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FACTOR PRODUCTIVITY DYNAMICS IN KOREA:
EVIDENCE FROM MACRO DATA

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Bankruptcy Policy Reform and Total Factor Productivity Dynamics in Korea:
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ABSTRACT

Using the firm level panel data, obtained from the period between during , this study shows that the failing firms, accepted in the court-administered rehabilitation procedures after the post-crisis bankruptcy reform in Korea, had experienced less persistent problems in the pre-bankruptcy Total-Factor-Productivity (TFP) performances than those before the reform. The most crucial element of the post-crisis reform in the post-crisis court-administered bankruptcy system is the implementation of an economic efficiency criterion, whereas the pre-reform system benefited failing firms deemed as having high social value and prospects for rehabilitation. The new system removes the possibilities for interested parties to oppose the exit of the firms without economic values. Then, to get an idea of how the bankruptcy policy reform would affect the performance of aggregate TFP, we assess the role of the creative destruction process of entry and exit in total factor productivity growth utilizing plant level panel data in the Korean manufacturing sector during the 1990-98 period. For this purpose, we document the plant entry and exit rates, examine the dynamic relationship between plant turnovers and plant productivity, and quantify the contribution from entry and exit to productivity growth. We conclude that, for sustained total factor productivity growth, it is important to establish policy or institutional environment where efficient businesses succeed and inefficient businesses fail.

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I. Introduction

During the onset of the Korean financial crisis in 1997, an inefficient corporate bankruptcy system had a detrimental affect on Korea's economy. Prior to the crisis, in 1996 and the first three-quarters of 1997, a number of large firms facing bankruptcy actively sought shelter under the court-administered rehabilitation procedures. However, the inadequacies of the bankruptcy system failed to maintain discipline in targeting appropriate firms to undergo the rehabilitation procedure among the increasingly large number of financially distressed firms. Meanwhile, before the outbreak of the economic crisis, the uncertainty and delay encountered in dealing with failing firms clearly added to the distortion of the resource allocation process in Korea's economy.

In other words, the exit barriers for large firms seemed to have deteriorated the efficiency of resource allocation before the onset of the crisis. Prior to the crisis, Korea's corporate bankruptcy system had a tendency to work as a de facto exit barrier. For example, before the reform, producers with persistently declining productivity were more likely to be accepted in some rehabilitation procedure if they were deemed as having "high social value" such as a large output or employment share in the economy.

Hence, the natural course of action for post-crisis Korea was to undertake a

sweeping reform of its corporate bankruptcy system. As the case with other structural reforms in the corporate sector, reforming Korea's bankruptcy policy was pushed forward based on the belief that new reforms were essential in preventing recurrent economic crises from plaguing the economy. Yet, the past experiences of crisis-hit countries suggest that there is a strong possibility that incomplete or weak reforms will often lead to recurrent economic crises. Despite the suggestion, to the best of our knowledge, there are few empirical studies to examine how bankruptcy reforms in the post-crisis Korea affect the efficiency of resource re-allocation and, ultimately, the total factor productivity (TFP) growth in Korea's economy.¹

Against this backdrop, our study aims to address the issue of evaluating the effects of bankruptcy policy reform by analyzing micro data on the firm or plant level. First, by employing the firm-level panel data, the study will examine how the post-crisis reforms in the bankruptcy policy affect the productivity dynamics of failing firms. In the analysis, we will focus on bankruptcy procedures administered by the courts. For example, failing firms faced with bankruptcy that are unsuccessful in securing an out-of-court settlement after exhausting

¹ There are some recent studies that begin by examining the determinants of the divergent growth path of crisis-hit countries and (simply) suggest that such policies as bankruptcy policy reform, are possibly the candidates. However, they do not analyze the effect of bankruptcy policy reform on the resource re-allocation process of the economy based on the details of institutions at the micro level. For instance, Hayashi and Prescott (2000) show the 1990's of the Japanese economy is the failure to improve productivity not the failure to accumulate inputs. Based on this finding and other evidence, they further suggest that the industrial policy of protecting failing or declining industries or firms by the Japanese government is the main culprit behind the "lost decade". Meanwhile, in a comparative study of Chile and Mexico, Bergoening, Kehoe, Kehoe, and Soto (2001) show that the decade-long divergent growth paths of the two countries since the financial crisis in the early 1980's are predominantly driven by the differences in total factor productivity growth rates. They suggest that policies such as the bankruptcy policy reform, are candidates for explaining the different paths of the two countries.

all options would have to settle for an in-court settlement. Maintaining discipline in in-court bankruptcy procedures would have far-reaching consequences on out-of-court bankruptcy procedures, because the discipline would act as an effective and credible deterrent to failing firms in other stages.

We examine whether the firms accepted under the reformed court-administered rehabilitation procedures would experience less persistent problems in their pre-bankruptcy TFP compared with firms undergoing the process before the reforms. We expect that, if the reform in the in-court bankruptcy procedures is successful, then only the firms with temporary difficulties would be accepted by the rehabilitation programs, whereas failing firms with persistently declining productivity would be rejected. Successful reform of the corporate bankruptcy system would imply an improvement in the efficiency of resource re-allocation.

Secondly, to formulate an idea of how bankruptcy policy reform would contribute to preventing prolonged economic stagnation, we will examine how the reforms would improve the efficiency of resource re-allocation and, in turn, aggregate TFP growth.

Over the past years, there have been studies documenting that the resource re-allocation process from exiting producers to entering producers explains a substantial portion of TFP changes at the aggregate level. Most of the studies find that exiting producers exhibit

persistently declining productivity while entering producers that survive the market selection process exhibit rapidly increasing productivity (Foster, Haltiwanger, and Krizan 1998, Hahn 2000, etc). This pattern suggests that policies that prevent the efficient reallocation of resources via entry and exit could be potentially very costly with the cost possibly growing over time. On the contrary, the reforms of bankruptcy policy, which induce inefficient firms to exit with a lower cost and allocate released resources to efficient entrants or incumbents, would enhance the rate of aggregate productivity growth.

In this study, we will ask whether this productivity dynamics of entering and exiting producers holds in Korea, by using the plant-level panel data on the Korean manufacturing sector. Specifically, we will examine the following questions. What kinds of time profiles do the TFPs of exiting and entering producers show? Given the pattern of productivity dynamics, how does the competitive process of entry and exit improve aggregate productivity? Can we expect the policies that improve the efficiency of resource re-allocation, such as bankruptcy policy reform, to improve aggregate TFP instantaneously or over a period of time?

The broad outline of this study is as follows. In section 2, we examine the effects of the post-crisis bankruptcy policy reform in Korea on the resource re-allocation process using the firm-level data. For this objective, we discuss the key elements in the post-crisis bankruptcy reforms and then proceed to analyze the TFP performance of failing firms

entering the court-administered rehabilitation procedures before and after the reform. In section 3, we examine the mechanism by which the reform would improve the efficiency of resource re-allocation or the performance of aggregate TFP, by using the plant-level panel data on the Korean manufacturing sector,. In section 4, we summarize and conclude this study.

