

Does Modern Management Increase Inequality?

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Abstract

This paper examines whether modern management, characterized by performance and target based practices, explains the recent rise in wage inequality. I hypothesize that modern management's shift to performance pay, management-skill complementarity, and management-technology complementarity contribute to the increase in wage inequality within establishments. The period after the Asian Financial Crisis in South Korea provides a unique setting to examine the impact of management practices on wage inequality. The IMF provided emergency loans to Korea conditional on it making drastic structural reforms in the corporate sector. The neoliberal economics views at the IMF shaped the reforms, and management practices, which traditionally valued organizational harmony and firm expansion, shifted to emphasizing individual performance and firm profitability. I examine manufacturing firms when the reforms were being implemented using a workplace survey from 2002 and 2003 and construct a standardized management index. To generate plausibly exogenous variation, I use the industry level management practices of western advanced economies as instrumental variables. I find that modern management increases the white-collar blue-collar wage gap. A standard deviation increase in the management index increases the wage gap by about 36 percent. Skilled wages increases but unskilled wages decreases. Modern management increases the demand for skilled workers, especially managers and technical workers, and decreases the demand for production workers. Better management increases both return on capital and the wage gap in large establishments. In short, modern management improves efficiency but also increases inequality within establishments.

Keywords: Modern management, Wage inequality, Management-skill complementarity

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1 Introduction

This paper examines whether modern management practices can explain the recent rise in inequality. Economists have examined how organizational change, characterized by layering and multi-tasking, increases the demand for skill (Caroli and Van Reenen 2001), and how performance pay increases wage inequality (Bandiera et al. 2007, Lemieux et al. 2009). However, the literature has not examined whether management practices in general impact wage inequality, and has largely focused on skill-biased technological change, international trade, and executive compensation as contributing factors to inequality. This likely stems from a couple of reasons. First, despite the understanding that management is important for firms (Milgrom and Roberts 1992), the systematic measurement of management practices across countries and firms has been carried out only recently. Second, finding exogenous variations in management practices, especially at a scale large enough to examine inequality, is challenging to say the least. This paper builds on the recent development in the management literature to examine the impact of modern management practices on wage inequality, and utilizes a unique context whereby the IMF induced South Korea's corporate sector to *modernize* management practices soon after the Asian financial crisis.

What this paper refers to as modern management is a set of generally perceived best practices, such as, whether workers are incentivized and compensated accordingly, whether targets are initially identified and later assessed, and whether procedures to minimize production errors are in place. Firms decide whether or not to adopt modern management practices based on the projected benefits and costs involved with implementing those practices. As Bloom and Van Reenen (2010) illustrate using their data from the World Management Survey, there is substantial variation in management practices across firms and countries. Given that management practices are choices that firms make, examining the impact of management practices on economic outcomes likely suffers from endogeneity. Though randomized control trials have been used to examine the impact of management practices on firm performance (Bloom et al. 2013), examining how management impacts inequality in a society would require a large scale intervention. South Korea's economy, induced by the IMF after the Asian financial crisis in 1998, underwent major restructuring that

altered corporate governance and management practices. Management practices in Korea had traditionally emphasized the organization over the individual worker. Workers were paid based on preset wage-tables and individual salary contracts were rare. Bonuses were usually shared based on the overall firm or team performance. Family owners had disproportionately large control over shareholders and managers regarding firm operations, and often focused on growth over profits. Furthermore, the close government-bank-chaebol ties enabled these corporations to be highly leveraged. As a large literature examining the Asian Financial Crisis documents, these were considered as one of the main causes that eventually led to the crisis (Krugman 1999, Faccio et al. 2001). When South Korea realized that it could not resolve the crisis at home on its own and reached out to the IMF for help, the IMF used the crisis as an opportunity to fix what it considered backward corporate practices. As a result, new corporate governance and management practices spread across Korean firms soon after the crisis.

I examine manufacturing firms when reforms were being implemented using a new workplace survey that was collected in 2002 and 2003. In fact, one of the motivations and goals of the surveys was to document and understand how management reforms were taking place. I construct a standardized management index based on questions similarly asked in Bloom and Van Reenen (2007), and examine how this management index impacts within firm wage inequality between white-collar and blue-collar workers, and the relative demand for skill. To generate plausibly exogenous variation in the Korean management index, I use the industry level variation in management practices of western advanced economies, particularly that of the Anglo-American countries and continental European countries. The neoliberal economics views at the IMF and the US Treasury shaped the reforms that Korea had to implement to receive the loans. Naturally, management practices at leading western countries of the IMF influenced management practices in Korea. Specifically, I construct an Anglo-American (US and Britain) and Group of 5 countries (US, Britain, France, Germany, Italy) industry level management index from the World Management Survey, and use those as instrumental variables for the Korean management practices.

Management practices across industries vary considerably and such variation correlates across advanced economies. Similar to the idea that financial dependence differs across industries due to

technological reasons (Rajan and Zingales 1998), management practices likely varies across manufacturing industries because of production technologies. The production technology of each manufacturing industry influences the extent to which firms benefit from adopting modern management practices. Since production technologies across countries, especially advanced economies, are similar, industry level management practices are likely to be correlated across countries. Moreover, the teachings of modern business schools and the prevalence of their graduates across industries may further contribute to the industry level correlation across countries. The Anglo-American or Group of 5 management indexes are highly correlated with the South Korean management index. However, the western country indexes are likely exogenous to within firm inequality in South Korea other than through it's correlation with Korea management practices. If other factors that impact inequality such as skill-biased technological change or international trade were driving the industry level variation of management practices, one would find correlation between management practices in Korea and other advanced countries like Japan and Sweden. However, I find no evidence of such. Furthermore, I continue to find robust evidence of the impact of management practices on within establishment inequality even when I control for information technology prevalence, labor unions, and the types of corporate governance structure.

The overall findings indicate that modern management does increase the white-blue collar wage gap. A standard deviation increase in the management index increases the skill premium by about 36 percent. The increase is accompanied by an increase in the demand for skilled workers, especially managers and technical workers and a reduction in the demand for production workers. Modern management increases the skill premium and firm performance, measured by the returns on capital, primarily in large establishments. Modern management increases efficiency of the establishment but there is a trade-off with equity. Finally, I merge in the industry level management index to the manufacturing census and conduct a two-step least squares estimation on the universe of manufacturing firms using the Anglo-American and Group of 5 management indexes as instrumental variables. I again find that modern management increases the wage gap between white-collar and blue-collar workers.

Economists have examined the impact of globalization on inequality, but the focus has been on

international trade, e.g., or how outsourcing impacts domestic labor market (Autor et al 2013), how trade impacts quality upgrading and demand for skill (Verhoogen 2008). As international trade barriers have gone down under the WTO regime, many have wondered what the implications of the reduction in non-trade barriers will be. This paper focuses on the more softer side of globalization, the spread of business culture, in particular, management practices. My findings show that softer aspects of globalization mechanisms may have consequential influences on inequality. Recently, the rise in executive compensation and top income inequality has attracted much attention in both academia and the public (Piketty 2013). However, the focus of the current paper is not on top level managerial pay, but on the wage gap between the skilled workers and production workers in general, and how modern management plays a role in widening that skill premium. Overall, this paper finds that there are efficiency gains from modern management practices, but also a trade-off with equity. Modern management increases the pie, but not everyone shares the larger pie to the same degree. Song et al. (2015) find that a large part of recent inequality stems from the rise in across firm inequality. I find evidence that modern management may contribute to this pattern, as modern management increases performance more so in already productive larger firms.

The paper proceeds as follows. The next section discusses why modern management practices might impact wage inequality in relation to the literature. Section 3 discusses the IMF induced reforms after the financial crisis and the rise in wage inequality in South Korea. Section 4 discusses the data. Section 5 discusses the identification strategy and estimation. Section 6 presents the results and Section 7 concludes.

2 Why Might Modern Management Impact Inequality?

2.1 Institutional change: wage tables to performance pay

Modern management is characterized by pay schemes that compensate workers for their performance. As Lemieux et al. (2009) document more jobs in the US are being paid based on performance through salary contracts, bonuses, commissions, etc. Traditionally, many jobs were paid based on pre-set wage tables, which calculate worker pay based on multiple variables including the

job title, task, and one's tenure at the firm.¹ However, as technology enabled the monitoring of worker performance less costly, performance pay became more popular based on the idea that it would improve worker effort and firm productivity. One of the main tasks of today's management is setting up and implementing procedures related to performance pay: assessing one's performance based on key performance indicators, meeting workers to discuss their goals and setting new objectives, identifying and recruiting talented workers, and so on. If performance pay better aligns worker compensation with the marginal product of workers, and if wage-tables had been compressing the pay spread relative to individual productivity, the expansion of performance pay could expand the wage distribution. Lemieux et al. (2009) confirm this in the US. Using a panel of individuals they find that performance pay accounts for a fifth of the growth in the variance in male wages between the 1970s and 1990s, with most of the increase being attributed to the top quintile of wage earners. However, as Lazear (2001) points out how performance pay schemes are actually implemented in the real world varies considerably across firms, and does not necessarily guarantee better alignment of worker pay with marginal product. For example, only a subset of employees may be subject to performance pay, and performance pay schemes often have minimum output requirements. Empirically identifying the impact of performance pay needs to incorporate the specific institutional details of the contract. Lazear (2001) was able to obtain detailed information on how performance pay was carried out for one specific firm. Comparing a large sample of firms to assess the impact of performance pay becomes much more challenging, given the numerous variations in how each firm implements performance pay.

