attainments. Consequently, this approach to technology accumulation leads to faster improvement, the higher the level of productivity already is. Pursuing to relate technological improvement to the relative stage of development, the definition of the economies average proximity to frontier is added, $a_t \equiv A_t/\bar{A}_t$. In combination with the equation for technological development the following relation is derived:

$$a_t = \frac{1}{1+g}(\eta + \gamma a_{t-1}),$$

giving us the proximity trajectory as a function of the two accumulation processes, imitation η and innovation γ . Initially, when productivity is low, the term A_t/\bar{A}_t is small and imitation has a stronger influence on increasing the technological capabilities and consequently a_t . When approaching the frontier, a_{t-1} increases and innovation becomes a superior source of technology improvement (AAZ, 2002; Zilibotti, 2008). AAZ describe the optimum approach for an economy to maximize growth at each stage is likely to start with an *investment-based strategy*. Imitation, adoption and modification are carried out, basing on investment in existing technologies. At a later stage a switch to an *innovation-based strategy* is necessary to tap the full potential of growth. This modeled dynamic corresponds to the observation of changing accumulation approaches at different stages of development. But this theory does not yet consider that the performance of the two improvement strategies depends on institutional and political factors. A possible misfit can build a barrier to the desirable switch and hinder the convergence process, leading to a *non-convergence trap* (AAZ, 2006a, 2006b).

2.2 Organisational forms and market relations

If organizations and markets evolve along the process of economic development they may support used strategies. However, if structures misfit the currently optimal process of accumulation, they can turn into a hassle and hinder further catching-up. To integrate this into the model, different influences determining physical- and human-capital investment are formulated. Two different structures of contractual relations are constructed,

long- and short-term oriented, that either support an imitative or innovative approach to technological improvement.

The first outline is a labor market with two types of managers, either high- or low-skilled. Their abilities are subject to uncertainty at the moment of hiring and only reveal throughout performance. If firms are organized in long-term contracts, managers will be retained, independent of their revealed skills. In contrast, short-term contracts lead to replacement of low-skilled managers, a process of ‘creative destruction’ raising quality of matches between firms and workers. Additionally, managers can not borrow in the credit market and consequently investment costs are borne fully by the organization. But as returns must be shared with the manager, investment remains below the efficient level. Long-term contracts can prevent this underinvestment problem by providing incentive for insider managers to invest retained earnings. Adding to the illustration of this trade-off in contractual arrangements, their influence on the decision on human-capital is modeled. In this setting the quality of matches between firms and managers is assumed to be good or bad, dependent on idiosyncratic shocks but not on human-capital. Investment in human-capital is firm specific and desired by the organization but it is not contractible. As expenses incur for the employee but his returns are subject to uncertainty, managers can only be induced to invest firm specific if they are guaranteed reemployment within the firm. Such human-capital does not contribute to innovative capabilities as it bases on the current technology level (AAZ, 2006a; Zilibotti, 2008).

Resulting out of these modifications, long-term contractual arrangements between organizations and banks, or organizations and their managers promote large projects that require big investments. This structure favors adoption and accumulation of established technology. Opposite to this, short-term contracts generate more flexible structures and lead to better selection of managers. This provides organizations with the entrepreneurial skills necessary to process innovation-related activities. These formulated applications are included into the model by assuming for η and γ to be functions, determined by the structure of investment and contracts. The two constructed scenarios are: ‘long-term contracts’ $R_t = 1$ and ‘short-term contracts’ $R_t = 0$. The equation defining the path of catching-up, is extended to

$$a_t = \begin{cases} \frac{1}{1+g}(\bar{\eta} + \underline{\gamma}a_{t-1}) & \text{if } R_t = 1 \\ \frac{1}{1+g}(\underline{\eta} + \bar{\gamma}a_{t-1}) & \text{if } R_t = 0 \end{cases},$$

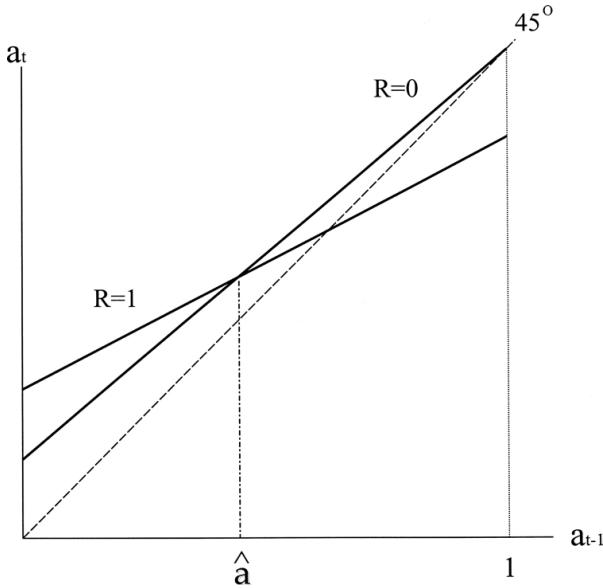
where $\bar{\eta} > \underline{\eta}$ and $\bar{\gamma} > \underline{\gamma} > 1 + g$. The assumption that $\bar{\eta} > \underline{\eta}$ models the fact that

organizations with long-term contracts generate faster growth operating imitation and investments. The assumption that $\bar{\gamma} > \underline{\gamma}$ models that in organizations which implement short-term contracts, only well-performing managers with high entrepreneurial skills are retained. This higher turnover leads to a better quality of matches, which is assumed to increase innovative capabilities.

Figure 1 illustrates the different dynamics related to the two cases. It shows that industries or economies where firms are networking through long-term relationships ($R = 1$) an investment-based strategy is followed. They catch-up faster through imitation and investment, than others who implement short-term contracts ($R = 0$). This is captured in the higher value of η , determining the intercept. But the smaller γ , defining the slope coefficient, shows that through the channel of innovation greater growth can be achieved in an economy that is organized in short-term contracts and follows an innovation-based strategy. Which structure should be adopted to maximize growth is dependent on the current level of a_{t-1} . Up to a particular level of development $\hat{a} \in (0, 1)$, long-term contracts ($R = 1$) is the optimum structure. Higher growth can be achieved through imitating and investing in existent technology than through innovation. After this level, when $a_{t-1} > \hat{a}$, faster development is progressed through short-term arrangements ($R = 0$), as now innovation attains faster technological improvements. The ideal point for a switch in strategy is defined by \hat{a} . However, the organizational structures that determine the approach to technology accumulation are not necessarily imposed to change as they are influenced by market settings (AAZ, 2006a, 2006b; Zilibotti, 2008).

Additionally to the contractual arrangements AAZ also model the influence of firm size and delegation. I will only introduce the main implications, as they are useful to my analysis without further integration into the model. The basic idea states that innovation activities are initiated by the owner or manager. However, innovation requires effort and time like other organizational tasks, which are fundamental to production. How much scarce time will be allocated to innovative activities is determined by the level of *managerial overload*. In large, vertically integrated firms this scarcity in time creates a drawback to the innovation-based strategy. Outsourcing and delegation would unburden managerial capacities, but are subject to a standard holdup problem. Again a development of firm structure in response to changes in the optimum strategic approach is desired, but is influenced by environmental settings like market imperfections (AAZ, 2002, 2006b).

Figure 1: Dynamics through different contractual arrangements



Source: AAZ, 2006a, p.58

2.3 Government policies and reforms

The political environment in a country is supportive of either of the two strategies or hinders their implementation. Zilibotti (2008) presents governmental influence by differentiating between *rigid* and *flexible* policies, the first promoting long-term contracts and the investment-based strategy, the latter providing market structures that foster short-term relations and the innovation-based strategy. Rigid policies are characterized by market protection and entry barriers, selective support through preferential financing or tax reductions, employment protection and direct government influence on corporate governance. Typical forms are licensing systems, infant-industry protection or import substitution policies. Such ‘low competition regimes’ are usually referred to as barriers to development and growth, creating monopolies and corruption. Nevertheless there are various examples of economies that developed well under such anti-competitive setting.