II. Bankruptcy Policy Reform and the Productivity Dynamics of Failing Firms

2.1 Corporate Bankruptcy System prior to the Economic Crisis

< Exit Barriers for Large Firms >

In Korea, economic growth in the past was possible through the growth or restructuring of existing firms rather than through the dynamic process of entry and exit. In the period of development when profitable new markets were rapidly emerging, the inadequate corporate bankruptcy system did not significantly distort the resource allocation of the economy due to the ability of the economy to easily re-allocate resources from declining sectors to emerging profitable sectors. Under these circumstances, through rationalization programs, the government played an active role in re-allocating resources from failing firms to other existing firms. During the developmental period, many of the

failing firms were not filing for bankruptcy procedures overseen by the courts.²

In particular, most small and medium-sized bankrupt firms were effectively liquidated on a non-judicial basis. A bankrupt firm's debt was usually collected on an individual basis under the Civil Procedure Act. Most of the bankrupt firm's assets were already subject to mortgage or security, consequently, leaving little for unsecured creditors. Additional procedures for the collection of debt were not necessary.

For large firms, however, the 'too big to fail' argument played a part in building exit barriers in the sense that inefficient firms were often allowed to operate through some explicit or hidden subsidies from the government. Several large sized bankrupt firms were periodically bailed out through the government's various "rationalization" measures, undercutting Korea's formal bankruptcy procedures.

Since the early 1990s, however, Korea's inadequate corporate bankruptcy system began to distort the economy's resource allocation, which increasingly grew until the outbreak of the financial crisis in 1997. Since the early 1990s, some failing firms began to enter court-administered bankruptcy procedures, but the bankruptcy system was often abused by controlling shareholders of the failing firms.

² One technical hurdle to enforcing judicial bankruptcy procedures was the Act on Special Measures for Unpaid Loans of Financial Institutions. The act gave the Korea Asset Management Corporation (KAMCO) the authority to hold auctions of the bankrupt firm's assets before the initiation of court procedures. The act basically nullified the Corporate Reorganization Act since the auction of assets by KAMCO effectively preempted the corporate reorganization process. In 1990, the Constitutional Court declared this provision unconstitutional, paving the way for the expanded use of judicial bankruptcy procedures.

By enacting the Rule on Corporate Reorganization Procedure in 1992, the Supreme Court began to shift towards improving judicial bankruptcy procedures. In particular, the new rule established conditions for initiating corporate reorganization proceedings. The conditions established by the new rule included firms which exhibited high social value, financial distress, and potential for rehabilitation; interestingly however, economic efficiency was not a condition for corporate reorganization. The new rule tended to give preference to larger failing firms for in-court corporate bankruptcy settlements creating a de facto exit barrier for large firms. For example, producers with persistently declining productivity were more likely to be accepted in one of the rehabilitation procedures if they were deemed as having “high social value” such as a large output or employment share in the economy.

< Exit Barriers from the Controlling Shareholders of Failing Firms >

Prior to the economic crisis, the controlling shareholders of failing large firms often sought to take shelter under court-administered rehabilitation procedures. However, Korea’s inefficient bankruptcy system failed to maintain discipline in targeting appropriate firms for the rehabilitation procedures among an increasingly large number of financially distressed firms.

The frequent abuse of the corporate reorganization procedure highlighted by several notorious cases involving controlling shareholders of failing firms forced the court to amend

the system in 1996. In particular, the court argued for wiping out shares held by controlling shareholders responsible for a firm's failure. The introduction of the amendment in 1996 produced an unintended consequence: controlling shareholders of failing firms pursued other means that would allow them to retain their ownership and control. Controlling shareholders found a loophole in the bankruptcy proceedings through the composition procedure, which was originally designed for small- and medium-sized firms with less complex capital structures. However, before the law's revision later, the composition procedure did not contain an explicit limit on a firm's size, which enabled existing management of larger firms to retain control.

// Table 1 here //

As shown in Table 1, there was a dramatic rise in bankruptcy filings for the composition procedure where the number of cases increased from nine cases in 1996 to 322 in 1997, and 728 in 1998. In the first three quarters of 1997, before the onset of the crisis, many large firms on the verge of financial collapse sought to file for bankruptcy under the composition procedure. Kia Motors was among the many that filed for composition procedure. It deserves special attention. In the case of Kia Motors, the debtor and creditors initially sought to file for different procedures: Kia, the debtor, initially filed for composition

procedure, but shortly thereafter creditors decided to file for corporate reorganization. In cases when involved parties file for different proceedings as in the case of Kia Motors, corporate reorganization overrides a composition filing. In the end, the court accepted Kia Motors' bankruptcy filing for corporate reorganization, but the uncertainty and delay resulting from the inefficient bankruptcy system in dealing with large failing firms such as Kia Motors clearly worsened the situation of the economy.

2.2 Post-Crisis Bankruptcy Policy Reforms

The economic crisis of 1997 placed tremendous strain on the existing corporate bankruptcy system for both in-court and out-of-court proceedings as a result of the soaring number and scale of bankruptcies. Table 1 shows that the filings for judicial bankruptcy procedures rose dramatically in 1997. The fallout from the economic crisis on the system was the main driving force in implementing revisions in the bankruptcy laws and procedures. In addition, the IMF and IBRD required that improvements be made in the corporate bankruptcy system as a condition for the bailout package.

After the economic crisis, the Korean government implemented reform efforts to remove exit barriers along two separate lines: one involved the court-administered bankruptcy procedure, and the other, the pre-bankruptcy informal arrangements for corporate restructuring. Whereas the workout procedure had a significant impact on the corporate restructuring of larger

failing firms, the court-administered procedures focused on the restructuring of medium-sized failing firms.

In this study, we focus on policy reform in the court-administered bankruptcy system. Except for small-sized firms with less complex capital structures, the court-administered bankruptcy procedures would be the last resort for insolvent firms if the interested parties could not agree on the pre-bankruptcy informal arrangements for corporate restructuring. For pre-bankruptcy informal arrangements, one of the most effective disciplines should come from the discipline of the court-administered bankruptcy procedures. In other words, during out-of-court informal settlements the incentives of interested parties' would be directly affected by how they expect the outcome of the court-administered bankruptcy proceedings to be.

< Bankruptcy Policy Reform in 1998: Economic Efficiency Criterion and the removal of the Exit Barriers for Large Firms >

The most crucial element in the post-crisis court-administered bankruptcy system was the court's establishment and tight enforcement of an economic efficiency criterion in selecting qualified firms for judicial bankruptcy procedures. Instead of basing the system on economic efficiency, the pre-reform system was based on high social value and prospects for rehabilitation. Presently, a comparison of a distressed firm's value as a going-concern with its

liquidation value is required to initiate judicial bankruptcy proceedings.

The new criterion greatly contributed to removing the de facto exit barrier placed on large firms that had existed in the in-court bankruptcy system prior to the crisis. Prior to the crisis, producers with persistently declining productivity were more likely to be accepted into a rehabilitation procedure as long as they exhibited “high social value” such as a large output or employment share in the economy.