In the Korean sample, which I will be examining, the main indication of performance pay is whether a firm is shifting away from wage-tables and moving more of their workers on salary contracts. However, in Korea when salary contracts were being newly introduced there were considerable variation in how firms were actually implementing "performance" pay. Korean business culture traditionally emphasized harmony and equity over star performers and stand outs within the firm. Seniority often trumped ability or performance. Hence, the implementation of performance pay may have initially not carried the expected emphasis on individual performance as we

¹In the survey I use in the empirical analysis, some firms have preset wage tables with 90 pay possibilities.

would expect in salary contracts.² Especially, at the early stages of introducing salary contracts, firms may have set salaries based on the wage tables that were used in previous years. Since the data does not give the details of the salary contracts and how these differ by firms, a valid concern is that firms were simply following a new fad by transitioning to “salary contracts”, but with salaries in reality based on wage-tables used in prior years. In the empirical analysis, I will focus on whether human resource management’s general goal is to evaluate and compensate for worker performance, rather than the share of workers on salary contracts.

2.2 Management skill complementarity

There are both benefits and costs associated with implementing modern management practices. There could be potential gains in firm performance from implementing better management practices, but such practices would incur costs associated with the managerial personnel, equipment, training, external consultants, etc. Ultimately, the firm weighs the benefits against the costs and decides whether or not to change management practices. However, the skill level of the manager doing the evaluation, organization, communication, etc., as well as the skill level of the workers will likely impact the potential benefits from modern management practices. A skilled manager would be able to better organize and oversee activities. Skilled workers may be able to better implement the practices and tasks directed by modern management, e.g., documenting one’s Key Performance Indicators, or implementing procedures that can reduce error in production. Hence, there will likely be complementarity between modern management and skill. Firms that decide to implement modern management practices, would prefer to hire skilled managers and workers. The complementarity would work in the other direction as well. Firms with a more skilled workforce will likely benefit more from implementing modern management practices. Caroli and Van Reenen (2001) discuss the complementarity between skill and organizational change, specifically, the decentralization of authority, and empirically documents that decentralization indeed increases the

²Another easily relatable example is the economics academic job market. In Korea, Japan, or continental Europe the notion of equity and seniority is emphasized and pay scales are pre-determined. However, US institutions that focus on retaining and recruiting the best talents compete pay according based on the market’s demand. However, only institutions with sufficient funds can compete in this manner. Even in the US there are institutions that emphasize within and across department equity.

demand for skill within firms, and that firms with greater levels of skill are more likely to implement decentralization in British and French establishments. My focus is on general management practices but the logic is similar. If skilled managers and skilled workers better implement modern management practices then modern management would demand more skill and the skill premium would increase. As previously stated, the current paper's main effort is not to document management skill complementarity in general, but to show that there is a causal impact of management on inequality.

2.3 Management technology complementarity

Modern management strives to reduce errors and optimize production operations. For example, Six Sigma which was pioneered by General Electric exemplifies these efforts. As a consequence, especially in manufacturing, firms have adopted new technologies and automation procedures that require more technical workers. Also, to optimize operations and production efficiency, management may emphasize research and development on the production processes, as well as the products. On the other hand, the new production technologies may substitute for routine production tasks. Hence, modern management's emphasis on operations and production efficiency increases the demand for technology and the relative demand for skilled workers who can develop and operate new technology. In other words, modern management is likely one of the underlying causes of skill-biased technological change.

The above subsections discussed how the change in the pay institution, management-skill complementarity, and management-technology complementarity could render modern management practices to impact the wage distribution. I summarize the testable hypotheses below.

Hypothesis 1: The general emphasis of human resource management's on individual incentive and compensation will result in the shift in the pay structure, and likely increase the wage dispersion.

Hypothesis 2: Management and skill complementarity implies that modern management practices

increase the demand for skill, in particular, managers and white-collar workers.

Hypothesis 3: Management and technology complementarity implies that modern management practices increases the demand for research and development, and technical workers, and decreases the demand for production workers.

3 The IMF Induced Structural Changes and Patterns of Inequality in Korea

3.1 The IMF Induced Structural Changes and Rise of Modern Management

The Asian Financial Crisis which started with the global selling of the Thai Bhat in 1997 quickly spread to neighboring Southeast Asian countries, but also hit South Korea the same year. The capital flight from South Korea was unexpected as South Korea was a more developed economy far from the epicenter of the crisis and the IMF had just published a report on the soundness of the South Korean economy that year. The crisis quickly spread to South Korea in part by being grouped together in the emerging market funds, but fundamentally because of the excessive short-term debt in the economy. The value of the Korean Won dropped by more than 30% and the stock market lost more than 40% of its value during the crisis. Its foreign reserve was bottoming out by late 1997 and South Korea was suddenly in a liquidity crisis. Multiple South Korean banks and corporations that took out short-term loans in foreign currencies were on the verge of going bankrupt. In November of 1997 the South Korean government requested emergency loans from the IMF. The IMF agreed to offer an emergency loan package of \$58.4 billion but payments were to be made conditional on making progress on a wide range of structural reforms. South Korea without much alternative agreed to the conditional loans and embarked on a series of radical structural reforms.³

³The IMF's required structural changes were so so vast and wide, it truly shook the economic culture of South Korea. This period in Korea is referred to as the "IMF Crisis" rather than the "Asian Financial Crisis" in Korea

The IMF required Korean banks to clean-up non performing loans and either merge or shut down non-viable financial institutions. Furthermore, capital account of banks became open to international finance and corporate governance was strengthened with boards being established and oversight committees newly in place. These series of reform resulted in about 40% of Korea's financial institutions closing by June 2003.

Corporations went through similar reforms. South Korean conglomerates, called chaebols, had amassed enormous amounts of debt to expand their business portfolio among which were many high risk projects. Chaebols believed that the close government-business ties would serve as an insurance when projects flounder or they would be able to divert resources from subsidiary accounts, as they had traditionally done.

However, this all changed under the IMF regime. Daewoo, one of South Korea's then largest chaebol on par with Samsung and Hyundai, evaporated along with many other chaebols. Surviving chaebols were disintegrated and numerous jobs were destroyed. Figure 1 shows the magnitude of the crisis. Total employment in the manufacturing sector decreased from around 2.4 million to 1.8 million in about between 1996 and 1998.

Measures to enhance the accountability and transparency in corporate governance took place. The IMF further opened South Korea's financial and equity market and foreign investors started to influence corporate management. Foreign shareholders modernized governance and management practices based on practices from their home countries. Korean firms started to focus more on profits and less on growth and expansion. Figure 2 presents the debt ratio of all firms in the manufacturing sector. Before the financial crisis average debt ratios were extremely high, hovering around 80%, indicative of the obsession with firm expansion. However, during the structural reforms firms rapidly shed down their debt and firms with high debt ratios were left to exit out. By the mid 2000s average debt ratio hovered around 55%. Traditional Korean corporate culture was deemed unsuitable in the newly restructured economy and firms started to adopt western corporate governance and management practices. Figure 3 illustrates the rise of management jobs in Korea. The share and number of jobs categorized as managers suddenly increased after the crisis.

and the loss of sovereignty was widespread enough to be compared to colonial rule.

Financial crises impact countries in unique ways. In Korea, the IMF induced restructuring caused structural changes in all aspects of the Korean economy - the financial sector, corporate sector, and the labor market. What makes South Korea's case particularly valuable is that the changes were (1) triggered by a shock that originated in South Asia, and (2) was enforced by an external institution, the IMF, effectively creating, a rare economy wide structural break in corporate governance and management. This structural break offers a unique opportunity to examine the impact of modern management practices on wage inequality.

3.2 Patterns of Inequality

Figure 4 presents how overall inequality evolved in South Korea. The solid line represents the Gini coefficient and the dashed line the ratio of the 90th percentile to the 10th percentile. There is a clear discontinuity. Both jump in 1998 which is right after the crisis, and remains high. I next examine cross-country inequality trends in Figure 5. I use the top 1% income share from the World Top Income Database, for eight countries.⁴ The top income shares for all countries were within a narrow range in the early 1970s. However, the trends diverge with the US first increasing drastically in the late 1980s, soon followed by Canada and the UK. On the other hand, France, Denmark, and Sweden all maintain a relatively stable trend with overall less inequality. In Asia, both Japan and South Korea maintain a stable trend and closely resemble the European countries until South Korea diverges in 1998 when inequality increases at a rapid pace.