The model supports these observations by predicting low competition policies to be temporarily appropriate for economies far from the frontier with relatively low levels of productivity. Considering that market imperfections or incentive problems might restrain investments in the first place, limiting competition can be necessary to initiate technology improvements and prevent the economy from stranding in a poverty trap. However persisting on protective market settings in the long run may slow down growth,

as they retard structures that support innovative activities and lead to a non-convergence trap. The ability to introduce reforms on economic policies is now crucial for further catching-up. To integrate the political influence into the model two particular types of reforms are constructed: a pro-competitive reform and the implementation of pro-worker regulations. Both modifications are designed to demonstrate variation of effects across regions or industries. First the influence of reforms that liberalize markets and foster competition is examined, differentiating between the influence on a more and a less developed state. In both cases the political reforms lead to a change towards an innovation-based strategy. The state close to the frontier benefits and achieves higher growth through this approach. Meanwhile in the more backward economy, characterized by incentive problems and market imperfections, the reform leads to a decrease in investment and diminish growth. The analysis of a change in labor market regulations leads to very similar results. In an economy starting out on short-term contracts a pro-worker regulation will not change the pace of development. In industries where long-term contracts used to be placed, the change in organizational structures can have the same effects described in the first scenario. The implementation will provoke an early switch to the investment-based strategy, slowing down growth momentarily. Both situations may lead to a reduction in the speed of convergence due to an early switch, but do not impede development in the long run.

For economies to switch late or not at all is more costly and has more severe implications as it leads to non-convergence traps: Market settings or rigid policies which sustain the investment-based strategy keep the economy trapped at a certain proximity to frontier. Meanwhile, a reform introducing incentives for innovation activities would lead to further technological convergence. The probability to maintain protective structures too long is higher in economies with serious market imperfections. Entrepreneurs that are given advantage and benefit financially through rigid policies have strong incentives to preserve them. To the extent that firms and economic actors can lobby or exert political pressure, the danger for institutions to be maintained beyond being appropriate increases (AAZ, 2002, 2006a; Zilibotti, 2008).

According to these modifications, the development of market structures is crucial to firms' strategic approach and consequently lead the path of technological convergence and economic growth. However, this evolution does not need to come automatically or by chance and can be hindered through political powers forming markets at the outset. This is a very plausible assumption when analyzing newly industrialized economies where sudden growth was triggered by something. Therefore political reforms introducing

changes are a powerful instrument that initiate, support or retard economic growth and need to be aligned carefully to the process of development.

3 Imitation and innovation in South Korea's industries

In my application of the presented model to the development of South Korea I follow the composition of the framework, beginning with the underlying assumption. I reflect on industrial development, focusing on the evolution of technology accumulation to later compare the observed strategies with organizational structures and political environment.

Beginning in the 1960s, when a new government came to power, South Korea transformed itself from an undeveloped nation to a world market competitor by the beginning of the new millennium, at a pace only few economies have reached. Real GDP growth rates averaged 8% from 1971 till 1996 and recovered astonishingly fast after the Asian financial crisis, achieving 6% on average in the period between 1999 and 2007 (OECD.Stat, accessed 10.06.2009). But development progressed uneven, featuring slowdowns and recessions as well as showing differing trends across industry sectors.

Starting out on a low stock of capital, the economy pursued exports of relatively cheap products, manufactured in labor-intensive processes. Productivity improvement was primarily obtained through vast imports of foreign technology, making capital accumulation the driving force in early growth. In being able to use technology that advanced countries had to create during their development and industrialization, late-comer economies take a different path in their technological evolution. They typically do reverse-engineering: First importing plants for assembly production, they progress to advanced, more technology-intensive parts and begin to modify and invest in improvement of the produced goods, finally innovating and engineering new products to serve perceived market needs (L. Kim, 1997; Lee & Lim, 2001).

Following an investment-based strategy, in the first two decades imitative engineering led to fast technological improvement and growth. Especially exporting firms, which were competing in international markets, producing low-priced duplicates often through original equipment manufacturing advanced fast in productivity. As capabilities improved fast, the economy soon aimed for higher-value, technologically advanced goods. This was implemented through a new focus on heavy- and chemical industries (HCI), such as automobiles, semiconductors and steel. Korea continued to achieve rapid growth

through increasing exports. But after the oil-price shock, and political unrest in 1979 change came about and in the following year growth fell to -1.5%. Due to raising trade imbalances leading western nations turned more and more reluctant to share their superior technology. Combined with a vast increase in real wages, Korea was loosing its comparative advantage in labor intensive manufacturing to other developing economies and consequently turned to creative imitation and investment in R&D. The decrease in mere imitation and turn to creative modifications is documented in Table 1 through a significant rise in R&D expenditures and patent registrations. Although both rates increased remarkably, in absolute terms the gap to leading economies still remained persistent (Chung, 2007; L. Kim, 1997).

This change of focus, consequent to an economic slow down follows the model dynamic. However it cannot be accounted as a general switch to an innovation-based strategy, as reactions and technological improvement in different industries took individual paths. Economic growth continued, reaching nearly 10% on average, well into the first years of the 1990s and South Korea joined the OECD in 1996. As a consequence, financial markets which have been partially liberalized since the 1980s were opened. So when the Financial Crisis took a grip on Southeast Asia only a year later, the economy was hit hard, suffering from -6.9% real GDP growth in 1998 (OECD.Stat, accessed 10.06.2009). And although rates regenerated astonishingly fast and R&D spending was continuously increased in the new century, only some Korean industries achieved the level of innovative capabilities that defines the world technology frontier (Hobday, Rush & Bessant, 2004; S. Kim 2007). Lee and Lim (2001) document the growth rates of patents placed in the US and measure the speed of technological convergence by taking the difference between values for Korea and the rest of the world. Combining these findings with observations on the development of world market shares, they come to the conclusion that while some Korean industries continued convergence to the frontier others slowed down at a substantial distance. Members of the first group are the cellular phone and semiconductor industry. Consumer electronics and personnel computer industries are found in the latter group. The automobile industry builds its own group, showing ambiguous characteristics of increasing world market shares but stagnating technological convergence. Similar results are presented in a study by Hobday, Rush and Bessant (2004): Based on interviews and analyses of single firms they find that 19 out of 25 firms do not yet qualify as “capable of contributing to the world technology frontier through R&D or new generation high value products” (p. 1442). These firms are aware that the strategy they follow reaches limits but fear the risk and costs related to cutting-

Table 1: Development of R&D expenditures

	1965	1970	1975	1980	1985	1990	1994
Total exp. in billion won	2.1	10.5	42.7	282.5	1237.1	3349.9	7894.7
Government share in %	61	97	71	64	25	19	16

Source: L. Kim, 1997, p.54-55

edge innovations.

I discuss in more detail three industries that took different paths of development: automobile, consumer electronics and semiconductor. The diverse outline provides multiple settings to compare to the theory.

3.1 The automobile industry

Starting out in the 1960s, within few decades Korea has become one of the biggest automobile producers and exporters in the world. Owing a very low technology base at the beginning of industrialization it was inevitable for Korean firms to rely on cooperation with transnational companies (TNCs). Accordingly Hyundai, Kia Motors or Daewoo all began as mere assemblers for major western producers. Although the alliances were useful for providing training and technology transfers, the Korean firms always pursued nationalist strategies and intended to become independent global players (Evans, 1995; L. Kim, 1997).

Catching-up in a scale intensive industry with a rather predictable and incremental innovation path gives big firms like Hyundai an advantage, as they are able to concentrate immense resources to specific R&D goals. Fast accumulation of technologies from various sources across the globe through licensing agreements enabled Hyundai and Kia to manufacture their own models for the local market by 1975. In modifying and improving used technologies through R&D, the companies acquired proficiency for more advanced engineering and successfully started exporting to foreign markets in the mid 1980s. But as they were still pursuing an investment-based strategy and world-leading manufacturers were reluctant to share their latest innovations and designs, Korean quality was lagging behind. Continuing in their approach to technology accumulation and manufacturing cars at a cost advantage the companies grew further (Kim, 1997; Lee & Lim 2001). The financial crisis brought wide restructuring in the industry. Hyundai could take the chance to buy out Kia Motors. Daewoo Motors as well as Samsung Motor

Company, who only entered the industry in 1995 were financially troubled. Continuing to approach the frontier, R&D investments were made, aiming to improve core competencies from manufacturing to new product design. But catching up has slowed down significantly and the continuous increase in market shares is accounted to retained cost advantages.

The Korean automobile industry constitutes an example of a sector that achieved fast growth through an imitative approach to technological catching-up but struggles to switch to innovative activities as their tried and tested strategy reaches limits. The industry is heading for a non-convergence trap and a drawback concurring to this stagnation is the decision of local component suppliers to continue focusing on reproduction at a cost advantage and being fast followers, resigning from competition with TNCs like Bosch. As Korean producers anticipated the difficulties they returned to cooperate with TNCs, a form of licensing quality. Samsung and Daewoo sold most of their stakes to Renault and General Motors respectively, leaving only Hyundai to remain as an independent Korean company (Hobday et al., 2004; Jwa, 2002; Lee & Lim 2001).

