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# The Legacy of the HCI: An Empirical Analysis of Korean Industrial Policy*

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While much has been written on the successes and failures of industrial policies, systematic evaluation of their effects remains difficult. This paper presents an approach based on a combination of cluster and discriminant analysis, applied to time-series of the rate of change of average wages by industry. We apply this approach to a Korean data set that may be one of the most comprehensive national archives of industrial and occupational wage data in the world. Our approach permits quantitative assessment of the legacy of Korean industrial policy, and helps to show how Korean development has depended both on government and the market.

## I. Introduction

Governments and markets both exist. And while enthusiasts of markets have contested the role of government in development, and vice versa, it seems more realistic to accept that both play roles in the development process. The important questions are therefore: what roles? and through what channels? and to what extent? A sensible way to advance this discussion is to present an empirical indicator that can show the legacy of policies and other factors that have contributed to industrial and economic growth, and thereby approach the issue of the role of the government and the market. This article will present a combination of cluster and discriminant analysis applied to time-series of average wage change by industrial category, in order to assess the balance of government and market forces in Korea, with the Korean Heavy and Chemical Industrialization as the prime example.

From 1971 to 1991, the Korean economy changed dramatically, in part because of a massive industrial policy. Our goal is contribute something to the literature assessing this experience. We will first present a brief overview of the literature on the role of government in industrialization, highlighting the government/market dialectic. Second, we will review the history of the Heavy and Chemical Industrialization (HCI) policy, which was surely one of the grandest efforts at national industrial transformation, relative to the size of the underlying economy, ever undertaken. Third, we will introduce the methodology and data employed in this research, followed by a discussion of the results.

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## II. The Government and the Market in the Literature

The study of state intervention in stimulating industrialization is not completely novel. Historically, mercantilism served the same goal, so that Adam Smith's critique of Elizabethan practices can perhaps be called an early analysis of industrial policy (Smith (1776)). More recently, Alexander Gerschenkron's (1962) historical analysis depicts how, in the late 19th century, German government-backed industrial banks commanded industrialization.

A new element from the 1980s was a more refined theory of the State. Katzenstein (1978) discusses strong and weak states, and following him Johnson (1982, 1987) provides a focus on bureaucracies and bureaucrats. Still more-refined discussions have analyzed government-business relations, developing the Statist argument that in certain countries, notably Japan, these relationships make government industrial policy and government leadership over industries meaningful (Samuels (1987)). One type of government-business relationship takes the form of "reciprocity"; Amsden's (1989) idea was to find the reciprocal relationships that, she argues, have existed between big business and the Korean government since the 1960s.

Against Statism, an alternative construction has focused on the market arguing that Korea's development track can be explained in neoclassical terms (Patrick and Rosovsky (1976), Hugh (1985, 1988), Westpal (1978)). Scholars in this tradition have argued that the main impetus behind Korean development has been private business investment demand, private savings, and a well-educated work force operating in market-oriented environments. These authors are not unaware of the role of government; they simply put more weight on market factors, believing that market mechanisms rather than state policies have been decisive.

With two conflicting ideas, research has developed in several directions. One has provided deep investigation into specific industrial policies. This approach has yielded a comprehensive vision of how actual government support was provided to firms and of how government and firms interacted with each other (Okimoto (1989)). One case study of the Japanese computer industry, for instance, shows that government not only provided financial support for a start-up of the industry, but also created demand to make the investment worthwhile (Anchorduguy (1988)).

A second stream has attempted to link the state and market traditions, for example by describing government at the management of a "quasi-market" system (Wade (1990)). Other examples in this second stream have refined the description of industrial policy in Korea, with a systematic and persuasive presentation of data (Leipziger (1987)). These authors have opened their eyes clearly to the Korean context. Whereas earlier statist authors had ignored serious crises that Korea's HCI experienced after the two big pushes (1973-1974 and 1978-1979), this fact is well-treated in some of the later studies, notably Auty (1992, 1994), who has described the lagging performance of the HCI sectors in Korea as "the maturation of the HCI sectors".