Finally, in figure 6, I present another measure of wage inequality, the skill premium measured by the white-collar blue-collar wage gap in the manufacturing sector. The manufacturing census allows one to examine the within establishment inequality for the universe of manufacturing establishments until 2006. The skill premium is defined as the average white-collar and blue-collar wage gap for all manufacturing establishments in Korea. White-collar workers include managers, research and technical workers, office workers, and sales and service workers. Blue-collar workers include those in production and performing simple tasks, such as cleaning. The solid line is the difference in log

⁴The top income share has the benefits of having a long time series for many countries, compared to the often used Gini coefficient.

wages between the two, representing the skill premium. The dashed line is the employment share of white-collar workers and represents the relative demand for skilled workers. Similar to previous figures, the skill premium hovers around slightly below zero before 1997 but jumps drastically to about 4% soon after the crisis. The demand for white-collar workers also jumps in 1998 and then continues an increasing trend. Figure 6 illustrates that within establishment inequality in the manufacturing sector also increased after the structural reforms.

The core question of this paper is whether the introduction of modern management practices played a role in this increase in within establishment inequality. The IMF induced structural reforms caused widespread changes in the economy, including the spread of modern management practices. The descriptive figures in this section hint to the possibility that modern management may have been one of the causes of increasing inequality. To probe into this further, I examine an establishment level survey with detailed information on management practices not long after the reforms started to take place. The next section describes this data.

4 The Data

The main data for the empirical analysis comes from surveys conducted in 2002 and 2003 by the by the Korea Labor Institute. These surveys resampled all establishments (private and public across all industries) with 30 or more employees over the two years, and served as the basis for creating the final sample and questionnaires used in the Workplace Panel Survey which starts from 2005. The empirical analysis mainly focuses on manufacturing establishments for a couple of reasons - to draw comparisons with the overall trend in inequality presented in the previous section, and because of the identification strategy which I discuss in the following section.

The survey interviews the representatives of managers and workers of each establishment and covers a wide range of topics such as management practices, compensation policy, labor relations, and worker benefits. The main benefit of these surveys is that they were conducted not long after the financial crisis when the economy wide structural reforms were happening. Several questions ask how new management practices were being introduced in the workplace. As previously discusses,

firms started to transition into the salary system as modern (western) management practices began to spread and more firms decided to evaluate and compensate individuals based on performance. Figure 7 presents the distribution of answers to a question that asks the year the firm introduced a salary system. Not many establishments had a salary system in place before the crisis. Soon after the crisis many firms started to introduce salary systems and the number of firms that introduce the salary system peaks in 2000 at the height of the structural reforms. As Figure 7 illustrates, the pay institution, a fundamental aspect of human resource management, transitioned in a matter of years.

The survey provides detailed breakdown of employment by category (managers, R&D and technical workers, office workers, service and sales workers, production workers, and simple task workers). The survey collects data on the average salary of workers in managerial positions vs non-managerial positions. Though salary by employment category is not given, I am able to use this information and a smaller supplemental survey that collects information on the temporary wage paid to each employment category to construct the white collar blue collar wage gap. I provide detailed description of the construction of the variable in the Appendix.

The survey asks the HR manager a series of questions relating to management practices. Following Bloom and Van Reenen (2007) I construct the index based on questions that ask about employee evaluation, operations, and human resource management strategies. The questions are listed in Table 1. Evaluation questions ask how important individual performance is in promotion decisions and whether the establishment implements Management by Objective (MBO) practices, where individuals set goals at the beginning of the year and are evaluated based on performance on these goals at the end of the year. Operations related question is whether the firm implements Six Sigma, which is a set of practices that aims for process improvement. One thing to note is that these management concepts were all devised or popularized in the west, in particular, the United States. MBO was popularized by the management guru Peter Drucker in 1954 and Sigma 6 was introduced by Motorola and Jack Welch used it as a central business strategy of General Electric. I standardize each response and take the sum to construct the management index used in the empirical analysis. Table 2 provides summary statistics of the management index and the

main variables used in the analysis.

5 Estimation and Identification: Using the Industry Level Management Indexes from Western Advanced Economies

A central challenge in analyzing the impact of modern management practices on inequality is generating exogenous variation in management practices across establishments. Though the structural reforms at the national level were exogenously imposed by the IMF in South Korea, each establishment decides whether or not to adopt, and the degree to adopt, modern management practices. If factors that impact such decision is related to the white-blue collar wage gap, endogeneity would be a concern. My identification strategy is to use the industry level management practices in the west to generate plausibly exogenous industry level variation in Korea. Specifically, I use the management scores of the Group of 5 (US, Britain, France, Germany, and Italy) countries, or a subset of these countries, from the World Management Survey (WMS) as an instrumental variable for the management index I create for Korea. The WMS uses standardized procedures to survey firms in a number of countries, among which South Korea is not included, and create standardized management scores, enabling comparisons of management practices across countries.⁵

In practice, I first estimate the following pooled OLS regression

$$y_{ijst} = \beta m_{ijst} + X_{ijst}\Gamma + \omega_j + \theta_s + \eta_t + \epsilon_{ijst}$$

for establishment i in industry j , state s , in survey year t . m_{ijst} denotes the establishment level management index, X_{ijst} the base control variables which include age of the establishment and log of employment, and ω_j , θ_s , η_t the industry, state, and year fixed effects.

To deal with endogeneity, I perform the following 2SLS estimation where the first stage is

$$m_{ijst} = \pi z_j + X_{ijst}\Gamma + \theta_s + \eta_t$$

⁵The WMS has not surveyed South Korea

and the second stage

$$y_{ijst} = \beta m_{ijst} + X_{ijst}\Gamma + \theta_s + \eta_t + u_{ijst}.$$

z_j is the instrumental variable, the industry level management scores from western developed countries. I now discuss why this measure would serve as a valid instrumental variable.

5.1 Is the management index from advanced western economies a valid instrument for Korean management practices?

Before discussing why the management index from the Group of five countries is a reasonable instrumental variable for Korean management practices, I first discuss why management practices differ by industries. As Figure 8 illustrates management indexes vary considerably across industries. Firms weigh the benefit against the cost of introducing modern management practices and decide whether or not to adopt new practices. Firm level characteristics will factor into that decision. However, industry level features that are common across countries could also play a role. For instance, industries that often use complicated machineries and production processes may reap the benefits of modern management more than others. Industries that use a multitude of intermediate goods sourced from many regions may benefit more from modern management than industries that do not. In short, there are likely some technological reasons that impact the degree to which modern management is more beneficial to certain industries.⁶ Given that advanced economies are often at the frontier of production technology, the prevalence of modern management practices by industry would likely be correlated across these countries. Cultural factors can also impact the correlation of management practices across industries. For instance, managers in Anglo-American countries or advanced western economies may more easily interact or move jobs with each other. Moreover, the teachings of modern business schools and the prevalence of their graduates across industries may further contribute to the industry level correlation across countries.

In addition to the above channels, South Korea's management practices after the Asian financial crisis were more likely impacted by western advanced economies of the US and Europe. When the

⁶This is similar to Rajan and Zingales (1998) argument that financial dependence differs across industries due to technological reasons.

financial crisis unraveled, the west was quick to point out the moral hazard, opacity, and corruption in East Asian corporations as a root cause. The IMF imposed structural reforms on the South Korean economy prescribed treatments based on western practices, especially those prevalent in major western economies.

I focus on the Group of 5 (G5) countries (US, UK, France, Germany, and Italy) that had the largest voting quota and influence in the IMF. Also, pooling the five country management indexes from the WMS help expand the coverage of industries and smooth out country specific idiosyncracies in the data. As I show later, the G5 management index is highly correlated with the South Korean management index. However, the G5 index is likely exogenous to within firm inequality in South Korea other than through its correlation with Korea management practices. If other factors that impact inequality such as skill-biased technological change or international trade were driving the industry level variation of management practices, one would find correlation between management practices in Korea and other advanced countries like Japan and Sweden. However, I find no evidence of such.

6 Results

6.1 Pooled OLS regression

Table 3 presents the pooled OLS results that control for establishment size and age, and the industry, country, and year fixed effects. Columns (1) through (7) examine the relative demand of the different types of employees, columns (8) through (11) examine the log wages of different employee groups, and column (12) presents the white-blue collar wage gap. The results imply that a standard deviation increase in the management index is associated with about a 1% increase in manager share, 1.5% increase in office worker share, but a 1.6% decrease in production worker share. The relative demand for white-collar workers increase by 2.2%. In terms of wages, a standard deviation increase in the management index is associated with a relatively equal increase in wages across all employee groups, and hence no change in the wage gap between white and blue collars.

It is interesting that we see an increase in skilled worker share but not the skill premium. This

may be due to the large skilled category, which includes office and service workers. However, this may also be driven by omitted variables. The across establishment relation between management practices and the wages may likely be driven by unobserved firm characteristics. The overall picture presented in Table 3 is that better management practices are associated with an overall increase in wages, which likely implies improved productivity, and an increase in the relative demand of skilled workers and decrease in the demand for production workers.

6.2 First-difference regression

In Table 4, I take advantage of the fact that a subset of the sample was surveyed in both years. For those establishment I examine how the changes in the dependent variables relate to the change in the management index. The only significant result is for the manager share. A standard deviation increase in the management index results in about a 1% increase in manager share, which is similar to the Table 3 results. However, all other estimates are very noisy. The time frame may have been too short to examine meaningful changes in employment and wages, as well as management practices. Furthermore, the notoriously rigid Korean labor market will likely render the short term analysis inadequate.⁷ Also, the change itself may be endogenous, and hence I next turn to the instrumental variable strategy.