3.2 Consumer Electronics Industry

The Industry started out small in 1958 when Lucky Goldstar (LG) first assembled amplitude modulation radios in a garage operation. This initial acquisition of technology was proceeded through reverse-engineering of mature technology. But capabilities were not substantial enough to continue this strategy on more sophisticated products and foreign licensing agreements were entered for production of black and white TV sets. Assimilating the imported production technology enabled local firms to move to self-reliant fabrication of more diversified and advanced goods like audio equipment. Despite the technological development, growth proceeded rather slowly until the beginning of the 1970s. Then the industry turned to export orientation and firms grew rapidly, due to cost advantage in the international market and scale effects. But soon they had to face the fact, that advanced producers of color TV sets were unwilling to share or license the new technology. Developing and improving accumulated knowledge through joint research and hiring of experienced engineers let the Korean producers accomplish the challenge on their own. These investments built the basis to a new focus on R&D. Quality was continuously improved through cooperative research with universities as well as international mergers and acquisitions. LG for instance established a global network of institutes monitoring changes in technology at the frontier and Samsung, who has moved from crude imitations in 1979 to be the worlds second largest microwave manufacturer

by 1994, drastically increased R&D investments and patent registrations (L. Kim, 1997). However, this evolution in strategy did not take place in all product division.

The personal computer producers followed a different path of development: Although having gained large market shares in the 1980s through price advantages in mass production, firms like Hyundai or Daewoo did not invest in technological capabilities to move from commodity exports to design-intensive IT solutions. But in the PC industry concept changes happened frequently and direction of evolution was hard to predict. Consequently the underestimation of short product life cycles led to a drastic decrease in exports when the industry developed away from large batch production to chip sets. Korean firms reacted to the breakdown of exports in retreating from PC manufacturing and successfully switched to the production of less complex PC peripherals (Evans, 1995; Lee & Lim, 2001).

Although having progressed from simple imitation to improvement and modification of mature products Korean firms mainly continue an investment-based strategy as followers in production of consumer electronics. The competencies are still found in manufacturing, as the producers have not moved to engineering of complex systems, solutions or services. But although not pursuing radical innovations, in some specific areas, namely cellular phones and flat panel displays, Korean firms have caught-up to the frontier. Advanced technological capabilities and resources have been attained and according to Hobday et al. most of these producers follow a “hybrid portfolio” strategy (Hobday et al., 2004): being fast followers for certain products and at the same time being world leaders for others.

3.3 The semiconductor industry

In comparison to automobile and consumer electronics industries, the later start in the semiconductor industry put producers like Samsung, Hyundai and LG in the advantage of being able to draw upon a considerably built-up technology base. The first activities in the industry were initiated in the 1960s by US manufacturers which invested in offshore production and took advantage of cheap labor. Discrete devices were assembled to be reimported and used in the home market. In 1975 Samsung was the first *chaebol* to enter the semiconductor business. Transfer of knowledge from an experienced engineer enabled the firm to produce a number of different transistors and integrated circuits. Hyundai, LG and Daewoo followed the successful example and by 1983 they were had raised investments to start very-large-scale integration production. Having performed modest assembly and production of discrete devices for two decades, Korean firms wanted to

advanced to technology-intensive production of 64K DRAM in the mid-1980s. This move implied a major jump in technological capability. Leading foreign producers had been reluctant to share the advanced technology. Due to a high innovation-frequency in the industry, but a rather predictable technological trajectory, Samsung decided to rely on its own engineering for development and design. Licensing from small and enervated US producers provided the needed tactic knowledge. In combination with collaborative R&D with institutes in Silicon Valley and Korea the necessary technology for production of very large scale integrated memory chips was acquired. The Korean firms had switched their strategy in the semiconductor industry switched from imitative following and licensing to innovative activities. Skipping the stage of 128K DRAM they progressed rapidly to 256K DRAM and by 1987 were ready to market 1M chips, lagging only a year behind Japan. Research expenses grew exponentially with development of every new generation and the three Korean producers drastically increased investment in production and R&D to catch-up with the world leaders. While being head-to-head at launching mass-production of 4M DRAM, Samsung had eventually surpassed Japan in 1994 when they were first to successfully develop a working prototype of 16M DRAM. This marked the Korean technological capability for production of semiconductors to be at the world frontier level (Cheng-Fen & Sewell, 1996; Evans, 1995; L. Kim, 1997; Lee & Lim, 2001).

Defying the fall in semiconductor prices in 1996, Korean firms continue to obtain market shares based on sustained advantages in process capability. Hyundai and LG semiconductor production was merged after the financial crisis to build Hynix, ranking among the ten largest producers in the world, but not quite big enough to keep up with Samsung who ranks second behind Intel. Competing at the world technology frontier they re-focus on differentiation and improvement, well aware of market developments (Feenstra, Hamilton & Lim, 2002; Hobday et al. 2004; Lee & Lim, 2001).

4 Korean organisations and markets

During Korea's economic development markets have been subject to severe imperfections. Most notably are the monopolistic and oligopolistic structures as few big firms, called *chaebol* dominate across multiple industry sectors. Such diversified companies are also common in other Asian economies like Japan, which had led in similar rapid industrialization. To see them succeed in economic development had added fuel to an old Korean competitiveness towards Japan, enforcing their will to outperform them. Both

economies provide only small domestic markets. This disadvantage was overcome by the creation of large firms to exploit economies of scale and scope, supporting mature production technologies employed for initial industrialization. Increasing shares in number of employees and increasing share of total value added in big enterprises document the *chaebols* rapid growth. These firms concentrated market shares and economic resources on them, becoming the driving force behind economic growth. Concentration was enforced by the development of a stark decline in economic power within the top 30 ranked *chaebol* throughout industrialization (Jwa, 2002). “By 1997, 93% of all commodities and 62% of all shipments were produced under monopoly, duopoly or oligopoly conditions in which the top three producers accounted for more than 60% of market share” (L. Kim, 1997, p.28). But despite the high concentration of domestic markets and big groups in the industries, dynamic competition was significantly taking place among them and in international markets which they aimed for (Jwa, 2002). Table 2 shows that especially the larger groups diversified and vertically integrated more widely. This created a portfolio of cash flows across different product categories, smoothing alternating subsidiary performances, allowing for example Samsung to increase sales in 1995 despite the large fall in semiconductor prices. Subsequent to this excessive growth and investment, by the 1990s the *chaebol* outweighed the government in the Korean economy. Consequently the government was unable to bail out companies when they had to declare insolvency due to over-investment, during the financial crisis in 1997. Along with Daewoo, one of the top five *chaebol* half of the thirty biggest business groups had gone bankrupt. Many affiliated firms were taken over by other *chaebols* e. g. Hyundai absorbing Kia Motors. The post-crisis restructuring, called the ‘big deals’ is listed in Table 3. Earlier attempts were followed in assigning industries to certain groups, leaving the economy with business groups just as large and higher market concentration than before the crisis (Feenstra et al., 2002; H. Kim, Hoskisson, Tihanyi & Hong, 2004; S. Kim, 2007).

Such concentrated market structures are generally regarded as barriers to competition what, according to AAZ, leads to constraints on innovative capabilities. This is supported by the idea of managerial overload, hindering managers from pursuing innovation in big, diversified businesses. Size, diversification and vertical integration enhance imitative accumulation of technologies through big investment projects. These predictions are approved by the observation of fast industrial development and growth in the first two decades since 1960, achieved through an investment-based strategy. Especially in industries characterized by predictable direction of technological trajectory, which typically feature high market shares held by large diversified firms, vast improvements were

Table 2: The top ten *chaebols* in 1997

Group Name	Rank	Total diversification	Affiliates
Hyundai	1	43	57
Samsung	2	41	80
LG	3	23	49
Daewoo	4	23	30
SK	5	10	46
Ssang Yong	6	21	25
Hanjin	7	21	24
Kia	8	8	28
Hanwha	9	21	31
Lotte	10	9	30

Source: Korea Fair Trade Commission cited in Jwa ,2002, p.136

attained. In these sectors *chaebols* performed fast catching-up through imitation, as defining targets was simple and all resources could be concentrated on a specific project (Lee & Lim, 2001). This setting reflects Korea's progress in automobile production, dominated by Hyundai, Kia and Daewoo, where cost advantages and realization of scale effects still build the basis of profit. The same market structures also fostered initial development in consumer electronics, dominated by LG, Samsung, Daewoo and Hyundai. Similarly the *chaebols* failure to catch-up on technology in personal computers is consistent with the model framework as that industry is less vulnerable to entrants pursuing a simple follower strategy.