Still, the existing literature on HCI suffers from insufficient empirical support. Approaches generally based on statism tend to overemphasize the role of government, as a focus on the historical development of a specific policy must inevitably do. Approaches rooted in the neoclassical development paradigm tend similarly to minimize the importance of the government's role; this is again a function of the paradigm rather than of the evidence. Indeed both sorts of studies tend to provide little analytical support for their positions, offering up instead raw data and largely leaving it to the reader to assess what the numbers actually may mean. What is missing is an

analysis that can begin to "weigh up" the burden of the evidence. For that we need not only data but also method; this the present study attempts to supply.

## III. A Brief History of the Heavy and Chemical Industrialization Initiative

After successfully implementing its first and second economic development plans, the Korean government officially launched the ambitious Heavy and Chemical Industrialization (HCI) in 1973. By that time, however, much of the groundwork for the HCI had been laid (Enos and Park (1987), Pack and Westpal (1986), Haggard, Cooper, Collins and Kim (1994)), including the Pohang Iron and Steel Company, (POSCO), construction of which was started in 1968 with the first phase completed in 1973.

Under HCI, six strategic industries were selected for major support. These industries included steel, nonferrous metal, shipbuilding, electronics, machinery, and the chemical industries (Government of the Republic of Korea (1976), Office of the Prime Minister (1978)). These industries required a huge scale of investment, and government industrial policy was a crucial element in the undertaking; no-one has argued that it would have happened otherwise (Stern, Kim and Perkins (1995)).

The essence of industrial policy under the HCI was financial support, though more conventional measures such as tax incentives and the provision of industrial parks were also included in the policy package. New financial institutions such as The National Industrialization Fund (NIF) were specifically created for the HCI (Kim, Ji-Hong (1990), Leipziger (1987)), while commercial banks, virtually under government's control until the early 1990s, played major supporting roles.

The NIF, created in 1974, lent about two thirds of its portfolio to HCI industrial projects, which enabled the purchase of domestic machinery and ships, and the construction of facilities. The Korea Export-Import bank also served the HCI promotional goal of the Korean government by providing deferred payment loans to foreign buyers. Other financial institutions specially designed to promote the HCI include the Machinery Localization Fund and the Plant Localization Fund.

With intensive promotion, production of HCI products increased, and more importantly the proportion of HCI products among total exports of Korea also increased: from 4.8% in 1970 to 13.1% in 1983 and to 30% in 1995 (Bank of Korea (1971, 1984, 1995)). Yet, despite these indicators, many economists have described the HCI as a policy failure. Above all, the HCI policy has been criticized for misallocating subsidized credit toward excessively large-scale industries, with resulting inefficiency in the overall allocation of resources (Kwack (1984), Rhee (1987), Leipziger (1986)). The favor given to HCI sectors reflexively reduced industrial resources that light industries could have received. Thus, when the impact of the second oil shock came, the effects on the industrial base were quite dire. More deeply, economists have raised fundamental questions about the efficacy and meaning of sectoral policy (Krueger & Tuncer (1994)); these critics argue that while the necessity for infant industry protection can be admitted, subsequent targeting of industries always reduces the competition that will bring efficiency and only fosters rent-seeking behavior of firms (Frischtak (1989)).

Macroeconomists have also criticized the HCI, citing effects on inflation, the trade deficit, and debt accumulation. Instead of using stabilization measures, the Korean government launched the HCI at the moment of inflationary pressures from the oil shock and demand pressures from

the recycling of world income toward the Middle East (Auty (1992)). The HCI push thus worsened trade deficits at a critical time, leading to a major increase in Korean external debt. Korea's debt was increased from 3.9 billion US dollars in 1973 to 8 billion US dollars in 1976 (World Bank World Debt Tables 1988-89). This early burst is largely attributable to HCI investment to sustain growth through the first oil shock - though of course the much larger growth of Korean external debt in the late 1970s and early 1980s, up to $46 billion by 1985, had more complex causes.