6.3 2SLS regression

if unobserved establishment heterogeneity that determines the skill premium is correlated with the management index the OLS results would be biased. In this section I introduce the industry level management scores of advanced western economies from the World Value Surveys as instrumental variables. Table 5 presents the first stages of the 2SLS using a variety of instrumental variables constructed from the WVS. Column (1) uses the average industry level management index from the G5 countries - US, Britain, France, Germany, and Italy, and column (2) averages the indexes for the US and Britain to create an Anglo-American management index. The Group of five countries are each significantly associated with the Korean management index. The British and French indexes

⁷Korean labor law inhibits firms with unions from laying off workers at will.

are the most strongly related and the German index the least. Combining the indexes extracts the common components of the management practices across industries, and as can be seen in columns (1) or (2), have a stronger impact on the Korean management index. In the last two columns I examine the relationship with the Japanese and Swedish management index. Their indexes are not related with the Korean index. This is supporting evidence that the IMF induced changes in Korea were more in sync with the countries that had larger voices in the IMF and were leading proponents of neoliberal economics views then pervasive at the IMF. Overall, table 5 indicates that the Group of 5 management index, or the Anglo-American index serves as a strong instrument for the Korean management index.

Table 6 presents the 2SLS results. Panel A uses the Group of 5 index, Panel B the Anglo-American index, and Panel C the combined index from France, Germany, and Italy. Panel D uses the five indexes from the G5 countries all together in the instrumental variable set. Focusing on Panel A, I find that modern management significantly increases the manager share, technical worker share, but at a cost to production workers. The management index increases the skill premium. A standard deviation increase in the management index results in an 36% increase in the wage gap. This impact is driven by the increase in skilled worker wages, which increases by 16.7%, and the decrease in unskilled wages, which decreases by 19.3%. The results are significant regardless of whether I use robust standard errors or standard errors clustered by state-industry.

As hypothesize earlier, modern management increases the within establishment wage gap and the results are consistent with management-skill complementarity and management-technology complementarity. The increase in technical workers implies that there is management-technology complementarity and the decrease in production workers suggests that there is management-production worker substitution. This may be due to the shift towards automation. The use of different instrumental variables in Panels B to D present similar results.

In Table 7, I examine the robustness of these results. The recent rise in inequality is often attributed to the rise in executive pay. This is less likely the case, as executive compensation hadn't caught up in Korea in the early 2000s. I examine this in Panel A by limiting the analysis to the subsample of establishments that are not head quarters. I identify 246 establishments that are

non-head quarter subsidiaries, which would exclude any executive level top managers. I find that a standard deviation increase in the management index increases the wage gap by 45.5%, which is considerably larger than the results from the full sample. The relative demand for skilled workers and R&D and technical workers are also higher at both 15%. The results indicate that the increase in inequality is not driven by the top executives and that we see even larger increases in the wage gap in non-head quarter establishments.

Skill-biased technological change is considered as one of the main drivers of income inequality in modern societies. It seems unlikely that the demand for skill due to technological advances suddenly increased in 1997-98 in Korea. Korea had been investing and developing its high-tech sectors for several decades prior to the crisis and the financial crisis did not trigger an increase in the demand for skilled workers from a sudden advance in technology. In Panel B, I additionally control for the cost share devoted to information technology as reported in the survey. This variable is positively associated with the demand for skill, consistent with information technology being complementary to skilled workers. However, it does not directly impact the skill premium. Moreover, the IT share is not significantly related to the manager share or R&D and tech worker share. This suggests that the increased demand for skill is largely coming from office workers working with computers. Ultimately, the inclusion of IT share barely changes the coefficient estimates on the management index. Management practices impact the skill premium above and beyond modern technologies demand for skill.

The literature has found labor union membership to impact individual wages and given the drastic change in the labor laws, union status may have impacted establishments differentially. One of the main conditions attached by the IMF was to make the labor market more flexible and allow firms to layoff workers in situations of hardships. Korea's labor law until then prohibited layoffs unless the firm went bankrupt. Eventually, the law was passed in February of 1998 to relax the conditions for layoffs from bankruptcy to economic hardship. Labor unions eventually agreed to this legislative change given the dire situation of the economy. In Panel C, I examine whether or not the establishment had a labor union impacts the skill premium. Empirically, I find no impact of whether the establishment has a union on the wage gap. The coefficient estimate on the

management index is virtually unchanged.

I next examine whether the types of corporate governance is driving the relationship between the management index and wage inequality. There are seven ownership categories in the survey and I create dummy variables indicating each type and add to the main regression.⁸ Panel D presents the results. The inclusion of the corporate governance type dummies do little to change the patterns and significance of the coefficient estimates. Though management practices may likely be determined by the ownership structure and style, The management index nonetheless significantly impacts wage inequality and the demand for skilled workers. Though not reported in Table 5, when I examine the coefficient estimates on the dummy variables, none of the ownership type variables significantly impacts the skill premium. However, skilled and manager share are noticeably higher for firms being restructured. Lastly, I control for the IT cost share, union status, and corporate governance type at the same time in Panel E. The coefficient estimates on the management index changes little and continues to be statistically significant.

In the first stage of each robustness check, the coefficient estimates on the G5 management index are similar as before lying in the range between 0.52 and 0.59 and the F-statistics are above 30 except for Panel A where the sample is substantially smaller.

6.4 Results by establishment size

I next examine whether the impact of Anglo-American management on wage inequality differs by firms of different size, measured by the number of employees. I use the cutoffs of 50, 100, and 250 which were chosen to split the samples in relatively equal numbers. In establishments with less than 50 employees, the instrumental variable has virtually no predictive power and hence does not provide meaningful 2nd stage results. For establishments between 50 and 100 employees, the instrumental variable is very weak as well. However, for establishments with employees greater than 100 the first-stage of the 2SLS estimation is strong and the 2nd stage results return similar

⁸The types are (1) owner fully and directly controls the business, (2) there is a CEO but has limited decision making and owner primarily controls the business, (3) CEO company, but owner still makes important decisions, (4) Owner and CEO are independent, (5) Firm under court receivership, (6) Firm under debt restructuring, and (7) publicly owned.

results between Panels C and D. The fact that the instrumental variable works better in larger firms attests to the idea that larger and more productive firms which tend to be closer to the technology frontier are more likely to find it worthwhile to adopt modern management practices from advanced western countries.

The results in Panels C and D imply that modern management increases the skill gap by about 26% to 28.5% and the demand for skill by 3.5% to 5%. What is noticeably different compared to the results from the full sample is that both the white-collar and blue-collar wages increase, but the increase is twice as large for white-collar wages.

6.5 Results on firm performance

In Table 9, I examine whether modern management increases firm performance measured by the return on capital (ROC) and firm size measured by log revenue and log employment. When I examine all establishments, a standard deviation increase in the management index improves the return on capital by 0.285, and the impact is statistically significant at the 10% level. Given that the average return on capital is about 0.12 with standard deviation of 0.57, this amounts to half a standard deviation increase. However, better management on average does not result in larger firms as measured by employment or revenue.

When I examine the firm performance results by firms of different size, I again find that the larger firms benefit most from modern management practices. Panel B shows that better management has no impact on the ROC or establishment size for the set of establishments with less than 100 employees. However, for establishments with 100 or more employees a standard deviation increase in modern management increases the return on capital by about 0.19. Though the results on revenue and employment are not significant, the estimates does suggest that management positively impacts revenue and employment

Tables 8 and 9 indicate that there is heterogeneity in the impact of modern management practices on the skill premium as well as firm performance by size. Larger firms benefit from modern management practices more so that medium or smaller firms - they become more profitable and expand more. However, they also see an increase in wage inequality and demand skilled workers

substantially more.

6.6 Additional evidence from the manufacturing survey

Finally, I take the analysis to the manufacturing census and perform a two-step least squares estimation. I merge in the Korean and western management indexes to the manufacturing census by industry and similarly perform instrumental variable regressions in Table 10. Panel A first presents results from an OLS regression. The management index is associated with higher wages for both white-collar and blue-collar workers but not a larger wage gap. This is the same pattern as what was found in Table 3. However, when I perform the two-step least squares procedure using the G5 management index as the instrumental variable, modern management significantly increases the white-collar wage but not the blue-collar wage. The impact on the wage gap is positive but not quite statistically significant. The impact on the relative demand for skilled workers is significant at the 10 percent level. In Panel C, I use the Anglo-American management index as the instrumental variable. A standard deviation increase in the Anglo-American management index significantly increases the wage gap by 7% and the white-collar share by 6.4%. The increase in the wage gap is driven by the increase in white-collar wage. Though I use a different and much larger sample in this section, the finding that modern management increases the wage-gap carries through.