However, the *chaebols* did not only succeed in imitation but they also advanced to become world leaders in production of semiconductors, cellular phones and flat panel displays, improving technology through innovation. As the same firms practice domination and lead across all three sectors it seems that the *chaebols* apply multiple strategies at the same time, matched to the particular industry settings. The only scenario allowing such dual capability to exist in the theory would be political interventions promoting imitative catching-up. Rigid policies or a reduction in labor mobility, in economies that were preceding innovation otherwise constitutes such an environment. Firms that had advanced to process innovative activities would be forced to reorganize in short-term contracts, scaling down to imitative technology accumulation. Such a case of deliberate retarding is rather unlikely and as we will find, only the case for SMEs but not *chaebols* . Another eligible explanation in line with the framework would be provided if the af-

Table 3: Restructuring of the *chaebols* subsequent to the big deals

Industry	Before big deals	Restructuring
Aerospace	Samsung Aerospace Ind. Co. Daewoo Heavy Industries Co. Hyundai Space & Aircraft Co.	Form together a new joint company
Automobile	Hyundai Motor Co. Kia Motors Samsung Motors Daewoo Motors	Hyundai acquired Kia, Samsung was acquired by Renault, Daewoo was sold to General Motors after financial problems
Oil refining	Hyundai Oil Co. Hanwha Energy Co.	Hyundai acquired Hanwha
Petrochemicals	Samsung General Chemical Co. Hyundai Petrochemical Co. Hanwha Petrochemical Co. Daelim Petrochemical Co.	Samsung and Hyundai merged into one company and do joint business with Mitsui of Japan, Hanwha and Daelim merge into one company
Semiconductors	Samsung Electronic Co. Hyundai Electronic Ind. LG Semiconductor Company	Hyundai and LG merge into one company named Hynix
Ship engine	Hyundai Heavy Industries Co. Samsung Heavy Industries Co. Hanjung	Hanjung acquired Samsung

Source: J. Kim, 2002, p.33; Jwa, 2002, p.85

filiated businesses acted as independent entities, following different strategies according to their specific sectors and technological capabilities.

4.1 Chaebol corporate governance

In *chaebols* the smaller subsidiaries that are related through cross-shareholding cluster around a parent company. This firm is usually under control of a family clan, being founders and biggest investors. Human- and physical-capital is invested according to the criterion of maximize group benefits (Jwa, 2002; Shin & Park, 1998). The contractual arrangements that determine investment decisions show ambiguous characteristics, not evidently categorizing structures to be long- or short-term.

Working for a *chaebol* was prestigious and aspired in the Korean society as it also

implicitly guaranteed lifetime employment. While the same holds true for Japanese conglomerate firms, unlike them Korean employees were free to switch between firms and made use of this, as industrial expansion and diversification opened new opportunities for career development. While there were no functioning external labor markets, promotion and transfers of ‘insider’ managers to subsidiaries in promising sectors created an internal market, which enhanced management knowledge and technology diffusion across the industries (H. Kim et al., 2004; L. Kim, 1997). In this sense, Korean firms created a two-stage structure, placing long-term contracts in the first stage, but featuring characteristics of short-term arrangements in a second stage, where skilled managers are retained through promotion. This secured them with human resources of high quality. But as major decisions on strategy and finances were made at group level and not by the individual businesses, possible entrepreneurial skills in the affiliates’ boards did not come into operation. The decisions which followed group objectives were not always in the affiliates’ interests, what created a sever conflict between minor shareholders and the family owner. This owner, referred to as the chairman controlled and made decisions on the management of all subsidiaries while on average holding only 2 % of total assets. When the groups had grown too large for a single person to account for all relevant information, the chairman got assistance in central control from a headquarter. This concentrated authority stands in contrast to boards and supervisors of affiliated firms who could not fulfill their intended function in a contemporary way (Jwa, 2002; H. Kim et al., 2004; Shin & Park, 1998). The imperative top-down structure combined with three decades under a military government, created a management style described by L. Kim (1997) to “resemble a military bureaucracy, hierarchical and centrally controlled but relatively less formal” (p. 214). In their theoretical framework AAZ model such a lack in delegation and consequently specialization as a negative influence on the innovation-based strategy. Correspondingly the stiff organizations turned to be a drawback when innovation activities came to the fore in the 1990s. Decentralized, flatter organization of business units to enable bottom-up communication and fast, project-based response to opportunities and threats in the market would foster creative entrepreneurship. But such structures that enable innovative capabilities constitute a direct opposite to the *chaebols*’ bureaucracy.

The crisis and subsequent restructuring provided opportunity for change. The *chaebol* that had always aimed at becoming world-leading producers, maintaining independence from TNCs in management control were forced, in the need of funding, to consider joint ventures with foreign firms. The Korean industries had developed to an advanced

level that opened opportunities for new strategic alliances, not to learn and adopt on technology but on organizational structures (Hobday et al., 2004; L. Kim, 1997). The crisis also required massive layoffs, breaking with the tradition of lifetime-employment. This created an external labor market in which managers' focus is on their market value contrary to lifetime commitment. Despite these changes, major decisions on strategy and investment are still under tight control of the chairman (H. Kim et al. 2004).

The *chaebols*' complex business structure is not what was designed in AAZ's model for growth. Still it can be qualified 'long-term oriented' as selection of managers happens on a level without delegation of power on decision. I qualify this concentrated authority executed by the chairman who holds his seat for a lifetime an extreme case of a long-term contract. This orientation towards an investment-based strategy is supported by the managerial overload, bred in the hierarchical organization and evidenced in the appointment of a support headquarter.

Financing structures point in the same direction: Physical investment, like all other decisions was directed by the chairman. Allocation and moving of finances across the business group through cross-subsidies created an internal capital market, smoothing volatility in cash flows and optimizing tax liabilities at the group level. As the different firms are legally independent, funds cannot be transferred freely. Financing of projects or investments in related firms was supported either by transactions through a non-bank financial institution affiliated to the same *chaebol*, corporate bonds or cross-payment guarantees. The last describes the process in which firms could co-sign bank loans and thereby guarantee for the other affiliates default risk. This way of financing was excessively proceeded mostly by smaller *chaebols*. Such easy access to funds allowed the conglomerates to make investment decisions indeed sensitive to business opportunities for growth, but not to their internal operational cash flow. This led to over-investment and relative high debt ratios (Jwa, 2002; Shin & Park, 1998). The high leverages built up over the years proved to be very problematic. Feenstra, Hamilton and Lim (2002) find the dept-equity ratio of *chaebols* in 1996 to be highly significant in explaining bankruptcies of firms before the actual crisis. Later bankruptcies are found to relate to excessive levels of short-term debt, which banks would not roll over anymore during the crisis regardless of the debtor's creditworthiness. To cope with this problem cross-payment guarantees were prohibited in the crisis' aftermath (Feenstra et al., 2002; S. Kim, 2007).

As in *chaebols* the owner is the controlling manager, there is no principal-agent problem that would lead to under-investment. The extreme form of long-term employment

combined with too easy access to financing did not lead to efficient, but over-investment. This could be described as an unpredicted extrapolation of the model. Long-term contracts in external markets were also common and appropriate to the stage of development. That existing short-term debt was usually rolled over into long-term loans and that the dismissal of this practice was not handled well by firms exemplifies the argument. According to these contractual arrangements *chaebols* qualify as organizations that foster adoption and improvement of existent technology rather than innovation. This corresponds to Korea's rapid catching-up through an imitative approach, as well as that big Korean business groups still struggle to challenge business models and strategies which have worked well for them over a long period. Some firms managed a change in structures in their progress to a 'hybrid strategy' where in a portfolio structure innovation is applied to certain product areas (Hobday et al. 2004). But despite the found analogy to the model, in the semiconductor industry certain *chaebols* to have caught-up to the technology frontier. The ability of early improve technology through innovation, processed in such hierachic structures does not fit into the framework. This inconsistency is amplified in regards to the fact that in different subsidies managed by the same chairman different strategies of technology accumulation are pursued at the same time.

4.2 Small- and medium-seized enterprises

Consequent to the increasing dominance of the big firms during industrialization small- and medium sized enterprises (SMEs) declined in relative numbers. While small businesses, manufacturers and retailers with less than 50 employees had made up for 93% of corporations across the sectors in 1966 their share was reduced to 81% in 1985. In the same time their shares on total employment declined from 40% to 23% (Chung, 2007, p.34-35). Many medium-sized firms that did not diversify and emerge as *chaebols* eventually were acquired by the big firms and grew into them.