The reforms initiated in 1998 represented the most dramatic change in the system since the enactment of the corporate bankruptcy laws in 1962. However, in the wake of the crisis, in an effort to quickly implement the reforms, the government was not successful in initiating a fully comprehensive revision. The shortcomings of the first reforms resulted in another round of revisions in 1999. The two revisions to the bankruptcy laws significantly expanded the role of the courts in the corporate bankruptcy process. If not for the workout procedure introduced as an out-of-court settlement in 1998, the role of the courts would have been much greater.

Besides the economic efficiency criterion, the 1998 reforms attempted to speed up the proceedings. The revisions introduced time limits for critical steps in the proceedings such as for the decision on stay, the report of debts and equities, the approval of the reorganization plan, and other related steps. Additional changes in the 1998 revision included

the following: First, the reforms established mechanisms in order to induce a more active role for the creditors such as introducing a creditor's conference. Second, to enhance the court's capacity to deal with a large volume of bankruptcy cases, the court receivership committee was introduced as a special advisor to oversee the critical steps in the proceedings. Third, the process of wiping out the shares of controlling shareholders was strengthened and made more transparent. Fourth, to prevent the abuse of the composition procedure, some critical enhancements were made to the Composition Act. For example, large firms with complex capital structures were not allowed to file bankruptcy under the composition procedure. Table 1 shows the impact resulting from changes to the Composition Act, as the number of composition filings decreased sharply from 728 in 1998 to 140 in 1999.

< Bankruptcy Policy Reform in 1999: Mandatory Liquidation System >

Despite these significant revisions in 1998, there was room for further reform. To some extent, in fact, the 1999 reforms filled the gap between the initial reform proposals and what was finally passed in the 1998 revisions. While developing the revisions in 1999, there was an initial debate on the inclusion of an automatic stay provision for the new law. Under an automatic stay, the debtors' assets would be automatically protected from creditors seeking to secure their claims. After strong arguments were presented for both sides on the issue of automatic stay, the final compromise was to speed up the initiation of the proceedings to

within a month of the filing.

Although the automatic stay provision can enhance the rehabilitation of failing firms after bankruptcy, the debtor may choose to utilize the court in order to avoid a formal default and thereby evade criminal punishment under the Illegal Check Control Act. According to the Illegal Check Control Act, the managers or controlling owners of failing firms who issued bad checks are criminally liable. The objective of the act was to overcome the informational asymmetry between debtors and creditors. Creditors faced with highly unreliable accounting information would be less willing to facilitate loans to debtors without a credible means of recourse. As a result, debtors are forced to make a credible commitment to repayment by risking incarceration in the case of default.

The new revision also facilitated an efficient transition between corporate reorganization and liquidation. After the initiation decision, the court must compare the going-concern value of the firm with its liquidation value. If the liquidation value is larger than the going-concern value, the court must declare the liquidation of the firm. Donga Construction was liquidated in early 2001; it was the first large firm to travel down this path. The mandatory liquidation provision could be considered as a reform that contributes to enhance the efficiency of bankruptcy system.

However, the mandatory liquidation provision created an unintended consequence. The possibility of liquidation instilled fear among failing firms to a point where many

attempted to avoid the judicial rehabilitation procedures. Resolving this problem in the current judicial bankruptcy system remains as one of the major future policy objectives in Korea.

2.3 Bankruptcy Policy Reform and the Productivity Dynamics of Bankruptcy Cohorts

Firms go bankrupt due to their inability to pay their debts. From the perspective of designing a corporate bankruptcy system, a critical element is the ability to distinguish (or to elicit information on) whether an insolvent firm's financial distress is temporary or persistent. One method to resolve this issue empirically is analyzing the productivity of insolvent firms. In the study, we construct total factor productivity measures for the firms in our data set to evaluate the performance of the corporate bankruptcy system instituted after the economic crisis. In the analysis we examine a failing firm's cross-sectional distribution of corporate bankruptcy and time series productivity pre and post bankruptcy filing.

< Use of Bankruptcy Procedures by Chaebol Category after the Crisis >

<Table 2> shows the composition of bankruptcy procedures applied to insolvent firms by the chaebol category from 1997 to 1999. The table demonstrates the relative share of bankruptcy procedures among insolvent firms, weighted by the size of assets. The insolvent

firms in a given year include only those that went bankrupt for the first time in that year and excludes those from other years; hence, the table gives us the incidence of new bankruptcies in the specific year. By focusing on the year cohorts, we can control for various year-specific effects and single out the relationship between the various rehabilitation settlements and the size factor over time.

Once firms are insolvent, they can either enter into court or out-of-court administered settlements, including corporate reorganization, composition, or workout procedures. But not all firms enter into one of these rehabilitation programs; instead, some are simply left bankrupt for a prolonged period of time. Firms under these circumstances are cut off from credit, limiting the firms to only cash transactions.

// Table 2 here //

<Table 2> shows the relative share of different types of settlements for new chaebol bankruptcies from 1997 to 1999. The firms that went bankrupt in 1997 show a clear pattern. For the top 30 chaebols, the majority (94 percent in terms of asset size) was accepted into corporate reorganization whereas only a fraction (6 percent in terms of asset size) was accepted into composition. On the other hand, quite a significant proportion of small-sized chaebols entered into the composition program. A substantial portion of the independent

firms (and a less substantial portion of small-sized chaebols) did not qualify for any rehabilitation program after bankruptcy.

In 1998, the government introduced an out-of-court workout procedure. < Table 2 > shows that, for large-sized chaebols, the workout program was the main method of settlement. Similarly, the workout program played an important role among independent firms. By 1999, the role of the workout program had increased significantly, and most of the new bankruptcies (in terms of asset size) were handled through the out-of-court workout procedure.

< *Examining the Pre-Exit Productivity of Bankruptcy Cohorts* >

Note that one of the most significant changes in the 1998 revision was the introduction of the economic efficiency criterion. The new revision required that the courts compare the going-concern value of the firm with its liquidation value for the initiation of judicial bankruptcy proceedings. A preliminary analysis shows the firms that filed for bankruptcy between 1998-2000 experienced less persistent difficulties compared with the firms in 1997. For the firms filing bankruptcy in 1997, their productivity was lower than solvent firms several years before they enter into one of the rehabilitation programs. Rehabilitation mechanisms applied to firms under these conditions are most likely doomed to failure from the start. Rehabilitation procedures must target firms that undergo bankruptcy

due to temporary setbacks with the high potential for recovery. This is the case for the 1998-2000 cohorts. The introduction of the economic efficiency criterion in 1998 appears to have affected the types of firms targeted. Note that the 1998 reform was initiated at the beginning of the year.

These hypotheses can be tested statistically in the following manner. <Tables 3–4> show regressions of productivity on a set of dummy variables referring to the specific year bankruptcy cohort interacted with the year dummy. Only the particular cohort and the group of solvent firms are included in each regression. Then, the reported coefficients mean the productivity differential between the specific bankruptcy cohort and the group of solvent firms.