7 Conclusion

This paper examines whether modern management, characterized by performance and target based practices, explains the recent rise in wage inequality. I hypothesize that modern management's pay system, skill complementarity, and technology complementarity contribute to the increase in wage inequality within establishments. Empirical examination of management practices is often hampered by endogeneity. However, the period after the Asian Financial Crisis in South Korea provides a unique setting. The IMF provided emergency loans to Korea conditional on it making drastic structural reforms in the corporate sector. The neoliberal economics views at the IMF shaped the reforms, and management practices in Korea, which traditionally focused on harmony

and firm expansion, started to emphasize individual contribution and firm performance. I examine manufacturing firms when the reforms were being implemented using a workplace survey from 2002 and 2003 and construct a standardized management index. To generate plausibly exogenous variation, I use the industry level management practices of western advanced economies as instrumental variables. I find that modern management increases the white-collar blue-collar wage gap. A standard deviation increase in the management index increases this skill premium by about 36 percent. Skilled wages increases but unskilled wages decreases. Modern management increases the demand for skilled workers, especially managers and technical workers, and decreases the demand for production workers. Better management increases both return on capital and the skill premium in large establishments. In short, modern management increases efficiency but also increases inequality within establishments.

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Figure 1. Asian Financial Crisis in Korea - Total employment in the manufacturing sector

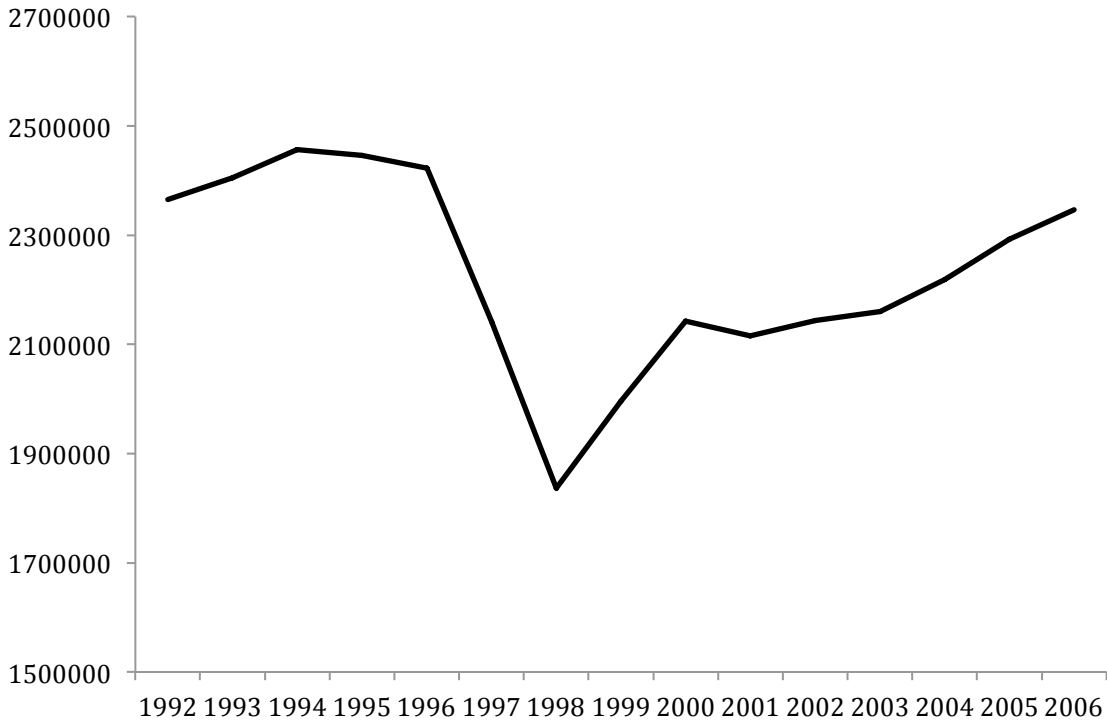


Figure 2. IMF induced structural change in Korea - debt ratio in the manufacturing sector in Korea

