＜論　　説＞

# 技術と産業社会

## ―日本労務管理史の再考に向かって―

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## はじめに

本稿は，とかく暗く陰惨な印象のもとに扱われてきた嫌いのある，産業革命期の我が国の労務管理について，改めて再検討を試みようとするものである。専門分化の進む学問領域においては，経営学を専門としながらも，労務管理については必ずしもプロパーとはいいがたい筆者が，日本労務管理史に再検討を試みるというのは，専門領域にある研究者からすれば甚だ僭越に映るかもしれない。

しかしながら，経営管理論の立場から日本の産業革命期の労務管理を概観するとき，国際比較をも含めて，日本の工場を中心とした労務管理が，一般に理解されているような非難されるべき過酷なものであったと，一概に決めつけることはできないのではないかと観るべき証拠が，数多くあるように思える。他方，煽情的に我が国の労務管理を誹謗し糾弾するがごとき，あるいはそのように利用されてきた文献も散見される。

ところがこうした文献を繙いてみると，センセーショナルなタイトルや著者の意図とは裏腹に，却って近代産業社会揺籃期からの我が国労務管理における，福利厚生への配慮を垣間見ることができる事例も少なからず存在する。近代工業社会や資本主義社会の興隆という，大きな時代の節目において，新しい企業社会という社会現象に対して，軽々に賞賛や誹謗のごとき価値判断に陥ることなく，先ずは価値中立的にその実態を観察してみることが必要である。経済学ないし経営学において，産業社会の発展過程に関する仮説はいくつも存在する。その中から，主ないくつかの理論を参照しつつ，経済発展の過程とそれを支えた人間社会との相互作用に検討を加えてゆくことにしよう。

無論，この小論文の中でこれまでの日本労務管理史全般を逐一詳細に再検討してゆくことはとてもできない。しかしながら，この小論文が提起するアプローチが，既存の労務管理史全般を支配するイメージに対して，一石を投じる再考への契機となれば幸いである。

本稿の狙いは，産業革命期の日本労務管理史を再考して，価値中立的に実態を明らかにし，それを世界に発信することにある。そのため，本稿の本文は英語で書かれている。そこで，本文に先立つ要約において，日本語の解説を付けておく。

## 要約

### 1. 工業化社会はどのようにして生まれたのか

A. トフラー『第三の波』によれば，工業化社会は「第二の波」と表現されている[1]。トフラーの主テーマは，第三の波である高度情報化社会の実態を説明するところにあるが，彼の述べる文明社会の発展過程を見てみよう。

先ず，人類は数百万年の長きにわたって狩猟採集生活をしてきたが，一万年前に農業文明への変革を遂げたとされる。これが，「第一の波」である。J. リフキンはこの一大変革について，一般に理解されているような狩猟採集物の余剰が，牧畜や耕作に回されたとする仮説を強く否定する[2]。リフキンは，獲物の劇的な減少による絶望的な飢餓が，農耕牧畜文明への変革を導いたと仮定する。このあたりの文明論に関しては，拙書『無知と文明のパラドクス』を参照願いたい[3]。

リフキンはこの仮説を敷衍化し，工業化文明も農牧文明の決定的な行き詰まりが契機となって，興隆してきたのではないかと観ている。この仮説は，意思決定論の仮説からしても甚だ妥当で，一般に人間は今のやり方でうまくいっているものを，わざわざ大きく変えようとはしないからである。

H. サイモンは，成功した意思決定は急速にプログラム化されると述べているが[4]，人間はうまくいった方法を即座に定型化し繰り返す傾向がある。従って，わざわざ手間のかかる大きな変革は，今までの方法が全くうまくいかなくなった時にしか生まれないと観るべきであろう。それは，人間の限定された合理性の故であり，満足のゆく解を見つけ出すためには，膨大な時間と労力を費やさねばならない。だから人間は，たまたまうまくいった方法にしがみつく，強い習性があると言ってよい。