As the critiques set in, policy headed toward liberalization. From the standpoint of industrial policy, this meant a reduction of incentives given to the HCI sectors. The preferential interest rate system, which favored the HCI, ended in 1982 (Cho (1988)). Interest rate differentials between large and small firms were reduced or eliminated. The Korean government reduced restrictions on interest rates and prices, five formerly public banks were privatized, and the government hoped to increase the savings rate through financial reform. The interest rate advantage of HCI over light manufacturing industries, which was about 3% in the period between 1974-1979, was reduced to approximately 1.6% between 1980 and 1984 (World Bank (1987)).

As the HCI case shows, government industrial policy can be powerful and yet inefficient, and can be regarded as either a success or a failure, depending on the theoretical orientation and on the time frame specific authors may take into account. In the most recent evaluations it seems that the reputation of the HCI initiative may be making a comeback. Almost two decades after the initial pushes. In 1995 HCI-related products made up almost 30% of all exports, *excluding* electrical and electronics sectors. When one includes the electrical and electronics sectors that were also targeted as a part of the HCI promotion, HCI products made up almost 64% of total Korean exports in 1995 (Bank of Korea (1995)). But even this will not prove to be the final word, as it is just as possible to argue that patterns of world demand, rather than decisions about domestic supply, and therefore that the market rather than the state was in some ultimate sense responsible for this latter-day reversal of fortune.

## IV. Methodology and Data

Our study is based on a different premise: that the market and the state are inseparable, but that it is possible to assess the relative effects of particular policies with some precision, if one approaches the analytical task in a systematic way, and this should enable us to cast some light on issues of efficiency and rent-sharing. We are interested in the *relative performance* of industries in Korea, specifically the performance of those were HCI-targeted as against those that were not, and with the forces through time that affected and differentiated the relative performance of industries. The first question, then, is how to measure industrial performance?

Our theoretical idea is that workers earn industry-specific labor rents (Katz and Summers (1989)), and these comprise a significant part of the pay packet (Blanchflower, Oswald and Sanfey (1996)). As Galbraith and Calmon (1990, 1994, 1996) have pointed out, this implies that *change* in wages must reflected the *changing* relative performance of industries, hence it should be possible to infer changes in relative industrial performance from changing wage patterns. Thus a pattern of steadily rising *relative* wage rates in a group of industries can be taken as a marker of rising rents in that sector. Since we know that the HCI sector was heavily subsidized through

financial channels, and that the HCI sectors expanded rapidly in consequence, the interesting question becomes: did these subsidies generate industry-specific rents that show up in differentially-increased wages specifically for the HCI sectors? This would be a fairly sure sign of inefficiency and resource misallocation, though it would not necessarily bear on the criticisms and defenses of HCI on other grounds.

In the case of developing country like Korea, and particularly one where union activity was savagely repressed under an authoritarian government, one might argue that the case of the existence of industry-specific labor rents is less plausible than in developed countries. We doubt this: manufacturing industries even in repressive developing countries pay substantial wage premiums over agricultural labor, even though they could in principle easily replace their workforces with new recruits. In any event, the proposition is testable. If patterns of industry-specific wage variation can be found, that is a sign that industry-specific labor rents existed. (We shall see that in fact a major source of inter-industry wage variation is associated with changes in the flow of aggregate investment.)

More generally and on closer examination, that the Korean case should exhibit labor rents is not so surprising. In Korea, industrialization had already substantially reduced the importance of agriculture by the early 1970s; while by the end of our data series in the early 1990s Korea was a full-fledged industrial economy by any standard. Moreover, it is a fairly general pattern that unions emerge after labor rents become substantial, not beforehand. (See, inter alia, the discussion of interwar American unionization in Ferguson and Galbraith (1997).) We take the sharp rise in unionization and organized labor activity in Korea in the 1980s - after unions had been effectively and brutally repressed during the 1970s - as a sign that the flow of industry-specific labor rents had by that time risen to very substantial levels. The question, then, is what caused labor rents to rise, and to what extent the cause can be traced to the HCI policies.