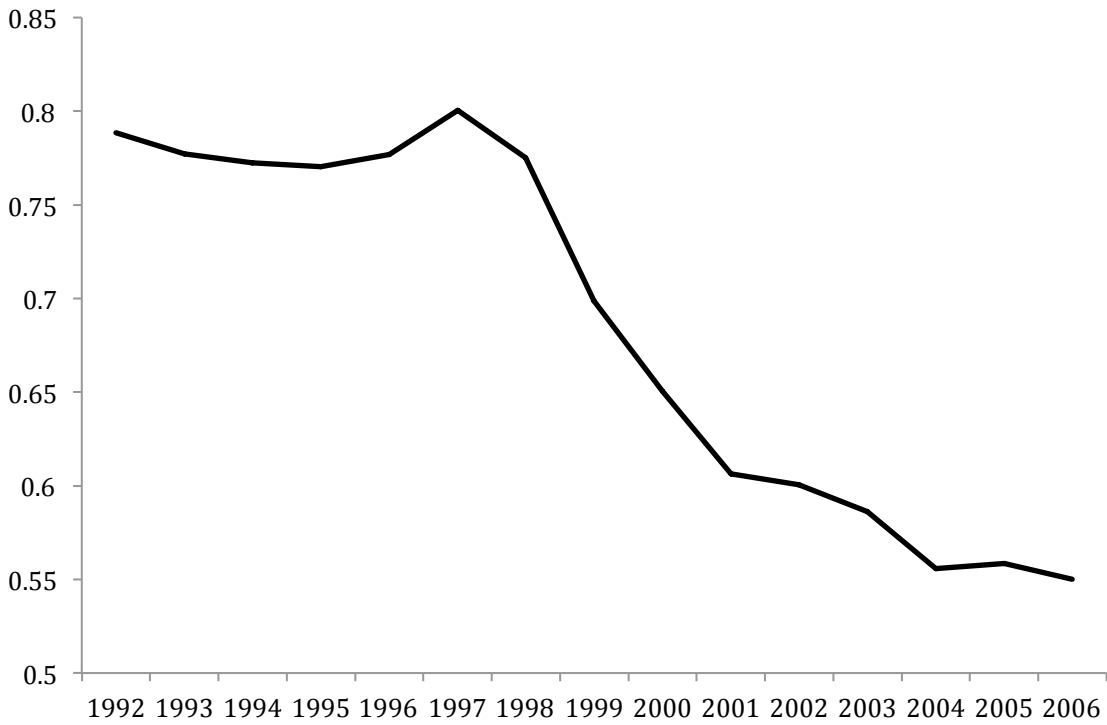


Figure 3. The rise of management in Korea

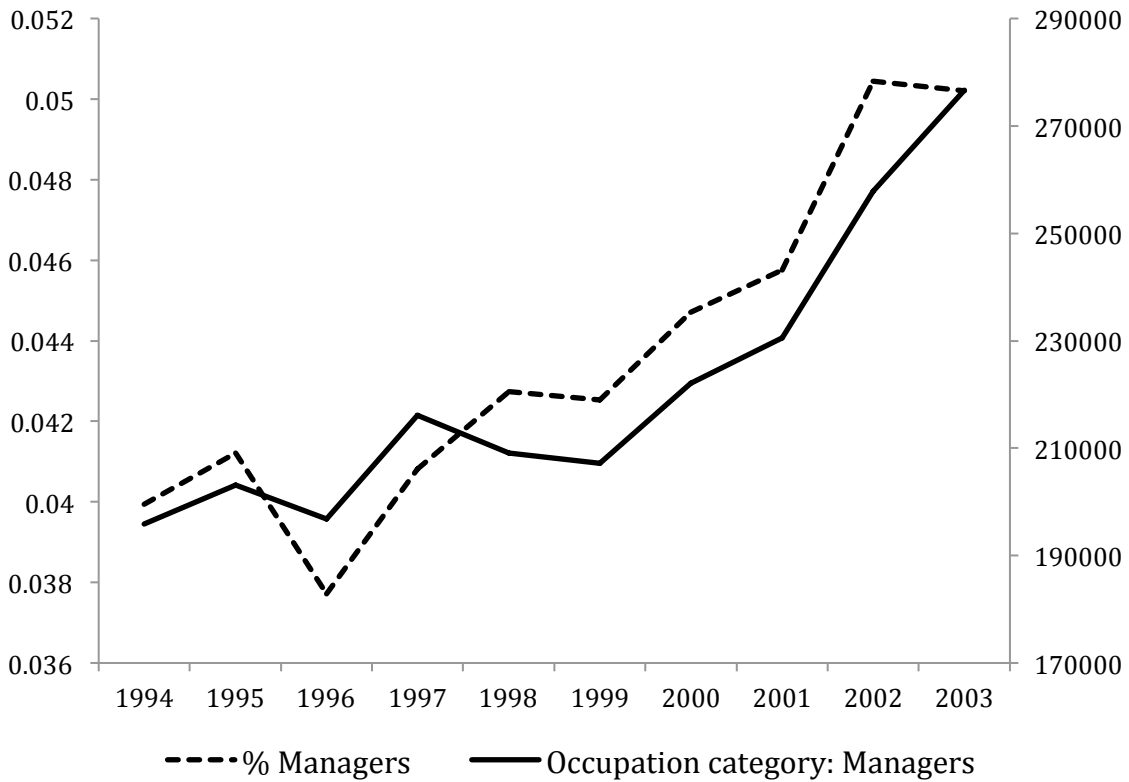


Figure 4. Evolution of inequality in Korea



Figure 5. Inequality trends across countries – Top 1% income share

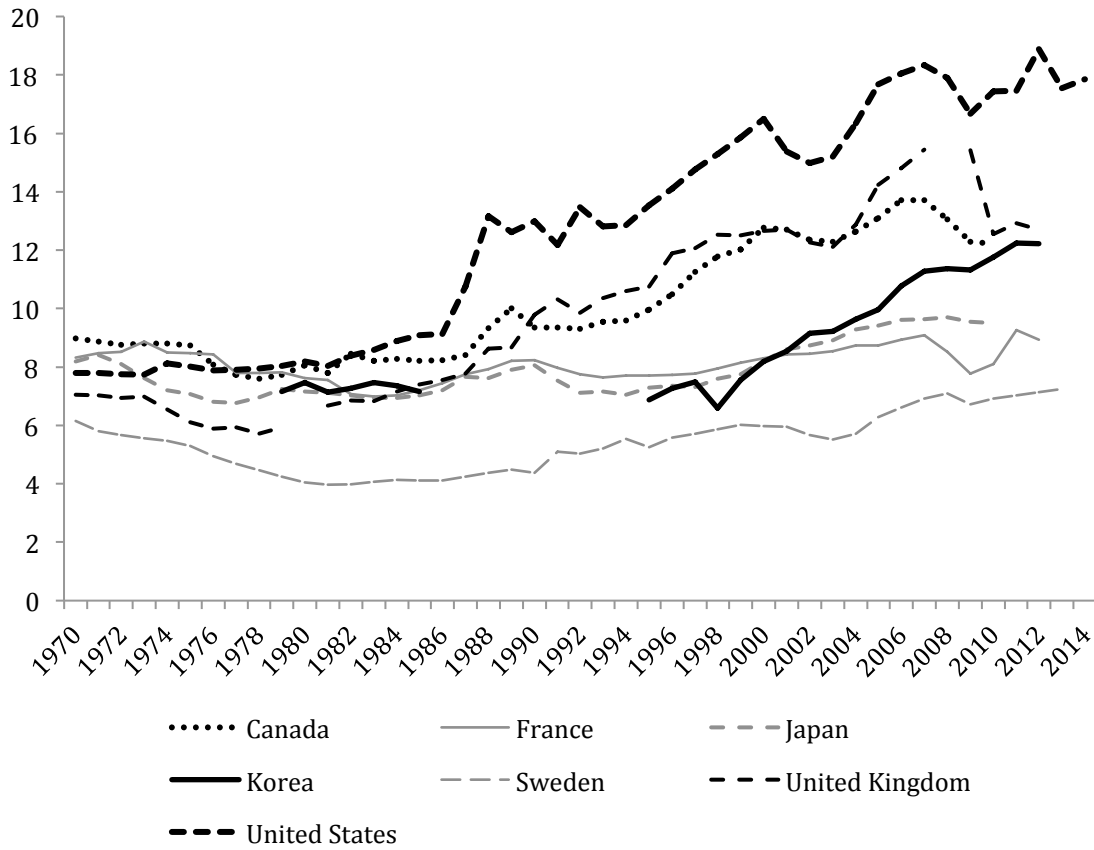


Figure 6. White-collar blue-collar wage gap – manufacturing sector

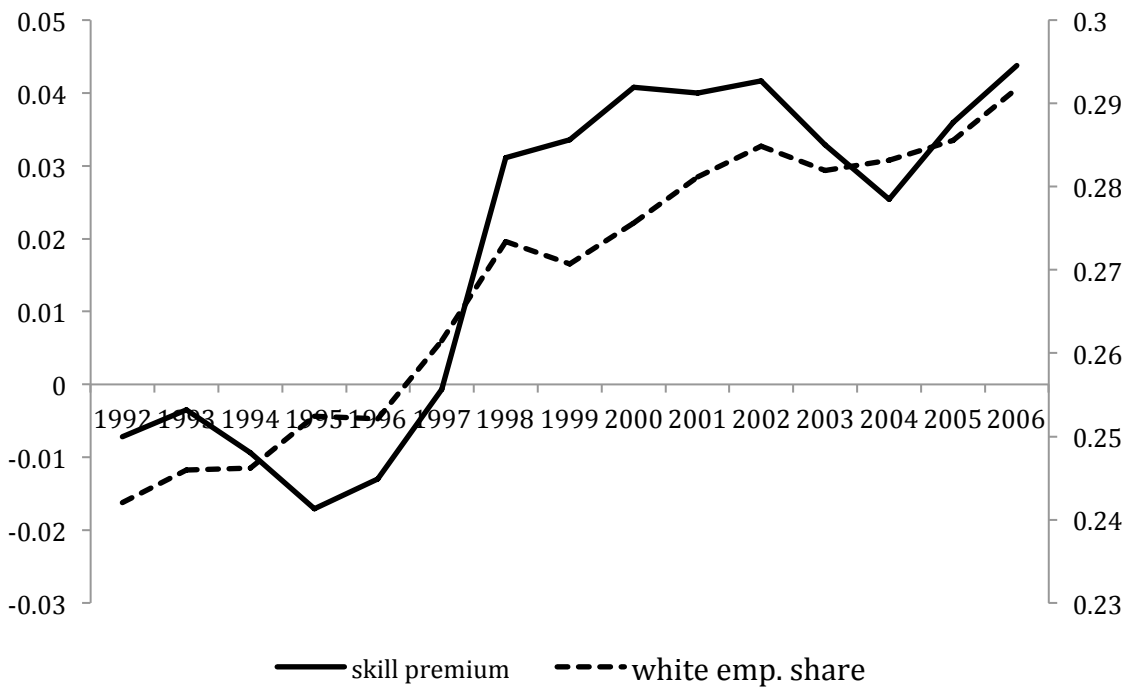


Figure 7. Year introduced salary system

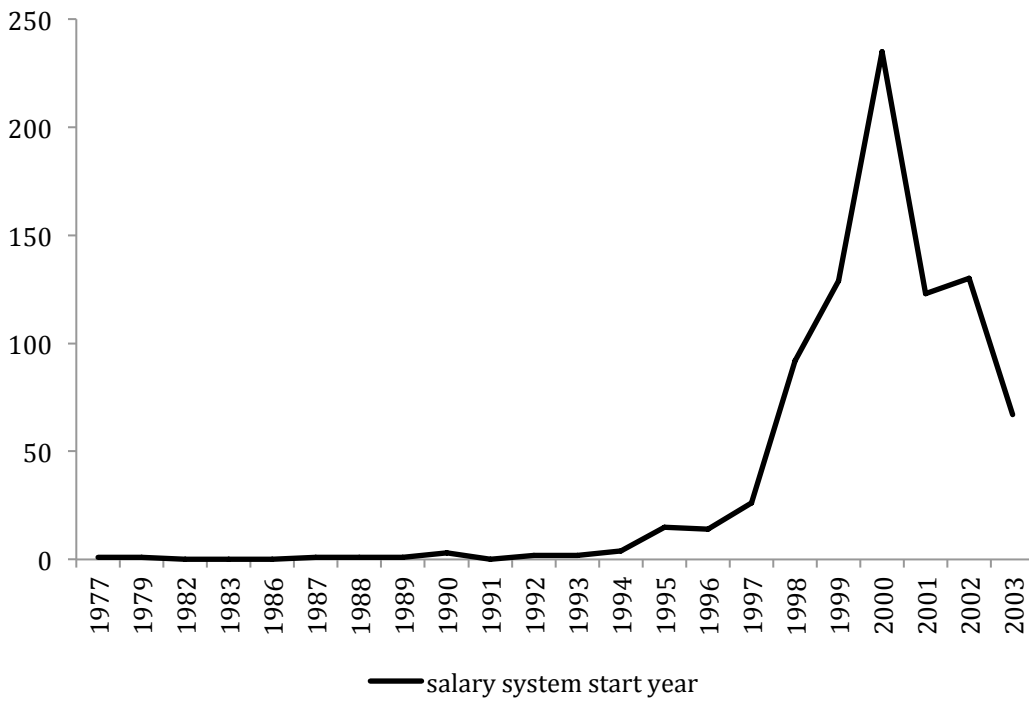


Figure 8. Group of 5 countries and Anglo-American management and Korean management and wage-gap across industries