The importance of small business and the cost of impediments on their development was belatedly recognized. Despite the subsequent changes in industrial orientation during the 1980s, the number of SMEs going out of business increased steadily. Main reasons were the lack in financial, human and technical resources, but also opportunistic behaviour of big businesses and increasing imports from newly industrializing low-wage Asian nations. As there was no functioning external labor market, human capital implied in junior or senior mangers was a scarce resource, limiting the opportunities of starting new enterprises. This disadvantage in human resources only was mitigated after the crisis when engineers and managers started to leave the big conglomerates perceiving

better career opportunities in start-up SMEs or foreign firms (Chung, 2007; H. Kim et al., 2004; L. Kim, 1997).

Financial resources were also subject to unequal allocation. Banks preferably issued loans to big businesses, in contrary SMEs' investment decisions were dependent on their operative generated cash flow. These financial constraints let nearly half of all suffer from a shortage in funds and forced about one tenth of SMEs to reduce their business operations. The discrimination in the credit market forced SMEs to perform on significantly lower debt-ratios than *chaebols* (Chung, 2007; L. Kim 1997; Shin & Park, 1997). In a study of corporate financing in Korea Kong (1998) shows evidence that SMEs relied more heavily on retained earnings than chaebols. They made up to 37% of financing from 1987-1989, in opposition to 21% in chaebols. This even increased to 60% in SMEs versus 30% in large enterprises from 1982-1985 (Kong, 1998, Table 1). Throughout both periods retained earnings were the main source of financing in small firms. Their unfavorable situation only changed at the end of the 1990s, when subsequent to the financial crisis foreign direct investment (FDI) flowed freely into Korea (Chung, 2007; Hobday et al, 2004).

Despite the disadvantages SMEs had managed to achieve a considerable productivity growth, even exceeding the large businesses in performance in several years until 1997. The lack in human resources and financing for R&D was overcome by making use of imitation and being followers of the *chaebols*. This investment-based strategy was supported through subcontracting agreements with *chaebols* as most of the small entrepreneurs had previously worked in middle-ranked positions in big firms. In following an imitative approach, the small firms reacted to perceived restrictions exactly as predicted by theory. But not all SMEs retrieved from innovation. Most of the entrepreneurs had received secondary education and some used this investment in combination with their engineering experience and accomplished the technological capability to engage in high-technology small batch production (Nugent & Yeeh, 2002; Rgnier 1992). Kim and Nugent (1994) present data on a small sample of SMEs in 1990. They find a larger share of SMEs operating in lower technology sectors like woven textiles and auto parts manufacturing, where especially the later sector favours subcontracting agreements with larger firms. However, in factory automation, a high technology industry, SMEs hold a large share of employment of 93% compared to the average of 62% across all manufacturing sectors. An even bigger difference is documented in the value added where the high technology SMEs achieve 86% versus the average of 44% (Kim & Nugent, 1994, Table II.1, II.2 and II.3). This minority of technology-based small firms and some spin-offs

accounted for a disproportionate large share of innovations developed (L. Kim, 1997). Consequently a stronger base of start-ups, spin-offs and other smaller business units that encourage creativeness and innovation would have accelerated technological convergence beyond imitation. But the number of independent entrepreneurs that generated technological advances through innovation was small. This led Korea to stay on the track of an imitative approach in most industries and also forced the big businesses to depend on foreign component suppliers.

Due to the changes that followed the financial crisis a new breed of SMEs has emerged since beginning of the twentieth century. Especially in industries with less predictable technological changes their number increased, what points towards further development in technological catching-up in these sectors (Hobday et al., 2004; L. Kim, 1997; Lee & Lim, 2001). But starting a business in Korea still is not unproblematic. Especially when comparing the number of procedures or the minimum capital necessary, Korea ranks at the very bottom compared to the other OECD nations (World Bank, 2008b).

The general development in small enterprises, where innovative capability only evolved when impediments were overcome approves AAZ's model of corporate strategy being dependent on market structures. The exceptions of SMEs who follow an innovation-based strategy despite the restrictions do not constitute a strong contradiction to the theory as their original structure supports innovation. However they correspond to inconsistencies between strategical approaches of *chaebols* and theoretical predictions for large conglomerates. This raises the question whether technological characteristics of certain sectors should be integrated into the model: they seem to have a big influence on the catching-up evolution as they favor specific organizational structures.

5 Government policies and reforms

As markets and organizations both show persistent characteristics that impede innovation but differences in performance across industries are documented, the question is raised whether political measures have been influential on these developments. Prevailing of rigid policies, the absence of reforms or ineffective implementation may be political causes for an economic environment inappropriate to the advanced stage.

In the case of South Korea the government has ever since the start of industrialization been actively intervening in economic development. When in 1961 Park Chung-hee, an army general seized control over state affairs, the government was appointed with the power to conduct industrialization. In 1962 the first 5-year economic development plan

was introduced in which the government set direction and focus of growth and six further followed until 1996. Through concentrating the scarce resources into strategic sectors and joint risk taking with entrepreneurs the government intended to accelerate development irrespective of underdeveloped markets. Domestic market protection, export promotion, subsidies, low-interest financing and provided access to foreign technology created a stable setting in which the government directed chaebols to become the engines of growth (Chung, 2007; H. Kim et al., 2004; L. Kim, 1997; S. Kim, 2007). With these rigid policies and fostering of large vertically integrated firms the government had formed the ideal environment for technological catching-up through imitation. And as this approach was appropriate to the underdeveloped stage fast improvement and growth was achieved.

But concurrent to theory, this strategy was prone to limits. Economic slow-down and heavy inflation in the 1980s entailed criticism and questioning of the totalitarian lead. The calls for economic liberalization were responded by a shift in orientation in the fifth economic development plan. Focus was set on the development of market principles, financial liberalization, innovation and support for SMEs. The government intended to move from direct guidance to a more regulatory role. With a reform to promote more flexible policies and economic opening, the Korean government would have continued to follow the optimum structural development, as the theory describes it. But continuing implementation in its interventionist role, revising, repealing and placing of new policies, the government sustained expectations of the private sector and continuously impeded the development of efficient market-structures. Finally, the financial crisis where inefficiency and overinvestment unloaded in large extent marked a sharp change in political orientation towards competition and openness (Feenstra et al., 2002; Jwa, 2002, L. Kim, 1997). Nevertheless, organizational and market structures persist to favor imitation rather than innovation. This dualism of political measures and their aims might provide some theoretical reason for differing developments across industries. To take a closer look at the impact on technological evolution and possible problems in implementation I structure political intervention into two different approaches: Regulation of industries and regulation of firms.

5.1 Financial market policy

In the early economic state an undeveloped capital market combined with very low domestic savings were the main obstacles to raising large funds for investments. Commercial banks were unorganized and incapable of their role as financial intermediaries. The government, the only institution able to raise financial aid and loans from abroad,

nationalized private banks. In the following decades the state made use of control over allocation of financial resources as a major instrument to direct industrialization. Although the evolution of financial markets might proceed differently than in real markets this example demonstrates the government's inability or reluctance to consequently reform without exposing the economy to external shocks.

To allocate the large amount of foreign loans according to government priorities special state banks were established, serving different customer groups. To replace lacking domestic savings heavy borrowing from abroad made up 60% of total investment between 1962 and 1966 (S. Kim, 2007, p.381). More than half of those funds were channeled into strategic sectors, guaranteed by the state and provided to the *chaebols* at below-market interest rates. In combination with undervaluing the domestic currency to raise the prices of foreign goods relative to domestic products, the government followed an import substitution and export promotion policy (H. Kim et al., 2004; L. Kim, 1997; S. Kim, 2007).

Vast increase in investment combined with large differences between the government- and curb-market interest rates let demand for funds exceed supply and put a strain on the financial market, reflecting imperfections. To narrow the gap in 1965 the 'Interest rate and foreign exchange rate Realization Policy' (IRP) was introduced, successfully raising incentives for domestic savings. Further regulation of the financial market followed in the 1970s in introducing new institutes. But the high inflation that followed the oil-price shocks in 1974 and 1979 was a drawback to financial deepening and maturing. As inflation ranged between 16% and 33% from 1974 to 1981 (OECD.Stat, accessed 10.06.2009) real interest rates on government loans were negative. This demonstrates the extent of preferential financing which was provided to the strategic sectors. They also were given better access to acquire real estate, which had become an investment in demand, subsequent to high inflation. Rates came down in the 1980s, followed by liberalization policies to privatize banks and allow free setting of interest rates within a determined range. But still the government took influence on financing of private R&D investments, not deregulating enough for the market to carry out its role as an intermediary. Financial institutes continued to issue loans according to government industrial policy rather than evaluating project risks. As this social planning could not simulate efficient allocation in functioning markets, it resulted in overinvestment in the strategic sectors and financial constraints for SMEs. The high leverages in large corporations peaked in 1997 at an average debt-equity ratio of 400 in the manufacturing sector (Bank of Korea ECOS, accessed 11.06.2009) and even higher among the top thirty

chaebols. The banks did not monitor the *chaebols*' over expansion subsequent to easy funding and they eventually outweighed the government in the 1990s. Consequently the state was unable to bail out Hanbo, one of the top business groups when it declared insolvency in 1997. Further failures of big conglomerates proved that the government's implicit guarantee for funds could not be met. Foreign investors withdrew loans from banks, which due to market liberalization were defenseless in the face of requests to repay external short-term loans.