We employ the year-to-year change in average wages by industry as our indicator of industrial performance and the variation of industry-specific labor rents. This particular use of changing wage rates deserves a word of defense. On a theoretical level we believe wage changes of a more reliable index of rent variation than even varying profit rates might be. Capital markets clear and labor markets do not; therefore profit rates tend to equalize across industries and wage rates tend not to. Industrial performance differentials should therefore not be expected to show up in profits, except as a very short-run disequilibrium phenomenon. Due to provisions of tax law, moreover, incentives to misrepresent profits are much greater than are incentives to misrepresent average wage rates. Wage rates surely move only in part with industry rents, but in contrast with profit rates, we do expect them to covary systematically with the performance- or rent-earning characteristics that we are fundamentally interested in.

There is also a pragmatic issue. Average wage data by industrial classification is available in time series format, both for Korea and for many other countries, and this creates possibilities for the use of statistical techniques to group industries by patterns of wage performance and then to analyze the forces causing variation in performance between groups. Our techniques require the existence of consistently measured information for every industry and every time-period. We would be happy to have a measure of industrial performance that is more sensitive to interindustry performance differentials - the Galbraith-Lu (1997) use of United States data on total compensation (in effect, value-added) per production worker hour is an example - but in

Korea wage rates are available and they will have to do.

In this analysis, we use the Occupational Wage Survey (OWS) collected and published by the Ministry of Labor in Korea 1971-1991 as our principal data source. The OWS covers approximately 18% (1971) and 29% (1991) of the total economically active, non-agricultural population in Korea, including both manufacturing and service industries. The sampling frame used in this survey is all workplaces that hire more than 10 workers. Due to the systematic and comprehensive sampling frame, we expect that the data set harbors reliable information on the inter-industry patterns of wage movement in Korea. With appropriate techniques, combining cluster analysis on the patterns of wage change to determine the group structure of industries with discriminant function analysis to determine the patterns of difference between groups through time, we expect to extract that information, in other words to develop a chromatography of factors that affected relative industrial performance, to assess the comparative importance of those factors, and to classify them as originating principally with the market or with the state.

Cluster analysis is a numerical technique that classifies objects (industries) based on the similarities found in their characteristic variable (Aldenderfer and Blashfield (1984), Lorr (1983)) - rates of average wage change in the present study. In actual calculation, we construct an N x P matrix A, in which A(i, t) represents the annual wage change of industry i in year t. Each row, a profile of an industry, contains P annual rates of change of average wages for the industry. Similarity between paths can be determined by means of a conventional Euclidean distance measure in a P-dimensional space. We deploy a hierarchical agglomerative clustering method designed to yield compact clusters (Ward (1963)). Ward's method has the advantage that it maximizes between-group variance and minimizes within-group variance at each step in the clustering.

As a first step, then, we deploy differing patterns of annual percentage wage change as an industry classification scheme. When compared to the conventional scheme of industry classification, such as the standard industrial classification (SIC), this new classification scheme shows the similarity of industries according to their patterns of wage change (industrial performance) through time. Industries are similar if the forces of history have affected them in similar ways, and different to the degree to which they have responded differently to those forces in the past. The use of percentage rates of wage change as a classification variable also has technical advantages in the application of cluster analysis, since these data are unit-free and therefore the resulting clusters are invariant with respect to changes in the scale of measurement.

Once clusters have been determined, the purpose of performing a discriminant analysis is to find out the factors that yielded the clustering pattern. Each discriminant function, denoted as F, can be understood as a function that expresses a force that underlies the pooled wage variation across industries (Tatsuoka (1988), Klecka (1980), Galbraith and Calmon (1990, 1996), Morrison (1969)). From the discriminant analysis, we get several canonical roots of the discriminant function, otherwise known as eigenvectors of a matrix of between-group variations standardized by the within-group variations. From among them we can select statistically meaningful ones, according to the value of the associated eigenvalues. Roots with smaller eigenvalues have less discriminating power. These canonical roots are matched with real world economic data series in the later stage of this research.

The discriminant function can be written as $F = a_1 x_2 + a_2 x_2 + \cdots a_p x_p$, and in the present

context it can be expressed as:

$$F = \alpha_1(\Delta w_1) + \alpha_2(\Delta w_2) + \cdots + \alpha_p(\Delta w_p),$$

where $\Delta w_i$ represents the percentage change of average wages for the sector in year $i$.