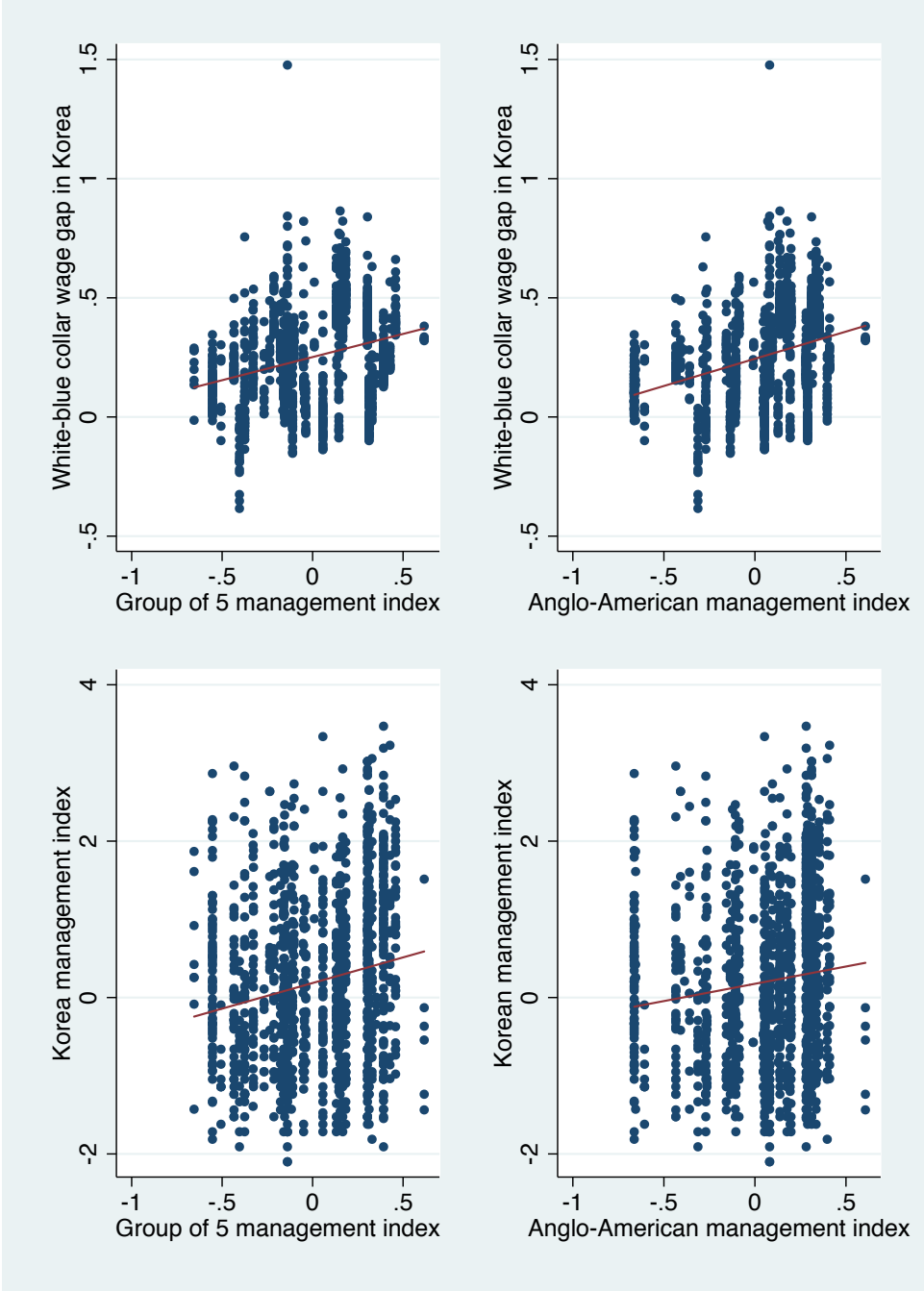


Table 1. Questions used in constructing the management index for Korea

Category	Survey question
Evaluation	How important are individual performance evaluation scores in promotion decisions? (0 to 100 scale)
	Do you implement Management by Objectives (MBO)? (Yes/No) MBO is a practice where individuals set goals at the beginning of the year and are evaluated based on performance on these goals at the end of the year.
Operations	Do you implement Sigma 6 practices? (Yes/No)
Human resource management	HRM's main objective is to reduce labor costs, as opposed to promoting loyalty to the firm (1 to 7 scale)
	Hire and fire qualified personnel based on firm needs, as opposed to develop personnel by hiring new recruits and maintaining long-term employment. (1 to 7 scale)
	Utilize temporary workers as much as possible, as opposed to use permanent workers as much as possible. (1 to 7 scale)
	HRM is based on individual performance, as opposed to teamwork. (1 to 7 scale)
	HRM focuses on maximizing employee's short-term performance, as opposed to long-term development and nurturing of employees

Table 2. Summary statistics

Variable	Mean	Std. Dev.	Min	Max	Obs
Management index	0.180	1.053	-2.101	3.528	1720
White-blue collar wage gap	0.236	0.200	-0.384	1.476	1720
Total employment	381	1684	3	42450	1720
White-collar worker share	0.450	0.298	0.010	1	1720
Return on capital	0.118	0.573	-1.945	9.545	1595
White-collar wage	26377	8237	1533	72423	1720
Blue-collar wage	20965	6964	1511	59526	1720
Manager share	0.122	0.108	0	0.79	1720
R&D and technical worker share	0.074	0.113	0	1	1720
Office worker share	0.169	0.161	0	0.920	1720
Service and sales share	0.084	0.145	0	0.964	1720
Production worker share	0.429	0.310	0	0.98	1720
Simple task worker share	0.121	0.218	0	0.99	1720

Table 3. OLS results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	manager share	technical worker share	office worker share	service and sales share	production worker share	simple task worker share	white-collar share	log(manager salary)	log(worker salary)	log(white-collar wage)	log(blue-collar wage)	white-blue collar wage gap
Management index	0.0103*** (0.00257)	0.00300 (0.00315)	0.0154*** (0.00398)	-0.00628 (0.00416)	-0.0161** (0.00790)	-0.00640 (0.00607)	0.0225*** (0.00619)	0.0297*** (0.00808)	0.0354*** (0.00888)	0.0318*** (0.00834)	0.0312*** (0.00896)	0.000584 (0.00308)
Base controls	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year fixed effects	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
State fixed effects	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Industry fixed effects	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	1,720	1,720	1,720	1,720	1,720	1,720	1,720	1,720	1,720	1,720	1,720	1,720
R-squared	0.500	0.408	0.438	0.449	0.499	0.349	0.664	0.471	0.498	0.516	0.510	0.753

Notes: Base controls variables are age and size (log employment) of establishment. Robust standard errors are in parentheses. *, **, *** denote significance at the 10, 5, and 1 percent level.

Table 4. First-difference results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	2002 to 2003 change in											
	manager share	technical worker share	office worker share	service and sales share	production worker share	simple task worker share	white- collar share	log(manager salary)	log(worker salary)	log(white- collar wage)	log(blue- collar wage)	white-blue collar wage gap
2002 to 2003 change in management index	0.00995*** (0.00359)	0.00458 (0.00401)	-0.000800 (0.00559)	-0.00338 (0.00638)	0.00666 (0.0126)	-0.0170 (0.0112)	0.0103 (0.00736)	-0.00911 (0.0107)	0.00920 (0.0121)	0.0100 (0.0113)	0.00860 (0.0121)	0.00141 (0.00441)
Base controls	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	691	691	691	691	691	691	691	691	691	691	691	691
R-squared	0.155	0.005	0.094	0.021	0.042	0.007	0.154	0.005	0.003	0.005	0.003	0.013

Notes: Base controls variables are the change in size (log employment) of establishment and age in 2002. Robust standard errors are in parentheses. *, **, *** denote significance at the 10, 5, and 1 percent level.

Table 5. First stage of 2SLS

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	<i>Korean management index</i>								
<i>Foreign management index:</i>									
G5: US, Bri, Fra, Ger, Ita	0.584*** (0.0947)								
Anglo-American: US and Britain		0.442*** (0.0959)							
US			0.181** (0.0896)						
Britain				0.294*** (0.0653)					
France					0.311*** (0.0521)				
Germany						0.0992* (0.0527)			
Italy							0.230*** (0.0527)		
Japan								-0.0623 (0.0397)	
Sweden									0.00439 (0.0938)
Base controls	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year fixed effects	Y	Y	Y	Y	Y	Y	Y	Y	Y
State fixed effects	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	1,275	1,275	1,253	1,267	1,132	1,116	1,169	1,093	1,080
R-squared	0.221	0.211	0.204	0.209	0.247	0.231	0.215	0.208	0.214

Notes: Base controls variables are age and size (log employment) of establishment. Robust standard errors are in parentheses. *, **, *** denote significance at the 10, 5, and 1 percent level.