//Table 3 and 4 here//

<Table 3> shows that for the 1997 (corporate reorganization or composition) bankruptcy cohort, the coefficients reported are negative from 1993 to 2000, and significant from 1995 to 2000. The 1996 bankruptcy cohort shows a similar pattern, but standard errors are large due to the small sample size of the 1996 cohort. On the other hand, for the pre-exit years of the 1998-2000 bankruptcy cohorts starting, the coefficients are small and

significantly negative only around the time of bankruptcy.

<Table 4> shows a similar pattern of regression for the variable of profitability. The variable of profitability does not show a clear pattern regarding the pre-exit year productivity of failing firms. A possible interpretation is that some explicit or hidden subsidies given to failing firms at the pre-exit years may have worked to blur the pattern of persistently declining productivity for the bankruptcy cohorts before the reform.

As discussed in Section 2.2, the most crucial element in the post-crisis court-administered bankruptcy system was the implementation of an economic efficiency criterion. The court established and tightly enforced an economic efficiency criterion in selecting qualified failing firms for the judicial rehabilitation procedures. One of the key criteria for all judicial bankruptcy proceedings was to conduct a comparison of the value of a distressed firm as a going-concern with its liquidation value.

Instead of economic efficiency, the pre-reform system was based on high social value and prospects for rehabilitation. Note that the prospects for rehabilitation could vary depending on the amount of subsidies from creditors and the government. In comparison with the pre-reform system, the new system removed the possibilities for interested parties (for example, controlling shareholders, labor union, or local /central governments) to be in the way of a failing firm's exit. In other words, the new system contributed towards removing the de facto exit barrier that benefited large firms under the in-court bankruptcy system prior to

the crisis. Under the new system, producers with persistently declining productivity were less likely to be accepted into a rehabilitation procedure regardless of whether they exhibited high social value such as a large output or employment share in the economy.

III. Entry, Exit and Aggregate Productivity Growth in Korea Before and After the Crisis

In the previous section, it was found that firms accepted in the court-administered rehabilitation program after the reform had less persistent problems in pre-bankruptcy TFP performance than those before the reform. We interpret this finding as a lending support to the argument that bankruptcy policy reform enhanced the efficiency of resource re-allocation after the crisis.

Then, how is the bankruptcy policy reform likely to affect the aggregate factor of productivity growth? To answer this question, we discuss how the resource re-allocation by the competitive process of entry and exit contributes to the aggregate productivity growth based on evidence from the plant-level data on the Korean manufacturing sector.

Before proceeding any further, it may be helpful to give a brief background. Recently, there are a growing number of studies that explore the relationship between the resource re-allocation process of entry and exit and aggregate TFPG, based on plant or firm

level data.³ Most studies support the point that the process of entry and exit enhances the aggregate productivity by reporting at least one of the following three effects: market selection, learning, and “shadow of death” effects. Here, the market selection effect is the part of the aggregate productivity gain that comes from the fact that the efficient survive while the inefficient fail. The learning effect purposes that surviving entrants become relatively more efficient over time. Finally, the “shadow of death” denotes the phenomenon that exiting plants exhibited relatively low productivity performance several years earlier.⁴

Then, can we expect that the same forces are at work in Korea’s case? To answer this question, we discuss below what the actual patterns of plant entry and exit have been and whether the plant turnovers reflect productivity differential among plants, based on Hahn (2000).⁵

<Patterns of Plant Entry and Exit in the Korean Manufacturing Industry>

In Hahn (2000), there are two types of entry—birth and switch-in. Birth is defined as a plant that first appears in the data set. Switch-in is a plant that existed in a market in the previous period which is different from its current one. Here, a market is defined as a five-

³ For a recent survey of the empirical literature in this vein, see Tybout (1996a), Caves (1998), and Foster, Haltiwanger, and Krizan (2001).

⁴ With regard to the question of how much of the aggregate productivity growth is accounted for by entry and exit, however, the available evidence seems mixed. For example, Foster, Haltiwanger, and Krizan (2001) on the U.S., and Aw, Chen, and Roberts (2001) on Taiwan report large role of entry and exit in aggregate productivity growth while Baily, Hulten, and Campbell (1992) on the U.S., and Griliches and Regev (1995) on Israel find a minor role.

⁵ For more detailed discussion, see Hahn (2000).

digit level industry. A continuing plant is the one that is neither identified as birth nor switch-in. Similarly, there are two types of exit—death and switch-out. Death is defined as a plant that disappears from the data set in the next period, while switch-out is a plant which moves out to another market in the next period. Under these working definitions, the actual patterns of entry and exit can be documented.

<Table 5> and <Table 6> show the percentage contribution of plant births and deaths, respectively, in terms of output and number of plants. Specifically, table 5 illustrates what fraction of output or number of plants for each year is attributable to the plants which are grouped by plant age. Table 6 shows similar statistics for each year by group of plants that will die within a certain time period. Overall, the figures below suggest that the plant turnover rate was quite high in the Korean manufacturing industry during the 1990-98 period.

According to Table 5, plants less than five years of age account for more than 25 percent of manufacturing production except for the crisis year of 1998. In 1998, the contribution from plants aged less than five years declines sharply to 21.5 percent. This decline is attributable not only to a fall in the birth rate but also to a rise in the closing of young plants, reflecting the severe recession. In terms of plant number, the importance of births becomes more pronounced; one to five-year-old plants account for about 65 percent of the total for each year, except for 1998. The larger contribution of young aged plants in terms of plant number indicates the relatively small size of those plants.

// Table 5 and 6 here //

The new plant entry rate in Korea seems to be higher than most other countries for which similar studies are available. While plants aged less than five years account for about 25 percent of a given year's output in Korea, they explain 13.6 to 18.5 percent in the U.S., 18.3 to 20.8 percent in Colombia, and 15.0 to 15.7 percent in Chile, depending on the year.⁶ Comparison of entry rate between Korea and Taiwan might be useful since, even though both countries were equally dynamic countries, these countries differed vastly in their industrial structure. That is, it is well known that Korea relied heavily on *Chaebols*, while Taiwan on small and medium sized enterprises, in their past economic success. If *Chaebols* in Korea employed a more capital intensive production structure requiring larger sunk setup costs than SMEs in Taiwan, then it could well be conjectured that this condition, combined with policy-related exit barriers, worked as an entry barrier, lowering entry rate in Korea. Consistent with this hypothesis, the entry rate in Korea reported by Hahn (2000) seems to be less pronounced compared with Taiwan. In a similar study for Taiwan, Aw, Chen, and Roberts (2001) report that one to five-year-old firms account for approximately one-third to one-half of the

⁶ See Dunne, Roberts, and Samuelson (1988) for the U.S., Roberts (1996) and Tybout (1996b) for Colombia and Chile, respectively. The figure for the U.S. is based on firm level data.

production in nine Taiwanese manufacturing industries in 1991⁷. However, further study is required to shed more light on this issue.

The plant death rate is also high in the Korean manufacturing industry, which is not surprising given the high cross sectional correlation between the entry and exit rates reported in the literature. Although there are some variations over the years, about 20 percent of the plants in terms of output and more than half of the plants in terms of plant number cease to exist within a span of five years. In 1993, the contribution of the plants that will die within five years became significantly larger reflecting the severe economic recession in 1998. The contribution of plant deaths in terms of plant number is much larger than in terms of output, indicating that the deaths are concentrated among the smaller plants.