The Korean economy recovered very fast from the financial crisis, adding to the opinion, financial panic rather than fundamental economic weakness was the cause. When analyzing the situation on the background of AAZ's theory, this view is partially approved. Potential for further growth and performance is predicted, however only in combination with consequent reforms. Accordingly not fundamental weakness but obsolete structures in organizations and markets were core to the crisis. Political reactions aimed at this direction support AAZ's model of development. A reduction of loans became focus of future financial reforms, as this also was obligated by the IMF loans and financial markets continued liberalization and opening to foreign investment (Feenstra et al., 2002; Jwa, 2002; S. Kim, 2007).

In this regard the government's reform of nationalizing banks to make them an instrument of policy and accelerate industrialization was very effective. But early government control suppressed market development and when liberalization and deregulation came into focus the financial market had not matured along with the other industries. It kept following old schemes, a lack in development not caused by unavailability of advanced technology but rather by missing pressure. That the government guaranteed for credits left no need to monitor their performance while restrictions on FDI protected from international competition. The introduced reforms and intended liberalization were not consequently integrated into government actions. Only after the crisis the state allowed free inflow of foreign capital, adjusting conditions to receive loans for all market actors (S. Kim, 2007). Such stagnation in market development through protective policies is just what is predicted in theory.

5.2 Industrial policy

To promote industrialization the Korean government had selected several industrial sectors through which economic growth was supposed to be realized. Table 4 gives an overview of the development of political orientation and strategic sectors. In the first five-year economic development plan the strategic sectors were designated for promotion

through ample supply with scarce financial resources at preferential rates, tax reduction and subsidies. Firms struggled to meet demands for entering the sectors, since after receiving permission profitable growth was practically ensured, as the government provided protection from other entries and access to foreign technology. But this competition to attain business licenses based on the ability to come up the fastest with necessary resources, rather than who is the most competitive producer. In this sense the government fostered firms of size to realize economics of scale inherent in mature production technology. Along with industrial development the government applied different policies starting out with import substitution and export promotion. With these structures building the cornerstone to government lead industrialization, a rigid environment was created, ideal for technological catching-up through an imitative approach (Jwa, 2002; H. Kim et al., 2004; L. Kim; 1997).

Domestic market protection to support infant industries had already been in use when the Park government came to power and started to promote industrialization. Protection from international competition had been granted most to agricultural sectors as well as to textiles and steel. In a first phase of industrial policies the government continued to restrict imports what created domestic markets in new industries for firms to enter under protection. Moreover, facilitating transfer of foreign technology established a basis for more sophisticated industries. But despite the high growth achieved through initial introduction of production technology the new military government was conscious of the small-sized domestic market and that substantial development and efficient capacity utilization in modern production technology could only be attained when producing for the international market. After relying on their advantage of cheap labor up until the 1970s the government shifted its focus to support more capital intensive industries that create a higher value-added. A new political phase was started in the third five-year economic development plan, introduced in 1972, where emphasis was set on HCI-promotion. An export promotion policy was implemented by rewarding export orientation and a five-year tariff reduction program on the import of materials used for production in exporting industries.

In restricting FDI and foreign licensing, firms were forced to independently improve productivity through importing and assimilation of foreign technologies. These rigid policies promoted technology transfer through reverse-engineering and imitation of imported goods. This was most effective in the early decades when technology was mature and learning by doing worked well. In comparison to import substituting industries, those engaged in exports were exposed to higher competition in world markets and

Table 4: Political orientation during the five-year economic development plans

Time period	Political measures and orientation	Strategic sectors
First plan 1962-66	Rigid political environment with intensive import substitution and additional focus on export promotion in second half of the 1960s	Cement
Second plan 1967-71		Fertilizer
		Flour milling
		Glass
		Oil refining
		Textile
Third plan 1972-76	Rigid political environment with focus on export orientation in HCI	Chemicals
Fourth plan 1977-81	and continuing import substitution	Electronics
		Machinery
		Nonferrous metals
		Shipbuilding
		Steel
Fifth plan 1982-86	Introducing liberalization through reduction of policy loans and import tariffs while shifting export promotion from HCI to more technology intensive industries	Consumer electronics
Sixth plan 1987-91		Information technology
		Semiconductors
Seventh plan 1992-96	Market liberalization	Aerospace
		Bioengineering
		Fine chemicals
		Microelectronics

Source: Chung, 2007

advanced faster. They also were supported by increasing benefits in the evolution of economic policies, as approaches had moved from industry neutral export incentives in the first decade to be industry- and sometimes even firm specific. Again the government anticipated for the high growth rates attained through imitation to not be a basis for long run catching-up. Already in the 1960s and 1970s government research institutes (GRIs) had been installed as an infrastructure for science and technology, promoting research at universities and in the private sector. But tax concessions and preferential financing could not help the lacking demand in the private sector and consequently in the early decades large proportions of total R&D expenditures were accounted to the government. The linkage to industries improved in the 1980s when technological progress was more and more based on creative modification and improvement of products. The *chaebols* engaged in joint research with the GRIs or hired their experienced researchers for pri-

vate industry R&D. But stiff organizational structures and a rigid, protective political environment still prevailed (Chung, 2007; Heo, 2001; L. Kim 1997).

In the automobile industry engineering of own models was mostly borne in private development while the direction was given by the government: The Automobile Industry Promotion Law of 1962 had been part of the first five-year plan and subsequent categorization as a strategic sector in the machinery sector during the HCI promotion offered firms easy access to loans, supporting the fast expansion of production facilities. The government ruled for rationalization in the industry through limiting the number of producers through business licenses and limiting the number of manufactured models. After the first oil crisis policies were adjusted from support for mere assembling to promote locally developed cars, by guaranteeing market protection and a large market share to secure initial sales. Design and engineering itself the *chaebols* successfully managed in private projects. Such rigid setting however did not promote innovative engineering, leaving Korean car manufacturers to continue in their strategy of relying on cost advantages at the expense of innovation (Evans, 1995; L. Kim, 1997; Lee & Lim, 2001).

Similar policy structures guided the development of consumer electronics production but with an ambivalent outcome. Starting out in a protected home market, sectoral growth only accelerated when the industry was designated strategic for export-orientation at the beginning of the 1970s. The government soon feared for the Korean manufacturers to get trapped in low-return assembly and commodity production. Higher quality and competitiveness in international markets was to be realized through localization of parts production and design, initiated through an import substitution policy. But no direct influence was exerted on private R&D projects. Supported by government procurement this import substitution policy also created a market for the PC industry, which became target of political promotion in 1984. But the application of this same set of policies did not produce equal results. As PC producers failed to catch-up further they switched to production of parts and peripherals, a prospering business. Creating a domestic market for intermediate goods seems to have promoted technological development, leading the producers to process innovation and become world leaders in some product areas (Evans, 1995; L. Kim, 1997; Lee & Lim, 2001).

Only in the semiconductor industry the government took reforms further. It established the South Korea Institute of Electronics Technology to directly involve in research and support the semiconductor and the computer industry development. When first introducing a six-year promotion plan for the industry in 1975 unlike the other sectors

investment first remained below planned levels, as most firms preferred other industries. During HCI promotion the Semiconductor Industry Fostering Plan was introduced in 1983, removing all import restrictions on production materials for the industry. The intended increase in private investments followed. But obtaining of foreign technology was more difficult than in other industries and with the evolution of research, costs grew exponentially for the competing *chaebols*. To avoid expensive duplication in R&D and investment, the government designated development of 4M DRAM a national project in 1986. But again *chaebols* would not follow the political plan, as they were unwilling to work together and rather engaged in a race against each other and leading world producers. In this industry firms seemed to follow their own path of evolution, not the one designed by the government. When promotion for semiconductor production started the *chaebols* had already grown strong enough, not needing the financial incentives offered. Accordingly industrial development occurred more naturally, dependent on firm- rather than on political initiatives (Cheng-Fen & Sewell, 1996; L. Kim, 1997).