Table 6. 2SLS results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	manager share	technical worker share	office worker share	service and sales share	production worker share	simple task worker share	white- collar share	log(manager salary)	log(worker salary)	log(white- collar wage)	log(blue- collar wage)	white-blue collar wage gap
A. G5 countries index as IV												
Management index	0.0247*	0.0440**	0.00992	-0.00267	-0.0893*	0.0134	0.0759*	0.0282	0.00224	0.166***	-0.193***	0.359***
	(0.0143)	(0.0211)	(0.0233)	(0.0215)	(0.0463)	(0.0348)	(0.0398)	(0.0408)	(0.0445)	(0.0468)	(0.0603)	(0.0632)
	(0.0177)	(0.0384)	(0.0305)	(0.0309)	(0.0646)	(0.0384)	(0.0651)	(0.0552)	(0.0654)	(0.0628)	(0.0954)	(0.0946)
B. Anglo-American index as IV												
Management index	0.00494	0.0501*	-0.0173	0.0182	-0.138**	0.0824*	0.0560	-0.0275	-0.126*	0.140**	-0.387***	0.527***
	(0.0191)	(0.0290)	(0.0333)	(0.0293)	(0.0650)	(0.0471)	(0.0525)	(0.0521)	(0.0653)	(0.0557)	(0.109)	(0.117)
	(0.0248)	(0.0514)	(0.0438)	(0.0409)	(0.0917)	(0.0570)	(0.0855)	(0.0776)	(0.0972)	(0.0839)	(0.160)	(0.163)
C. Continental European index as IV												
Management index	0.0445***	0.0328	0.0510**	-0.0124	-0.0868*	-0.0292	0.116***	0.0747	0.113*	0.191***	-0.0172	0.208***
	(0.0158)	(0.0222)	(0.0227)	(0.0214)	(0.0459)	(0.0354)	(0.0395)	(0.0541)	(0.0582)	(0.0620)	(0.0604)	(0.0443)
	(0.0173)	(0.0466)	(0.0270)	(0.0293)	(0.0617)	(0.0376)	(0.0684)	(0.0561)	(0.0694)	(0.0639)	(0.0882)	(0.0813)
D. Five country indexes as IVs												
Management index	0.0275	0.107***	0.0387	-0.0320	-0.103**	-0.0386	0.141***	0.0296	0.0641	0.134***	-0.134**	0.268***
	(0.0169)	(0.0227)	(0.0247)	(0.0233)	(0.0508)	(0.0415)	(0.0444)	(0.0436)	(0.0469)	(0.0472)	(0.0593)	(0.0560)
	(0.0228)	(0.0310)	(0.0320)	(0.0291)	(0.0667)	(0.0438)	(0.0614)	(0.0670)	(0.0831)	(0.0683)	(0.114)	(0.0990)
Base controls	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year fixed effects	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
State fixed effects	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Notes: Base controls variables are age and size (log employment) of establishment. Robust standard errors are in parentheses under the coefficient estimates and standard errors clustered by state-industry are in parentheses under the robust standard errors. *, **, *** denote significance at the 10, 5, and 1 percent level based on the robust standard errors.

Table 7. Robustness

		(1)	(2)	(3)	(4)	(5)
	First stage			2SLS results		
	Management index	white-blue collar wage gap	white-collar share	manager share	technical worker share	production worker share
<i>A. Subsidiary establishments (246 observations)</i>						
G5 management index	0.516** (0.221)					
First stage F-statistic	5.45					
Management index		0.455 (0.191)** (0.216)**	0.147 (0.0892)* (0.102)	0.0535 (0.0348) (0.0365)	0.148 (0.0719)** (0.0857)*	-0.0994 (0.110) (0.122)
<i>B. Technology control – Include IT cost share (1125 observation)</i>						
G5 management index	0.588*** (0.102)					
First stage F-statistic	33.07					
Management index		0.369 (0.0692)*** (0.101)***	0.0837 (0.0429)* (0.0667)	0.0291 (0.0154)* (0.0187)	0.0469 (0.0215)** (0.0353)	-0.114 (0.0503)** (0.0687)*
<i>C. Union control (1266 observations)</i>						
G5 management index	0.593*** (0.0951)					
First stage F-statistic	38.85					
Management index		0.354 (0.0618)*** (0.0925)***	0.0780 (0.0395)** (0.0641)	0.0242 (0.0142)* (0.0176)	0.0481 (0.0210)** (0.0363)	-0.0932 (0.0460)** (0.0631)
<i>E. Corporate governance controls - Include 7 governance type dummy variables (1267 observations)</i>						
G5 management index	0.578*** (0.0950)					
First stage F-statistic	37.06					
Management index		0.364 (0.0650)*** (0.0976)***	0.0747 (0.0404)* (0.0658)	0.0274 (0.0146)* (0.0177)	0.0440 (0.0216)** (0.0394)	-0.0873 (0.0469)* (0.0648)
<i>F. Technology, Union, Firm type controls (1110 observations)</i>						
G5 management index	0.584*** (0.103)					
First stage F-statistic	32.14					
Management index		0.373 (0.0712)*** (0.103)***	0.0842 (0.0438)* (0.0675)	0.0310 (0.0159)* (0.0189)	0.0497 (0.0221)** (0.0344)	-0.120 (0.0516)** (0.0689)*

Notes: Column (1) presents the first stage of the 2SLS regression. All regressions include age, size (log employment), year and state fixed effects. Robust standard errors are in parentheses under the coefficient estimates and standard errors clustered by state-industry are in parentheses under the robust standard errors. *, **, *** denote significance at the 10, 5, and 1 percent level.

Table 8. Results by establishment size

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Management index	white-blue collar wage gap	log(white-collar wage)	log(blue-collar wage)	white-collar share	technical worker share	production worker share
<i>Panel A: Employment < 50 (228 observations)</i>							
G5 management index	0.0634 (0.206)						
Management index		4.134 (12.84)	-1.735 (5.674)	0.705 (2.245)	-0.193 (0.818)	0.898 (2.841)	0.260 (1.540)
First stage F-statistic	0.094						
<i>Panel B: 50 ≤ Employment < 100 (280 observations)</i>							
G5 management index	0.402* (0.219)						
Management index		0.610 (0.322)*	-0.141 (0.149)	-0.0398 (0.0774)	-0.0606 (0.0598)	0.0208 (0.0553)	0.135 (0.164)
First stage F-statistic	3.39						
<i>Panel C: 100 ≤ Employment < 250 (430 observations)</i>							
G5 management index	0.768*** (0.169)						
Management index		0.260 (0.0644)***	0.132 (0.0540)**	0.0706 (0.0351)**	0.0341 (0.0164)**	0.0365 (0.0300)	-0.176 (0.0672)***
First stage F-statistic	20.53						
<i>Panel C: Employment ≥ 250 (337 observations)</i>							
G5 management index	0.577*** (0.178)						
Management index		0.285 (0.0897)***	0.172 (0.0784)**	0.0802 (0.0449)*	0.0494 (0.0251)**	0.0307 (0.0336)	-0.113 (0.0786)
First stage F-statistic	10.54						

Notes: Column (1) presents the first stage of the 2SLS regression. The group of five countries management index is used as the instrumental variable. All regressions include age, size (log employment), year and state controls. Robust standard errors are in parentheses. *, **, *** denote significance at the 10, 5, and 1 percent level.

Table 9. 2SLS results on performance

	(1) ROC	(2) log(revenue)	(3) log(employment)
<i>Panel A: All establishments</i>			
Management index	0.285* (0.159)	-0.0691 (0.153)	0.228 (0.149)
First stage F-statistic	38.7	39.08	37.17
Observations	1,178	1,209	1,275
<i>Panel B: Employment < 100</i>			
Management index	0.882 (1.129)	-1.720 (1.701)	-0.405 (0.475)
First stage F-statistic	2.25	1.55	2.34
Observations	467	478	508
<i>Panel C: Employment >= 100</i>			
Management index	0.190* (0.0992)	0.0914 (0.126)	0.0231 (0.140)
First stage F-statistic	42.83	46.83	35.4
Observations	711	731	767

Notes: The group of five countries management index is used as the instrumental variable. Base controls variables are age and size (log employment) of establishment. Standard errors clustered by state-industry are in parentheses. *, **, *** denote significance at the 10, 5, and 1 percent level.

Table 10. Two-Step Least Squares results from the manufacturing survey

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	white-blue collar wage gap	log(white- collar wage)	log(blue- collar wage)	white-collar share	ROC	log(employee)	log(revenue)
A. OLS Results							
Management index	0.00491 (0.0126)	0.0538*** (0.0134)	0.0489*** (0.0183)	0.0353*** (0.00807)	-0.0496 (0.0314)	0.201*** (0.0544)	0.0461 (0.0453)
Observations	126,786	126,786	126,786	126,786	114,024	126,786	119,030
R-squared	0.062	0.122	0.040	0.027	0.037	0.121	0.892
B. 2SLS Results: G5 management index as IV							
Management index	0.0399 (0.0299)	0.0671** (0.0339)	0.0272 (0.0503)	0.0454* (0.0244)	0.0191 (0.0621)	0.274** (0.121)	-0.0618 (0.113)
Observations	113,151	113,151	113,151	113,151	102,020	113,151	108,482
C. 2SLS Results: Anglo-American management index as IV							
Management index	0.0706* (0.0417)	0.106*** (0.0401)	0.0357 (0.0632)	0.0644** (0.0283)	0.0210 (0.0827)	0.220 (0.140)	-0.0343 (0.135)
Observations	113,151	113,151	113,151	113,151	102,020	113,151	108,482
Base controls	Y	Y	Y	Y	Y	Y	Y
Year fixed effects	Y	Y	Y	Y	Y	Y	Y
State fixed effects	Y	Y	Y	Y	Y	Y	Y

Notes: Base controls variables are age and size (log employment) of establishment. Standard errors clustered by state-industry are in parentheses. *, **, *** denote significance at the 10, 5, and 1 percent level.