こう考えてくると，工業化文明を生んだ農業化社会の末期は，農牧畜文明の限界や矛盾が露呈した甚だ悲惨な状況であったことが予測される。つまり，工業化前夜の農牧社会は，決して一部のロマンチストが抱くような，穏やかで美しい牧歌的な環境ではなかった可能性が高い。

### 2. 工業化文明の特徴と発展

A. チャンドラー Jr. は著書 *Visible Hand* の中で，蒸気機関や電気，あるいはガソリン・エンジンなど天候や季節の影響を受けにくい動力源による機械化を，工業化文明の始まりととらえている[5]。当初機械化は，川の流れを利用した水車や，風を使った風車などを工夫して行われた。しかし，これらの動力源は天候や季節によって不安定で，例えば冬場の凍結時には水車は全く動かない。こうした限界が本格的な工業化文明を妨げていた。

さて，全天候型の信頼性の高い動力源が開発されると，工業化文明はその幕を開ける。この発展をもたらした各種の発明と開発は，産業革命と表現される。この産業革命を最初に成し遂げたのはイギリスであり，その後を追ったのがフランス，アメリカ，ドイツ，日本，ロシアなどの

国々である。

A. ガーシェンクロンは，著書 *Economic Backwardness in Historical Perspective* において，後発国は先発国の成功した技術を模倣して取り入れることによって，急速に発展できるという現実と，その発展過程で後発性を補おうとする何らかの独特な工夫を凝らしているという歴史を分析している[6]。

例えば，アメリカはイギリスの蒸気機関を取り入れるが，その生産に当たっては規格部品の組み立て方式による大量生産体制を生み出す。また日本も，欧米の技術や制度を取り入れるが，明治維新以来，官民一体の協力体制を築いて近代化を進めるという独特の手法を展開している。

つまり，後発国は先発国が苦心惨憺して生み出した発明を，模倣によっていとも簡単に作り上げることができる。さらに，それをより効率的に作るための方法を，自国の環境に適したやり方で考案し，先発国に急速に追いつき，さらに追い抜くことができる。

### 3. 労務管理の輸入

製品・製法の発明開発と同様に，後発国は先発国が苦心惨憺の上に創り上げた労務管理の方法も，模倣して取り入れることができ，さらに自国の状況に合わせて，より効率的に改良することができると考えられる。

例えば，最初の官営模範工場となった富岡製糸場は，当初 3 年間はフランス人ブリューナを中心とするフランス人経営管理者による経営が行われたため，フランス式の労務管理がそのまま採用されている。例えば，1 日 8 時間労働や日曜日の休業などは，当時 10〜12 時間労働が一般的だった日本の労働環境からすると，画期的な良環境であったが，そこには 18 世紀のリヨンにおける絹職人の暴動を通じて築かれたフランス式の労務管理を見ることができる[7]。

富岡製糸場も，日本人経営者の手に移ってからは，1 日 10 時間労働に変更されているが，被服や食事の供給，売店制度や教育施設などの福利厚生制度は引き継がれてゆく。富岡製糸場のみを別格視する向きもあるが，これが模範工場とされており，実際ここで勤務経験を積んだ熟練女工が郷里その他の全国に散って，機械操作にとどまらぬ工場管理の指導に当たったことを考えると，程度の差はあるとしても，フランス式の労務管理はかなりの程度日本全国に広まっていたと考えるのが自然であろう[8]。

紡織産業における労務管理は，産業史上大きな位置を占めているので，本文でも多少詳細に扱うが，日本の労働時間や福利厚生等の管理について，同じ時期のアメリカやイタリアなどと比較してみると，決して劣らぬ水準であったことがわかる。確かに一部には，女工の虐待や誘拐・監禁・強姦などの犯罪も数例報告されているが[9]，かかる犯罪行為を以って当時の労務管理全般を論ずることは正しくない。