The 1980s marked a decade where general change came to political orientation. The HCI policy, cause of over-investment and excess capacity was criticized locally and abroad as firms were confronted with grave financial problems. To many neoclassical economists this failure was an inevitable consequence of political influence that went beyond neutral incentives. Hence the government intended to move its role from heavy interventions to a more regulatory influence. Core of the fifth economic development plan was the implementation of market principles through reducing import barriers and trade liberalization, as well as financial liberalization and phasing out of direct assistance. But the government continuously introduced reforms, rationalized declining industries and required firms to invest in research and innovative designs (Chung, 2007; Heo, 2001; H. Kim et al., 2004; L. Kim, 1997; S. Kim, 2007). The government's "interventionist habit" (Jwa, 2002, p. 19) was difficult to break with. In general the government policies followed a theoretically desired evolution. The rigid market policy that had brought forward the economy on the basis of imitative catching-up was liberalized and restructured to promote an innovation-based strategy. However only younger industries, that developed in the time of turn towards flexible industrial policies, adapted to the innovative approach. These strategic differences in which some industries remain stuck on their initial approach of technological improvement, while others evolve along the process of economic liberalization, corresponds with the model framework of political influence. But while policies on industries and sectors were relaxed, reforms on corporate governance developed in the opposite directions.

5.3 Corporate policy

The rapid industrialization of the Korean economy was enabled by joint risk taking by the government and the early *chaebols*. Licenses to enter strategic industries in combination with big import substitution projects provided the businesses with early and easy growth. Access to imports and intermediates was unrestricted while bank loans supplied by the state helped physical capital formation. The government fostered firms of size and encouraged them to integrate vertically to achieve economies of scale and sustain global competitiveness. Firms that followed government initiatives and performed well in strategic sectors or risky enterprises were rewarded with scarce resources and licenses to attractive industries. This led to automatic expansion and diversification of their business portfolios. Through such mechanisms the government created and supported the big business groups to be the driving force of economic development (Jwa, 2002; H. Kim et al., 2004; L. Kim, 1997; S. Kim, 2007). But the underlying policy was firm-neutral as it was aiming at industrial structures and not specific businesses or corporate governance. However, the resulting concentration in markets and organizational structures were adequate to catching-up through imitation. This adjustment of contractual relations to the political environment traces the interrelated development described by AAZ.

The constraining effect, which such imbalance has on innovation was only realized in the late 1970s. To better the situation, the government came up with support schemes for small firms. But despite structural changes, the disproportionate allocation of resources and insufficient technology diffusion continued, leaving the SMEs helpless against opportunistic behavior of *chaebols*. Corruption and political collusion along the HCI policy resulted in irrational allocations of funds and resources leading the groups to steadily expand their business and influence. They grew to be such a major influence on national development that the government felt impelled to ensure their enduring performance for national welfare, while at the same time introducing reforms to regulate their size and power (Jwa, 2002; H. Kim et al., 2004; L. Kim 1997). Policy shifted towards liberalization, promotion of SMEs and innovative research as incorporated in the ‘Regulation on Monopoly and Fair Trade Act’ : The Korean Fair Trade Commission annually selected the thirty biggest *chaebol*, which then were subject to various regulations. Beginning with rulings concerning financial institutions and loan management in 1982, respectively 1984 the government aimed for reduction in lending concentration and improvement in the *chaebols*’ financial structures. This approach was later enforced in limiting cross-payment guarantees. To repel further diversification, regulation of big business groups

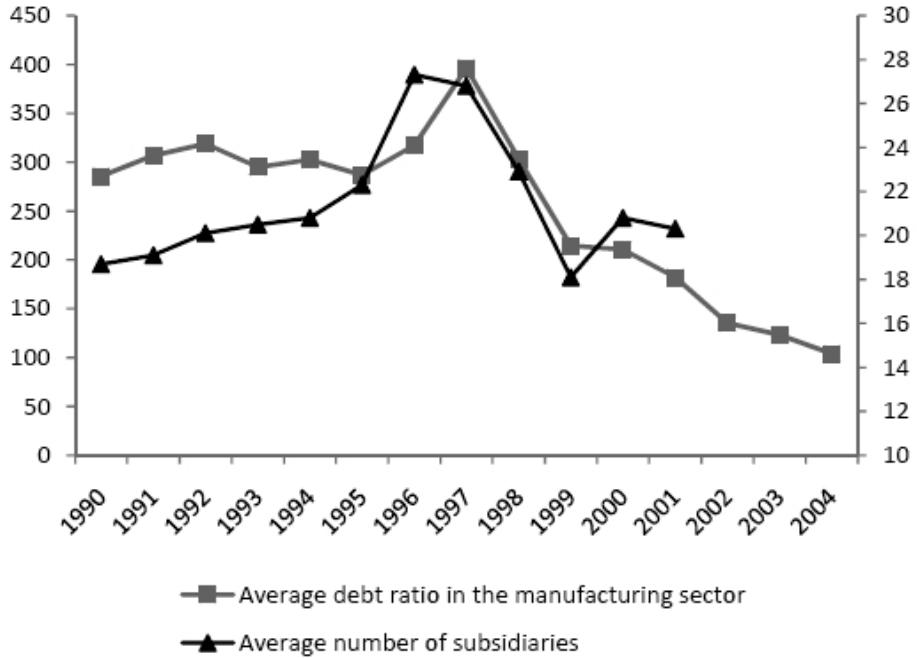
and M&As followed in 1986. This was supported by the business specialization policy in the new decade, requiring *chaebols* to limit their diversification and introducing incentives for specialization by excluding ‘core firm systems’ from the loan management policy (Jwa, 2002).

The fast increase in corporate policies may not only be interpreted as a reaction on increasing economic power exerted by *chaebols* but also on ineffectiveness of industrial policy promoting innovation related activities. The Korean government came to realize that the rigid policies they had introduced to foster growth through an investment-based strategy in early development were very effective, but had created corporate structures that endured and hindered a switch to innovation after market liberalization. The Korean experience constitutes an addition to AAZ’s theory: The *chaebol* did not keep the economy stuck in an investment-based strategy through exertion of political power to prevent liberalizing reforms. Rather their economic power left their structures unaffected of economic opening.

To continue technological convergence, the focus of reforms was shifted to corporate governance, implementing reforms to reduce market concentration and firm size. While promoting economic liberalization the government increased its influence on corporate governance. By trying to implement structures that foster innovation but doing so through rigid interventionist policies, the government created an ambiguous political environment. But similar as in the financial market, policy reforms on *chaebols* were not implemented consequently through all levels. Some business entry barriers or price regulations remained as relicts, restricting competition and the immature banks continued business as they were used to, granting loans to *chaebols* rather than to SMEs. Additionally, the government often could not let go incompetently managed chaebols but had to rescue them with public finances to prevent social costs up- and downstream (Jwa, 2002; L. Kim, 1997).

The “government-*chaebol* nexus” (p. 394) persisted until 1997, when the business groups had grown so large that they turned from ‘too big to fail’ to ‘too big to bail out’ (S. Kim, 2007). Debt-equity ratios averaged 600 among the top thirty groups (Jwa, 2002) and over investment was no news to the industry in early 1997 when some of the highly leveraged firms had to declare insolvency. The political reaction, that marked an important change was that the government abandoned the groups rather than keep on trying to restore them. In this regard the financial crisis encouraged and enabled the government to take more rigorous approaches in restructuring the *chaebols* financial structures, corporate governance and diversification. Political practice moved from regulation of firm

Figure 2: Development of debt ratios and conglomerate size



Source: Bank of Korea ECOS and Kim et al., 2004, p.38

size to internal structures. To improve transparency of business groups and to reduce power concentration on the chairman, appointing of outside managers and directors was regulated by law. Additional strengthening of the minority shareholder's voting rights and accountability of the chairman was supported. Since 1998 consolidated financial statements are mandatory, first revealing the high debt-ratios in business groups. The firms were required to reduce their debt and cross-payment guarantees, which were held responsible for the high leverages and corporate failures. Obeying the criterions tied to the IMF loans cross-payment guarantees were ruled to be absolutely suspended by March 2000 (Feenstra et al., 2002; Jwa, 2002; S. Kim, 2007).

A second set of policies, the 'big deals' aimed at *chaebol* production structures. Competitiveness was to be improved by reducing horizontal diversification, streamlining and focusing of business activities. Big swap deals between the large *chaebols* to concentrate different subsidiaries within an industry were strongly promoted and somewhat ordered by the government. Each group was allocated with a sector to focus on. These rulings are controversial as they resemble restructuring attempts of earlier decades and lead to higher market concentration creating inconsistency and possibly leading to conflicts

with political regulations on concentration (Feenstra et al., 2002; Jwa, 2002).