To obtain the coefficients $\alpha_1, \cdots, \alpha_p$ or simply the vector $\alpha$, consider the P-dimensional matrices of between-group variances $\mathbb{B}$ and within-group variances $\mathbb{W}$. The discriminant criterion, $\lambda$, can be expressed as follows:

$$\lambda = (\alpha' \mathbb{B} \alpha)/(\alpha' \mathbb{W} \alpha).$$

Using calculus, we can get following condition for $\lambda$ to be a maximum:

$$(\mathbb{W}^{-1}\mathbb{B} - \lambda \mathbb{I})\alpha = 0.$$

Here, $\lambda$, the discriminant criterion, is the eigenvalue and $\alpha$ is the eigenvector or eigenroot of the matrix $\mathbb{W}^{-1}\mathbb{B}$. The eigenvectors are the canonical roots of the discriminant functions, and - the essential point - in this application they are themselves a P-valued time-series variable. The last stage for discriminant analysis is to match our time-series eigenvectors with real world economic data (cf. Galbraith and Lu (1997), Ferguson and Galbraith (1997)) to attribute meaning to these variables.

**V. Findings**

Figure 1 presents the results of our cluster analysis, whereby we reduce 39 original categories to a small number of homogeneous and distinct large groups. The tree diagram, which depicts in a compact way the co-movement of wage change for every pair of industries, clearly suggests a four-group structure, even allowing for a somewhat higher degree of within-group variation in the group on the left of the diagram as compared with the other three. Table 1 lists the members of the four groups.

Group 1 includes Machinery, Transportation Equipment, Primary Iron and Steel, Metal Assembly and Other Chemical - all HCI or closely related - plus other mining, paper, and beverages, which are arguably related as regards either inputs or chemical process. We will take this sector as embodying the main sector-specific results of the HCI policy, with one exception to be noted below. It is already indicative of the power of HCI policy in this period that the members of the HCI group have a distinct and common pattern of wage change (industrial performance). This tells us that the HCI policy was largely unitary - it affected almost all of the designated sectors in similar ways.

Group 2 we identify as a labor-intensive and low-skilled sector. It includes Textiles, Apparel, Printing, Electrical Machinery, and three services categories: Social services, Hotel/Restaurant, and Land Transportation. Group 3 is primarily a skilled-labor manufacturing sector, covering

**Figure 1 Cluster Tree of 39 Industries**

**Table 1 Cluster Table: Member Industries in Each Cluster Group**

| Group 1 HCI Concentration | Group 2 Labor Intensive/Service |
|---|---|
| Machinery | Textile |
| Transportation Equipment | Apparel |
| Primary Iron and Steel | Other Manufacturing |
| Metal Assembly | Wood cork |
| Other Chemical | Print |
| Coal Mining | Electrical Machinery |
| Other Mineral | Social Service |
| Other Mining | Restaurant/Hotel |
| Business Service | Land Transportation |
| Beverage | |
| Paper | |
| **Group 3 Skilled Labor** | **Group 4 Service Industry Concentration** |
| Glass | Wholesale |
| Leather | Retail |
| Rubber | Electricity/Gas utilities |
| Furniture | Finance |
| Industrial Chemical | Insurance |
| Metal Mining | Construction |
| Realty | Marine Transportation |
| Sanitary | Transportation Related |
| | Personal Service |
| | Scientific Measurement |
| | Other Petroleum |

Glass, Leather, Rubber, Furniture, Industrial Chemicals, Metal mining, and also the small service categories of Realty and Sanitary services. Of these sectors one, industrial chemicals, was a targeted HCI sector; it is the only specifically targeted sector to fall outside of our Group 1. Group 4, finally captures the remainder of the services sectors: Retail, Wholesale, Utilities, Finance, Insurance, plus several transportation sectors and construction. On the whole, we consider that the cluster analysis is informative. Because it succeeds in dividing Korean industrial structure along lines that appear broadly to reflect factor-intensities of production, we are lead to believe that patterns of industry-specific labor rents did vary, over this period, in ways systematically reflecting the changing relative fortunes of different types of industry.