The plant death conditional on birth (not reported) is even higher than the unconditional death rates reported above. In terms of both plant number and output, the death rate conditional on births is much higher than the unconditional death rate especially during the first three years of operation. Thus, new plants seem to fail easily especially during the first three years. This might be due, among other factors, to the low productivity of births on average during the early stages of operation, which seems consistent with the theories of firm dynamics such as Jovanovic (1982) and Hopenhyn (1992). Switch-ins and switch-outs (not

⁷ Unfortunately, a direct comparison of the two studies could be somewhat misleading because Hahn (2000) used plant-level data while Aw, Chen, and Roberts (2001) used firm level data. Nevertheless, relatively high entry rate in Taiwan seems to be a robust conclusion since entry rate measured at plant level would be higher than at firm level in so far as there are multi-plant firms.

reported) are also frequently observed in the Korean manufacturing sector. In terms of output, they are almost as important as births or deaths, respectively. Compared with births or deaths, switch-ins or switch-outs are generally bigger in size.

<Productivity Differential Among Plant Groups At a Point in Time>

Having described the plant entry and exit rates in the Korean manufacturing sector, we proceed to the issue of whether plant turnovers reflect certain patterns of productivity differential. For this purpose, we first examine the relationship between plant turnover patterns and plant productivity, both at a point in time and over a period of time.⁸ Below, we discuss the former aspect of the study.

<Table 7> compares the unweighted mean productivity levels of plants that exist in a given year, by five plant groups defined as earlier. Main findings could be summarized as follows. First, deaths in a given year are, on average, less productive than continuing plants in that year. Depending on the year, they are about 3 to 6 percent less productive than continuing plants. This result is consistent with the prediction by models of plant or firm heterogeneity that market selection forces sort out low-productivity plants from high-productivity plants.

⁸ Plant productivity level is measured according to chained-multilateral index number approach as developed in Good (1985) and Good, Nadiri, and Sickles (1997) and employed in Aw, Chen, and Roberts (2001). For details,

// Table 7 here //

Second, births are on average less productive than continuing plants in the first year they are observed. They are even less productive than deaths. In fact, the productivity of a typical birth plant is the lowest among all groups of plants in every year. Initial low productivity of birth plants relative to continuing plants or deaths is not consistent with the presence of the simple vintage effect that new plants are more productive than older plants. However, it is not necessarily contradictory to the prediction of several recent models of plant dynamics, such as Jovanovic (1982) and Hopenhayn (1992). Potential entrants who are uncertain about their productivity but hold a positive outlook on their post-entry productivity performance—i.e., who expect they could catch up with the incumbents in terms of productivity sooner or later—may enter despite their initially low productivity. Of course, birth plants themselves are also heterogeneous in terms of productivity, as will be discussed later.

The initial low productivity level of births relative to incumbents is also documented by other studies, although these studies differ from ours in data and methodologies. For example, Aw, Chen, and Roberts (2001) reports that entrants in 1986 are between 0.6 percent and 6.9 percent less productive than incumbent firms depending on industry, using firm level

see Hahn (2000).

data on Taiwanese manufacturing industries. Meanwhile, Table 10 in Foster, Haltiwanger, and Krizan (2001) reports that there is no statistical difference between continuing plants and entering plants in terms of multifactor productivity in 1987, based on ten-year interval analysis of plant level data on U.S. manufacturing sector. However, the same table illustrates that the cohort of plants that entered during the past five-year period, rather than ten-year period, show lower productivity than continuing plants in 1987.⁹

Third, switch-in or switch-out plants have higher productivity than birth or death, respectively. The productivity of those plants is roughly comparable to the continuing plants on average. Higher productivity of switch-ins relative to births is consistent with the idea that having experience in a related market is beneficial. Also, the finding that switch-outs have productivity levels comparable to continuing plants seems to suggest that high productivity plants possesses mobility. Finally, each new cohort of births are more productive than their previous cohorts. This finding conforms well with the presumption of recent R&D-based endogenous growth models, such as Grossman and Helpman (1991), in that potential entrants receives externality from previous innovation.

The above findings suggest that plant turnovers, especially entry by birth and exit by death, are not random events. In other words, the productivity of birth and death plants are more likely to be located at the lower end of the productivity distribution. In particular, lower

⁹ They report, however, that in terms of labor productivity entering plants have lower productivity than

productivity of deaths relative to continuing plants indicates that market selection forces are at work as predicted by theoretical models of plant or firm dynamics. Market selection of low productivity plants from surviving high productivity plants is a process that enhances the aggregate level productive efficiency.

Lower productivity of births relative to continuing plants or even death is not inconsistent with the prediction of theoretical models and often found for other countries. However, it could cast doubt on the positive role of exit and entry on the aggregate efficiency gain. That is, it suggests that the instantaneous effect of resource reallocation by plant deaths and births on aggregate productivity growth might be very small or even negative, which might be true especially if the resources released by deaths are entirely reallocated to births. Is this the end of the story? The answer is no. To further understand this point, we now discuss the dynamic aspects of the relationship between plant turnovers and productivity. Specifically, we discuss post-entry and pre-exit performance of plants by focusing on market selection, learning, and shadow of death effects.

<Post-Entry Performance: Market Selection and Learning>

To proceed, we utilize the longitudinal aspect of the data set to examine whether market selection forces sort out low productivity plants among birth plants. In our sample,

continuing plants even at ten year intervals.

there are eight cohorts of births according to birth year from 1991 to 1998. Focusing on a particular birth-year cohort has the advantage of controlling the possible age effect on survival. For example, we examine whether plants that belong to the 1991 birth cohort but die in 1993 have lower productivity at the time of death compared with the other surviving members of the birth cohort. To do so, plant productivity is regressed on a set of year dummies (not reported) and a dummy variable denoting whether the plant died after birth within the sample period interacted with year dummies. Thus, the estimated coefficients denote the productivity differential between deaths and survivors at the time of death. The regression results for three birth cohorts are reported in <Table 8>.

The table shows that, for each birth-year cohort reported, exiting plants demonstrate significantly lower productivity than surviving plants at the time of death. Depending on the cohort year or death year, deaths are less productive than surviving plants by about 3 to 6 percent. Thus, the evidence from the Korean manufacturing sector clearly supports the presence of a market selection effect: market forces sort out plants on the basis of productivity.

// Table 8 here //

As noted by Foster, Haltiwanger, and Krizan (2001), the entry and exit process

contributes to aggregate productivity growth also through rapid learning of surviving entrants.