While the restructuring of corporate organization introduced effective changes, supporting innovation on the one hand, the ‘Big Deals’ on the other demonstrated that not only the *chaebol* but also the government is subject to the force of habit. In its attempt to push firms to achieve further technological capabilities and rely on innovation instead of fast following, corporate structures were directed to be less concentrated and top down. But contrarily, for government regulations on employment, the Korean economy was ranked 152nd out of 181 nations reviewed by the World Bank in 2008. Having the second highest firing costs among the OECD states, political guidelines on contractual arrangements are still supportive of long-term contracts (World Bank, 2008a, 2008b).

The reforms supposed to promote more flexible structures are hard to internalize in a rigid political environment. This ambiguity provides support and impediments at the same time, leaving many firms insecure in a ‘strategic dilemma’ (Hobday et al., 2004) while others have advanced to world leaders for specific products. In most cases though corporate reforms were not followed by changes in the catching-up process. Korea is heading in the direction of becoming an open flexible economy but is not there yet. In reality the transformation from rigid to flexible, goes through ambivalent intermediate stages. Also it seems, that in reality industry characteristics in terms of industrial policy, technology intensity, frequency of concept changes through innovation and maturity at the stage when backward economies enter for convergence are more determinant on catching-up performance. Therefore this analysis questions the impact of organizational structures on the strategic approach and its link to the relative stage of development. However the emergence of the concentrated market structures appropriate to the early industrial policy corresponds to an interrelation with the political environment.

6 Conclusion

When using AAZ’s model of economic growth to evaluate the development process of South Korea, some inconsistencies between theory and reality are identified. While the general evolution of policies on corporate and market structures corresponds with the framework, the model’s definite predictions about the influence of these environmental settings on progress in technological capability is confronted with varying performance across industries.

The corporate structure of *chaebols* corresponds well with the theoretical organizational structures that foster long-term contracts and imitation. Also SMEs which would

be designated for innovative activities follow an investment-based strategy due to restrictions and political settings that foster the later approach. This demonstrates a practical example of the implemented relation between policies and technological catching-up, in specific on their repressive influence. The Korean case also supports the idea of corporate structures prevailing beyond the optimum point for a switch, however due to economic rather than political power. Also the development of political intentions follows the predicted development. However, in reality government activities can take rigid measures to support changes in markets towards more flexible structures. In the Korean development rigid political measures and open, competitive markets are not exclusionary. This possibly describes an intermediate stage in development as in reality the switch in political orientation can only be implemented step by step. In this sense the Korean economy is an illustrative example stressing the importance of ability to implement reforms when policies have created an environment that turned inappropriate to the stage of development. It exemplifies the risk inherent in enforcing structures that run out of appropriateness because they might be hard to readjust.

While the political and corporate development follow a path as it was described in the model the strategic approach to catching-up evolves in multiple ways that do not fit with the theory. In Korea an innovation-based strategy is not bound to open markets and short-term contractual arrangements, but also takes place in the hierarchic *chaebol* structures. There are some arguments from theory on industrial policy to explain this success while the corporate environment in which it took place constitutes a theoretical conflict. The fact, that the very same firms that proceed innovation in one sector fail to make the switch out of imitation in another supports the proposition that technological characteristics of different industries play an important role for catching-up performance. This discussion could be deepened in a comparison with Japan, where large conglomerates, called *keiretsu* dominate the economy. They are organized in similar corporate structures as *chaebols*. Nevertheless, Japan that today is considered to have achieved and contribute to the world technology frontier.

While inconsistencies with the model show up where strict and exclusive assumptions are made the general analogy in development allows for some projection on further development in Korea. To advance from imitative following to innovation and to catch-up with the world leading nations the Korean government has to resign from its ‘interventionist habit’. The ambiguous environment has to be resolved in favor of open and competitive market structures. More flexible employment and market relations through short-term contracts are also crucial to tap the full innovative capability. This analysis

made on the basis of AAZ's model for catching-up through technological development corresponds to the OECD advice for political influence in Korea (OECD, 2000). Consequently the presented theory of economic development is applicable to the case of Korea's industrialization and may also be applied to other countries that have not emerged from their underdeveloped stage yet.

7 References

Acemoglu, D., Aghion, P. & Zilibotti, F. (2002). Distance to Frontier, Selection, and Economic Growth. NBER Working Paper 9066.

Acemoglu, D., Aghion, P. & Zilibotti, F. (2006a). Distance to Frontier, Selection, and Economic Growth. *Journal of the European Economic Association*, 4(1), 37-74.

Acemoglu, D., Aghion, P. & Zilibotti, F. (2006b). Growth, Development, and Appropriate Versus Inappropriate Institutions. *Mimeo*, Institute for International Economic Studies, Stockholm.

Bank of Korea Economic Statistical System, ECOS Database,
http://ecos.bok.or.kr/EIndex_en.jsp, accessed 11.06.2009.

Cheng-Fen, C. & Sewell, G. (1996). Strategies for technological development in South Korea and Taiwan: the case of semiconductors. *Research Policy* 25(5), 759-783.

Chung, Y. (2007). *South Korea in the Fast Lane. Economic Development and Capital Formation*. New York: Oxford University Press.

Evans, P. (1995). *Embedded Autonomy. States & Industrial Transformation*. Princeton: Princeton University Press.

Feenstra, R., Hamilton, G. & Lim, E. (2002). Chaebol and Catastrophe: A New View of the Korean Business Groups and Their Role in the Financial Crisis. *Asian Economic Papers*, 1(2), 1-45.

Hobday, M., Rush, H. & Bessant, J. (2004). Approaching the innovation frontier in Korea: the transition phase to leadership. *Research Policy*, 33(10), 1433-1457.

Hoe, Y. (2001). Development Strategy in Korea reexamined: an interventionist perspective. *Social Science Journal* 38, 217-231.

Jwa, S., (2002). *The Evolution of Large Corporations in Korea. A New Institutional Economics Perspective of the Chaebol*. Cheltenham: Edward Elgar Publishing Limited.

Kim, H., Hoskisson, R., Tihanyi, L. & Hong, J. (2004). The Evolution and Restructuring of Diversified Business Groups in Emerging Markets: The Lessons from Chaebols in Korea. *Asia Pacific Journal of Management*, 21, 25-48.

Kim, J. (2002). *The South Korean economy: towards a new explanation of an economic miracle*. Aldershot: Ashgate.

Kim, L. & Nugent, J. (1994). The Republic of Korea's Small and Medium Enterprises and their Support Systems. The World Bank Policy Research Working Paper 1404.

Kim, L. (1997) *Imitation to Innovation. The Dynamics of Korea's Technological Learning*. Boston: Harvard Business School Press.

Kim, S. (2007). Finance and Growth of the Korean Economy from 1960 to 2004. *Seoul Journal of Economics*, 20(4), 377-418.

Kong, M. (1998). Stock Market Development, Liquidity Constraint and Investment: A Case of Korean Jaebol and Non-Jaebol Manufacturing Firms in the 1980s. *Asian Economic Journal*, 12(1), 1-22.

Lee, K. & Lim, C. (2001). Technological regimes, catching-up and leapfrogging: findings from the Korean industries. *Research Policy*, 30(3), 459-483.

Nugent, J. & Yeeh, S. (2002). Small and Medium Enterprises in Korea: Achievements, Constraints and Policy Issues. *Small Business Economics* 18, 85119.

Organisation for Economic Co-Operation and Development, OECD.Stat Database, <http://stats.oecd.org/Index.aspx>, accessed 10.06.2009.

Organisation for Economic Co-Operation and Development, (2000). *Regulatory reform in Korea*. Paris: OECD.

Regnier, P. (1992). Small business and industrialisation in South Korea. *Asia Pacific Journal of Management*, 9(1), 107-117.

Shin, H. & Park, Y. (1999). Financing constraints and internal capital markets: Evidence from Korean 'chaebols'. *Journal of Corporate Finance*, 5(2), 169-191.

World Bank. (2008a). Doing Business 2009, Country Profile for Korea. <http://www.doingbusiness.org/>, accessed 12.6.2009.

World Bank. (2008b). Doing Business 2009, OECD. <http://www.doingbusiness.org/>, accessed 12.6.2009.

Zilibotti, F. (2008). Economic Growth through the Development Process. *CESifo Economic Studies*, 54(3), 325-357.