Next, we report a discriminant analysis based on the grouping structure provided by the clustering. Three canonical roots were extracted; however, only the first two of these are statistically significant. Between them, these two roots account for 89.5 percent of between-group variations in wage change over our 21-year time frame (1971-1992), with the first accounting for 72.5 percent and the second adding the remaining 17 percent. With this in hand, the next step in analysis was to find macroeconomic data series that match these two roots.

The first root matches well with the annual change of gross investment during the same time. Figure 2 illustrates the co-movement of the two series, one of them drawn from the national income and product accounts and the other artificially constructed from wage data. This suggests to us that the single major force affecting comparative industrial performance and wage rates in Korea is *macroeconomic*: the movement of aggregate investment and the business cycle.

The economic intuition behind the finding that macroeconomic fluctuations cause differential performance across industries is straightforward, though at variance with the competitive model. In an economy characterized by degrees of market power and scarce factors of production, we would expect to find that labor-rents fluctuate with aggregate investment demand. Moreover, when demand is strong, rents should be concentrated in those sectors with the greatest concentrations of scarce factors (capital and skilled labor) and political and market power.[1] The HCI sectors enjoyed high capital intensity, greater-than-average political and market power and a skilled labor-force. One is therefore not surprised to find them scoring above average on the first root.

On the other hand, as the scatter plot of canonical scores in Figure 3 shows, HCI industries do not score as highly as the skilled-labor industries of Group 3. These industries - which except for industrial chemicals were not HCI targeted - show greater responsiveness to the flux of aggregate investment than do most of the HCI industries. The industries, on the left of the diagram, that show weak wage responsiveness to aggregate investment are the labor-intensive manufacturing sectors that are especially vulnerable to labor-saving innovation, and the services sectors that do not enjoy capital rents. Moreover, since aggregate investment over this period as a whole was strong, the scatter plot has an upward tilt and we can see that the behavior of aggregate investment in Korea had a distinct cumulative effect on the distribution of industrial wages between 1971 and 1992. We note - it is not surprising - that this effect originates entirely during the first half of the sample, that is during the time of the HCI pushes. Aggregate investment added nothing to inter-industry wage differentials after 1982.

1. This finding is consistent with evidence for the postwar United States (Galbraith and Lu (1997), Galbraith forthcoming).

**Figure 2 Time Series Plot of First Root and Annual Change of Investment**

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The appropriate inference, we think, is that *any* policy raising aggregate investment in Korea would have had approximately similar effects on the industrial and wage structures. Conversely, the HCI policy can be said to have worked through this channel *only* to the extent that HCI raised *aggregate* investment. To the extent that HCI *did* raise aggregate investment, investment rose not only in the HCI sectors themselves, but also in the non-HCI sectors that rely on skilled labor. It is the general rise in investment, and not the channeling of investment to the HCI sectors specifically, that accounts for the positive effect of this first canonical root on the structure of Korean industrial wages.

The second canonical root of the discriminant function, though it accounts for only 17 percent of the between-group variations, is equally telling, because it effectively does isolate the HCI sectors from the rest of the Korean economy. Figure 4 illustrates the distribution of canonical scores, showing clearly the position of the HCI sectors on the right of the diagram and of virtually everything else on the left. A second feature of the figure also stands out. In contrast to Figure Three, which is clearly upward sloping, the distribution of scores in relation to cumulative wage performance in Figure Four is flat. (If one divides the sample in 1982, it is also flat in both sub-periods separately.) This force clearly differentiates the HCI sectors from the rest of the economy during this period, but it does not lead directly to higher wages on that account alone.

Figure 5 presents the time-series comparison of the canonical coefficients of the second root with the variable that best matches it. This is the uncovered interest parity, or the London Interbank Offer Rate (LIBOR) minus the depreciation of the Korean won during the time period - a depreciation that typically had to be covered by high domestic interest rates. The uncovered interest parity is thus a measure of the relative tightness of monetary policy in Korea, as it applied to firms who were obliged to borrow on open domestic credit markets. Thus, the fact that the HCI sectors score high on this root and all others score low suggests that the HCI sector was successfully insulated from domestic monetary fluctuations. It is also noteworthy that this correspondence - the advantage of the HCI sectors during spells of credit restriction - is quite tight in the 1970s, but much weaker in the 1980s, when the HCI policy ended and financial markets underwent liberalization.