In the Korean manufacturing sector, the learning effect is also observed. To illustrate the point, let us examine the productivity performance of the surviving members of the births relative to continuing plants. <Figure 1> shows the average productivity of birth cohorts that survived until 1998 by birth year, in comparison with continuing plants in 1991 that also survived until 1998. Continuing plants have increased their productivity steadily and improved their average productivity by about 23 percent during the 1991-98 period. Each birth-year cohort starts with a productivity disadvantage relative to continuing plants at the year of entry. However, every birth cohort exhibits a very rapid improvement in productivity following entry, and catches up with continuing plants in terms of productivity level after several years. The initial productivity differential between births and continuing plants ranges from 6 to 10 percent depending on the birth year. In the following year after entry, the productivity differential narrows to only about 0 to 3 percent. In the third year after entry, the productivity level of births is roughly the same as, or even slightly higher than, continuing plants. The 1991 birth cohort in particular, which has the longest time series, maintains a higher average productivity than continuing plants three years after entry. Thus, the results are clearly supportive of the presence of a rapid learning effect by surviving members of births, especially during the first several years after entry.

// Figure 1 here //

<Pre-Exit Productivity Performance of Deaths: “Shadow of Death ” Effect>

In order to understand the connection between the micro process of entry and exit and the aggregate productivity growth, it would be ideal if we could examine the counterfactual phenomenon of what would have happened to the productivity performance of deaths if they had not died. Unfortunately, this seems to be an impossible task. However, it could prove to be beneficial to examine pre-death productivity performance of deaths in order to formulate an idea on the counterfactual. The issue is whether plant deaths reflect a random or transitory event or a persistently bad productivity performance record.

<Figure 2> shows the time series of the average productivity of plants that existed in 1990 grouped by the year of death in comparison with plants that survived throughout the sample period. There are two points to be noted here. First, there is a significant productivity gap not only at the time of death but also in the years preceding death between each death cohort and the group that survived until 1998, even though each death cohort experienced absolute productivity gain over time. This phenomenon suggests that plant deaths reflect underlying productivity differences that have existed for a long period of time. In other words,

those differences are not just a result of a random or transitory event. To take an example of the 1997 death cohort, the productivity disadvantage relative to the surviving group is about 6.5 percent in 1997. However, the productivity differential dates back as early as 1990 when it is as large as 3.7 percent already. Similar results hold for other death cohorts. Thus, plant deaths seem to reflect not only a disadvantage in productivity at a point in time but also persistently poor history of productivity.¹⁰

// Figure 2 here //

Second, the productivity differential between deaths and surviving plants tends to widen, especially during the periods nearing the death year. For example, in the 1997 death cohort, the productivity differential fluctuates between 3.5 and 4.7 percent during 1990-96 period, but in 1997 it rises to 6.5 percent. Similar patterns are found for other death-year cohorts.

So far we examined the pre-death productivity performance of death cohorts relative to surviving groups of plants and observed large and persistent productivity differences. The disparities often widen over time during the period near the death year. However, such large and persistent productivity differences observed in Figure 2 might reflect other uncontrolled

¹⁰ Hahn (2000) shows that these results are largely intact from the industry composition effect.

factors that differ between survivors and deaths, such as plant age. That is, younger plants may be less productive and suffer death more frequently than older plants. In order to control for this possible age effect on productivity and survival, we also looked at the pre-death performance of plants that are born in the same year.

<Figure 3> shows pre-death productivity of a 1991 birth cohort that is further divided by the death year, in comparison with the 1991 births that survived until 1998. For comparison, the productivity performance of 1991 continuing plants that survived until 1998 is also shown. As expected, the persistence of productivity differential among 1991 births is somewhat less pronounced than suggested by Figure 2. The 1991 births that dies before 1998 do not demonstrate a noticeable productivity disadvantage in the early years of operation compared with the surviving group. Especially in the first year of operation, which is 1991, there is virtually no productivity differential among them, except 1996 deaths. Moreover, for several years following entry, the productivity differential between the 1991 births and the 1991 continuing (and surviving until 1998) plants narrows over time.

// Figure 3 here //

However, as surviving members of 1991 births improve their productivity at a faster rate, productivity gap begins to develop and persists over time. In addition, for each death-

year cohort among the 1991 births, the productivity disadvantage relative to the continuing group becomes the largest in the last year they are observed. Thus, even if the possible age effect on productivity and survival is controlled for, plant deaths still reflect somewhat persistent productivity disadvantage that often widens during the period near death.

These findings seem to suggest that plant deaths reflect persistently poor productivity performance which often worsens near the death year. In other words, low productivity of deaths is not just an outcome of random or transitory events.

<Entry, Exit and Aggregate TFPG >

The empirical evidence presented above is summarized as follows. Overall, plant deaths reflect persistently low productivity in the past. Entering plants may initially begin with a relatively low productivity level, but over time, they go through the process of market selection: the inefficient fail and the efficient survive. The surviving entrants experience a rapid learning and become highly efficient over time.

This pattern of productivity dynamics suggests that the major effect from the resource reallocation of entry and exit on aggregate productivity will emerge over time even though the instantaneous gain may be small or even negative. The evidence also suggests that policies that inhibit the resource reallocation process of entry and exit of businesses are likely to be inefficient. In particular, although the cost of such policies may not appear immediately, it will materialize and grow

over time in the form of foregone aggregate productivity gain. Alternatively, policies that improve the efficiency of resource reallocation, such as bankruptcy policy reform, may not improve aggregate total factor productivity instantaneously. However, the benefits from such policies will most likely to be realized over time.

IV. Concluding Remarks

This study has found that failing firms, accepted in court-administered rehabilitation procedures after the bankruptcy reforms, had less persistent problems in pre-bankruptcy TFP performance compared with those before the reforms. We interpreted this finding as lending support to the argument that bankruptcy policy reform improved the efficiency of resource reallocation after the crisis.

Then, to get an idea of how the bankruptcy policy reform would affect the performance of aggregate TFP, we examined how the resource reallocation by the competitive process of entry and exit had contributed to aggregate productivity growth based on evidence from plant level data on the Korean manufacturing sector. The empirical analysis supports that, in Korea, exiting producers exhibit persistently declining productivity while entering producers that survive the market selection process show rapidly increasing productivity. These specific patterns of productivity dynamics suggests that policies that

prevent resources from being reallocated efficiently via entry and exit could potentially be very costly with the cost growing over time. Conversely, bankruptcy policy reform, which induces inefficient firms to exit and allocates the released resources to efficient entrants or incumbents, would contribute to increasing the rate of aggregate productivity growth.

| Appendix: Data

1. Productivity Dynamics of Distressed Firms in Korea in Section

(1) firm-level productivity measure

We use detailed financial information on the firms that have external audit reports. According to the Act on External Audit of Joint-Stock Corporations, a firm with assets of 7 billion won or more must issue audited financial statements. The data thus includes all the firms with assets of 7 billion won or more. For this data, firm productivity is estimated using the chained-multilateral index number approach.

(2) data on bankruptcy filings by distressed firms

The information on corporate bankruptcy was gathered from various sources such as the Courts, Financial Supervisory Service and the Bank of Korea.

2. Plant Productivity in Korean Manufacturing Sector in Section

The data used for this section comes from the unpublished plant-level database underlying the Annual Report on Mining and Manufacturing Survey. The data covers all plants with five or more employees in 580 manufacturing industries at five digit level. It is an unbalanced panel data with about 60,000 to 90,000 plants for each year during the 1990-98 period, so that the total number of observations is about 700,000. For details in measurement

of plant total productivity, see Hahn (2000).