What does this linkage imply for the study of industrial policy in Korea? From the existing literature on Korea's industrialization, it is well known that the government rationed capital in the form of policy loans (Cho and Cole (1992), Stern and Kim (1995), Amsden (1988), Wade (1990)). On this point, different theoretical approaches nearly agree. In a society where capital is a scarce resource, access to capital is an advantage. Even clearer is the advantage that comes from low-and-fixed rate policy loans for targeted industries, in comparison with conventional loans based on market rates for non-targeted sectors.

During its massive and ambitious drive to industrialize, and especially in the big push of the HCI in the 1970s, the Korean government offered preferentially low - but more importantly, stable - interest rates to the new heavy and chemical industries. Government statistics and previous academic works have presented the different interest rates given to the HCI sectors and how much capital was allocated to them as against other sectors (Bank of Korea Economic Statistics Yearbook, Leipziger 1987, Vol. I, Government of Republic of Korea, The Fourth Five Year Economic Development Plan 1976, Stern and Kim 1995). Our analysis shows the impact of that policy treatment on the HCI sectors. The other side of the HCI coin was a reflexive

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**Figure 5 Time Series Plot of Second Root and Uncovered Interest Rate Parity**

underemphasis of light industries and service industries. This has been discussed by earlier studies (Kwack (1984), Rhee (1987)). While heavy and chemical industries were able to rely on long term, fixed-rate capital for their equipment, light industries and service industries had to depend on short term capital. Our analysis clearly illustrates the source of this weak position. Light industries, such as apparel and textiles, and service industries, such as wholesale, real estate, and sanitary industries, score much lower on the uncovered interest parity ranking.

What we find, interestingly, is that on balance this differential impact was not enough to generate a sustained net surplus in the HCI sectors, as that would have shown up as a differential cumulative wage gain and therefore an upward sloping scatter plot. In other words, whereas the existence in the wage structure of roots corresponding both to aggregate investment and to credit subsidies clearly indicate the presence of labor rents in Korea, the HCI credit subsidies were not a sustained source of such rents. One possible interpretation is that periods of easy domestic credit, overall, were sufficiently frequent and important substantially to offset the pecuniary advantages that the HCI sectors were offered in hard times. Taken together with the evidence of the first root, this finding suggests that HCI policies were effective in raising aggregate investment, but that the credit subsidy element of these policies was not channeled directly into an inefficient and wasteful rise of relative wages.

Thus the movement of domestic credit proves to have been perhaps the key determinant of the effect of industrial policy in Korea, not so much because the government provided cheap capital to industry, but because it insulated preferred sectors from the fluctuations of the domestic interest rate after the policy loans were made. That, of course, only leads to a second question: what is the value of being insulated from domestic credit fluctuations when on the whole (as in the early 1970s) domestic credit conditions were not particularly tight?

We think the answer to this conundrum provides the key to the HCI policy, which lies in the value of *ex ante* stabilization *per se* for the industrial mix. Insofar as heavy industries with their large capital requirements demand a credible promise of macro- and credit stability before they can even begin to contemplate investing on a large scale, the essence of heavy investment in small countries is the artificial provision of stability. Small developing countries have historically found it very difficult to launch such industrialization without outright state ownership and the disadvantages of bureaucracy, polities and inertia that entails. Korea's solution was to guarantee financial stability *ex ante* to large private corporations, and thus achieve a balance between private-sector flexibility and public sector responsibility. In this way, the HCI can be said to have fundamentally guided the structure of Korean economic development, even though it conferred no measurable pecuniary surplusses either on the industries themselves or on their workers - even though the net benefits (or losses) from the policy were distributed over the economy as a whole.

In sum, our argument leads to the following narrative interpretation. During the early 1970s, interest rates were low in Korea, in part because of a world-wide climate of low interest rates, in part because of a tolerance for inflation by Korean policymakers, and in part because Korea became a magnet for Middle Eastern capital flowing back from Korean construction firms working in the Middle East after the oil shock. In this environment, with capital relatively cheap, it was not overly difficult for policymakers to launch the HCI. Indeed, it is hard to imagine that it could have been launched under any other conditions. But by the same token, the drama of the HCI initiative itself is overstated, since what was involved was simply a promise of differential

stability, not a fixed commitment to any particular reallocation of resources.

If there was a drama, perhaps it lay in the willingness of the HCI industries to believe the commitment. But firms did believe it. They drew the conclusion that they had been offered a no-lose proposition. More investment would lead to a bigger empire, more political power, and more economic income in the long run. If markets did not develop in the short run, products might be sold at loss; losses would be covered. No doubt, the dual-use character of the HCI in the context of Korea's security situation contributed mightily to this understanding. In sum, what was transformed, above all, was the attitude of HCI firms toward capital risk, as a result of which they took irrevocable commitments they would never otherwise have dared.

The real test of the HCI initiative, on the other hand, appears to have come later in the 1970s, when international events drove up interest rates both internationally and in Korea. This began in the aftermath of the oil shock, as tight monetary policies raised interest rates in the United States. In Korea, with HCI underway, the effects of tighter credit conditions were bifurcated, and the cost was paid in the very high interest rates that had to be charged to the non-HCI sectors. Obviously the HCI industries withstood the shock relatively well; they were insulated by their strong financial protection from the State. The macroeconomic implications that took the form of a great increase in Korea's external debt, as previously noted, were in part the consequence of this success: the policy sustained the rate of investment in Korea and prevented a contraction in response to the oil shock that would otherwise have occurred. During this period, the effect of HCI on the aggregate rate of investment takes the form of sustaining investment rates that might otherwise have collapsed, while putting off, through debt accumulation, the accounting that eventually struck in the 1980s.

As events unfolded, financial market liberalization brought an end to the HCI period, and the relative interest rate advantages of the HCI sectors declined. By that time, however, the industrial character of the Korean peninsula had been changed, and the pattern of development had been set. That which followed had the advantage of the capital sunk in the HCI during its heyday. It seems to us pointless to speculate on whether average Koreans might have been better off under some alternative allocation of resources. Had the HCI not been in place, the result would not have been an alternative path to full employment. It would have been a marked cutback in fixed and long-lived capital investment.

## VI. Conclusion

We have attempted to present the legacy of Korean industrial policy legacy from an empirical angle not explored by previous scholarship, with a view toward isolating the main channels of policy and assessing their comparative importance. By pursuing a cluster/discriminant analysis based on time-series of industrial wage change, we are able to reach some tentative conclusions in this regard - first that HCI policy worked mainly *through* its effect on the aggregate rate of investment in Korea, and second that it achieved this effect mainly by promising *ex ante* stabilization of the financial conditions for investment, in effect transferring interest rate risk from the companies to the State. In focussing on the empirical evidence that leads us to emphasize these macroeconomic and financial aspects of industrial policy, we can claim that we have moved the assessment of industrial policy one step forward.

The Legacy of the HCI:

Our analysis, we should stress, provides no definitive answer to the counterfactual question, would Korea have been better off without HCI? We do not see how any objective analysis can seriously tackle such a question. But we do point to a dynamic stabilization and buffering role for industrial policy that may be harder to criticize on efficiency grounds than the traditional arguments turning on the micro-efficiency of resource allocation would allow. Given the goal of heavy industrialization, the specific mechanisms of the HCI seem to have achieved it in ways that helped to stabilize the Korean macroeconomy through a period that might otherwise have seen a developmental crisis, and the fact that the crisis was deferred for eight years surely counts to the policy's credit. The fact that during those years sustained labor rents can be traced only to aggregate investment, and that credit subsidies were not large enough to generate wage-raising surplusses in the HCI sectors also suggests that they were not excessive relative to the task they accomplished.

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