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Table 1. Bankruptcy Filings before and after the Crisis

(unit: number of cases, %)

Bankruptcy Procedure	Year	1995	1996	1997	1998	1999	2000	2001	2002 ¹⁾
	Reorganization		79 (76.0)	52 (65.8)	132 (26.8)	148 (14.9)	37 (9.1)	32 (13.2)	31 (12.3)
Composition		13 (12.5)	9 (11.4)	322 (65.5)	728 (73.3)	140 (34.4)	78 (32.2)	51 (20.2)	23 (18.6)
Liquidation		12 (11.5)	18 (22.8)	38 (7.7)	117 (11.8)	230 (56.5)	132 (54.6)	170 (67.5)	82 (66.1)
Total		104 (100.0)	79 (100.0)	492 (100.0)	993 (100.0)	407 (100.0)	242 (100.0)	252 (100.0)	124 (100.0)

Note: 1) from January to October.

2) Numbers in parentheses denote the percentage.

Source: Supreme Court of Korea

Table 2. Insolvent Firms' Procedure by the Chaebol Category

(unit: trillion won, %)

	1997			1998				1999			
	No Procedure	Com-position	Corporate Reorg	No Procedure	Com-position	Corporate Reorg	Workout	No Procedure	Com-position	Corporate Reorg	Workout
1-30 Largest Chaebols	0.35 (3.38)	0.61 (5.80)	9.48 (90.82)	0.09983 (1.73)	0 (0.00)	0 (0.00)	5.669 (98.27)	0 (0.00)	0 (0.00)	0 (0.00)	3.455 (100)
31-60 Largest Chaebols	0 (0.00)	0 (0.00)	0.19 (100)	0 (0.00)	0 (0.00)	0 (0.00)	5.713 (100)	0 (0.00)	0 (0.00)	0 (0.00)	0.5862 (100)
61-300 Largest Chaebols	3.18 (13.51)	7.69 (32.66)	12.67 (53.84)	0.7850 (3.54)	1.560 (7.03)	6.795 (30.62)	13.05 (58.81)	0 (0.00)	1.081 (6.73)	0.2857 (1.78)	14.71 (91.50)
Small Chaebols and Independent Firms	3.95 (29.16)	1.32 (9.73)	8.27 (61.11)	2.090 (24.44)	1.638 (19.16)	1.469 (17.18)	3.354 (39.22)	0.4627 (1.69)	0.9036 (3.29)	0.4040 (1.47)	25.68 (93.55)

Notes: 1) The frequencies are weighted by the asset size.

2) Author's calculation for all the firms in the NICE data.

3) Numbers in parentheses denote the percentage.

Source: Youngjae Lim (2003)

Table 3. Productivity Dynamics of Bankruptcy Cohorts before and after Bankruptcy Policy Reform
(Firms undergoing Corporate Reorganization or Composition)

Independent variables: Dummy Variable Denoting a Specific Cohort Interacted with Year and Industry Dummy	Dependent Variable: Productivity				
	(1)For the 1996 Cohort	(2)For the 1997 Cohort	(3)For the 1998 Cohort	(4)For the 1999 Cohort	(5)For the 2000 Cohort
1993	-0.0687115 (0.1739958)	-0.0820866 (0.0596231)	-0.0069199 (0.035766)	0.0251072 (0.0527104)	0.0092007 (0.0795996)
1994	-0.0629782 (0.1739847)	-0.0815479 (0.0602887)	-0.0366698 (0.0347451)	-0.0219148 (0.0500552)	-0.0277665 (0.0750421)
1995	-0.0588727 (0.1739736)	-0.1367584** (0.0588782)	-0.0390412 (0.0339194)	0.0127083 (0.0474052)	-0.0821738 (0.0711893)
1996	-0.3647536 (0.2245488)	-0.1347013** (0.0595412)	0.0070321 (0.0334223)	0.0317036 (0.0470457)	-0.0124563 (0.0700231)
1997	-0.2869542 (0.2245442)	-0.2780865** (0.063298)	-0.0574577 (0.0356012)	-0.0368554 (0.0460487)	0.0304901 (0.0689116)
1998	-0.1409918 (0.1739603)	-0.2565868** (0.0650112)	-0.3211885** (0.0447192)	-0.1993039** (0.0648769)	-0.0003248 (0.0711459)
1999	-0.1321559 (0.2245506)	-0.1544865** (0.0700572)	-0.1599611** (0.0466198)	-0.1475066** (0.0722738)	-0.2036022** (0.091783)
2000	-0.1572699 (0.2245766)	-0.1793303** (0.0765336)	-0.1627449** (0.0488477)	-0.2222749** (0.0778949)	-0.3875751** (0.1376069)
Year Dummies Included	Yes	Yes	Yes	Yes	Yes
Industry Dummies Included	Yes	Yes	Yes	Yes	Yes
Number of Observations	40,205	40,476	41,025	40,588	40,373

Notes: 1) Numbers in the parenthesis are standard errors.

2) * significant at the 10% significance level

** significant at the 5% significance level

**Table 4. Profitability Performance of the Bankruptcy Cohorts before and after Bankruptcy Policy Reform
(Firms undergoing Corporate Reorganization or Composition)**

Independent variables: Dummy Variable Denoting a Specific Cohort Interacted with Year and Industry Dummy	Dependent Variable: Profitability				
	(1)For the 1996 Cohort	(2)For the 1997 Cohort	(3)For the 1998 Cohort	(4)For the 1999 Cohort	(5)For the 2000 Cohort
1993	-5.53285 (102.5908)	-1.053267 (35.0131)	1.02541 (20.11472)	-2.983965 (28.94122)	-4.046776 (42.627)
1994	-5.593412 (102.5857)	-2.923504 (34.5993)	-0.1474853 (19.65527)	-2.976718 (27.26436)	-1.751188 (39.96213)
1995	-3.757859 (102.5831)	-4.626083 (34.20874)	-0.618984 (19.36783)	-2.501499 (26.70296)	-7.389917 (38.80357)
1996	-55.05091 (132.4078)	-5.89941 (34.98389)	-0.7878422 (19.43056)	-2.480486 (26.52319)	-2.169504 (39.95305)
1997	-109.6434 (102.5782)	-19.09772 (34.97537)	-3.990996 (20.27411)	-5.698947 (26.16555)	-1.671837 (38.25027)
1998	-3.665419 (102.5801)	-29.41768 (37.19917)	-32.68748 (24.80246)	-31.58403 (36.19649)	-13.42344 (41.20706)
1999	-0.8003833 (132.4098)	-12.61717 (36.73676)	-5.174351 (22.27227)	-15.59426 (31.50063)	-19.05743 (50.03865)
2000	-10.02233 (132.4134)	-1.937577 (41.18623)	-0.7337271 (24.02397)	1.431097 (35.79111)	-4.809503 (59.18531)
2001	36.11783 (132.4123)	9.827578 (41.85452)	0.1038245 (25.12973)	9.514607 (37.65765)	-99.89773 (61.25584)
Year Dummies Included	Yes	Yes	Yes	Yes	Yes
Industry Dummies Included	Yes	Yes	Yes	Yes	Yes
Number of Observations	52,026	52,345	53,031	52,520	52,236

Notes: 1) Numbers in the parenthesis are standard errors.

2) * significant at the 10% significance level

** significant at the 5% significance level

Table 5. Contribution of Plant Births

(Unit: %)

Year	Under 5 years				Over 5 years			
	1-3		4-5		Total		Number of plants	Current Output
	Number of plants	Current Output	Number of plants	Current Output	Number of plants	Current Output		
1995	53.32	17.13	14.22	9.09	67.54	26.22	32.46	73.78
1996	47.60	15.36	18.68	11.11	66.29	26.46	33.71	73.54
1997	45.40	14.77	18.67	10.63	64.08	25.40	35.92	74.60
1998	39.45	12.77	18.63	8.68	58.08	21.45	41.92	78.55

Source: Hahn (2000)

Table 6. Contribution of Plant Deaths

(Unit: %)

Year	Within 5 years						Survive more than 5 years	
	1-3		4-5		Total		Number of plants	Current Output
	Number of plants	Current Output	Number of plants	Current Output	Number of plants	Current Output		
1990	36.85	13.36	15.71	6.48	52.57	19.85	47.43	80.15
1991	37.41	14.52	17.11	7.62	54.52	22.14	45.48	77.86
1992	39.28	15.08	16.72	7.77	56.00	22.85	44.00	77.15
1993	43.71	14.92	20.23	9.13	63.93	24.05	36.07	75.95

Source: Hahn (2000)

Table 7. Average Productivity of Plant Groups, 1990-1998

	Continuing	Entry		Exit		Total
		Birth	Switch in	Death	Switch out	
1990	-0.005			-0.044	-0.026	-0.016
1991	0.046	-0.031	0.041	-0.003	0.050	0.026
1992	0.061	-0.005	0.061	0.018	0.068	0.046
1993	0.087	0.030	0.096	0.051	0.101	0.072
1994	0.132	0.056	0.141	0.101	0.144	0.118
1995	0.190	0.132	0.199	0.150	0.202	0.174
1996	0.197	0.143	0.208	0.160	0.214	0.185
1997	0.239	0.177	0.252	0.182	0.245	0.218
1998	0.256	0.200	0.267			0.249

Note: Unweighted averages.

Source: Hahn (2000)

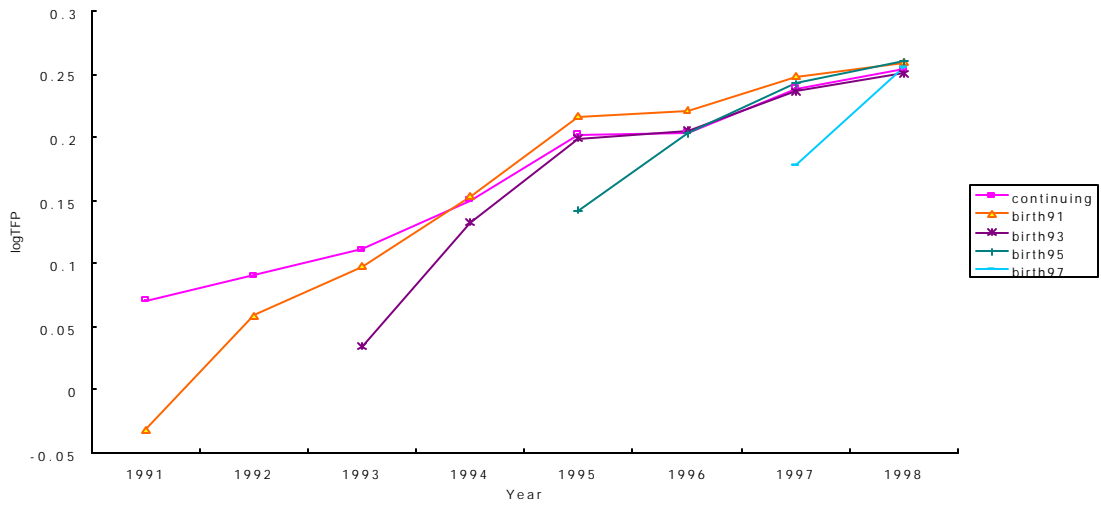
Table 8. Market Selection among Birth Cohorts

	Births 1991	Births 1993	Births 1995
Deaths 1992	-0.065 (0.005)		
Deaths 1993	-0.044 (0.004)		
Deaths 1994	-0.036 (0.004)	-0.042 (0.003)	
Deaths 1995	-0.032 (0.004)	-0.032 (0.003)	
Deaths 1996	-0.048 (0.004)	-0.030 (0.003)	-0.053 (0.003)
Deaths 1997	-0.038 (0.003)	-0.044 (0.002)	-0.039 (0.002)

Note: Numbers in parentheses are standard errors.

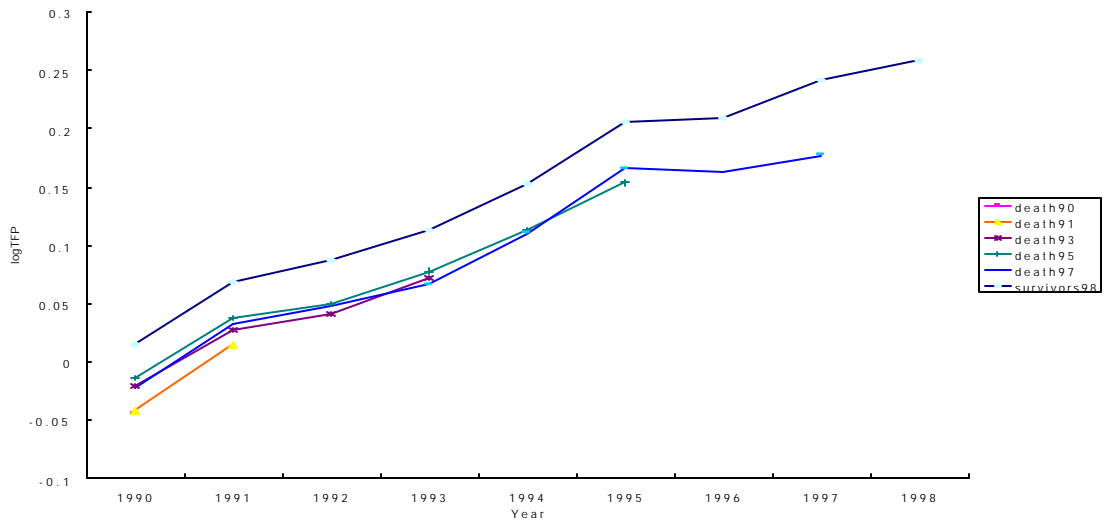
Source: Hahn (2000)

<Figure 1> Post-entry Productivity Performance of Surviving Births: Learning



Source: Hahn (2000)

<Figure 2> Pre-Exit Productivity Performance of Deaths: Shadow of Death



Source: Hahn (2000)

<Figure 3> Pre-Exit Productivity Performance of Deaths Among 1991 Births