## 4. 資本主義は，プロレタリアートを搾取してきたのか

F. ハイエクは，工業化文明を支えた資本主義とプロレタリアートの誕生について，次のように説明する。プロレタリアートなる無産階級は，農業化社会における自営農主が大資本に搾取されて没落した結果生じたのではなく，農業化時代には生存の余地がなかった人口が，大規模資本が築いた都市部周辺の工場に働き口を求めて集中し，生み育てられた人々である[10]。

これが真実であることは，T. アシュトンの『産業革命』に明らかである[11]。アシュトンはイギリスの産業革命期18世紀後半からの国勢調査において，小児死亡率の激減を通じて人口が急速に増大している現象に注目している。端的に言えば，産児制限の不徹底な当時，養育可能な範囲を超えた子供は，生存の余地が極めて低かった。ちなみに，柳田国男は南北に長く，方言や風土の多様性のある日本で，なぜどこにでも一様に河童伝説があるのかを自問している[12]。河童伝説は，やむを得ざる子供の育児放棄であり，「河童に取られた」とは，水子その他の隠語であったと考えられるし，「山姥伝説」またしかりと言うべきであろう。

産業革命期の工業化文明は，こうした子供たちが生きていけるだけの仕事を生み出した。イギリス産業革命期の初期の18世紀半ばには，小さいものは3歳から，さらに多くの5～6歳の小児労働者が現れ，紡織産業を中心に金属加工や工作機械，炭鉱など，13歳以下の小児労働者は労働者全体の3分の2を占めていたと言われる[13]。19世紀半ばの記録でも，小児労働者は全体の約30%を占めている[14]。

つまり，工業化資本主義社会の出現によって，農村部の余剰人口は，5歳まで育てればあとは都市ないし山間部の工場で，労働者として働き生きていくことができるようになった。またアシュトンも指摘している如く，産業化の発展によって清潔な布や石鹸，洗剤などがこれまでより容易に入手できるようになり，衛生面の改善によって幼児死亡率が低下した点も勿論重要であろう[15]。

さて，彼らが長ずるにしたがって，彼らへの待遇，男女の性的な問題，教育問題などが社会の重要問題として議論されるようになる。成人した小児労働者は家庭を築き，かくしてプロレタリアート階級は生み出されていったと考えることができる。小児労働の労務管理は婦人労働の管理と並んで，軽工業部門における第一次産業革命期に重要な意味を持っている。この管理実態についても，いわゆる風評的なイメージに惑わされない検証を試みてみたい。

とかく，マルクシズム的な経済社会観から，牧歌的な農村に襲い掛かった大資本の論理によって，子供も女性も工場に駆り出されて搾取されたという解釈を散見することがある。しかしながら，例えば小児労働者は上述したように，農業化社会では生存の余地のなかった子供たちであり，その賃金所得は家計所得の増大に貢献した[16]。

無論，多くの低賃金小児労働は産業の発展を支え，技術革新とともに生産性を向上させてゆく。この結果，成人の賃金所得が増大し，小児労働の必要性が下がり，産業革命期の末期には，小児労働は姿を消してゆくことになる。この流れを見ると，工業化と資本主義社会の経済システ

ムは，全般として明らかに労働者階級の所得増大に貢献してきたとみることができるのではないだろうか。

**注**

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# Technology and Industrial Society

## — Toward a reconsideration of the History of Japanese Labor Management —

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**Preface**

This article reconsiders traditional theories of Japanese labor management in the period of Industrial Revolution and its negative images because historical cases can prove that Japanese labor management at factories was not necessarily cruel. Although there are some sensational essays that blame Japanese labor management, they also contain various cases showing the existence of welfare systems in the Japanese labor management, despite their dramatic titles or authors' intentions.

Modern industrial society or corporate society brought about by the Industrial Revolution as a

historical turning point must be investigated with a value neutral approach. Existing literature on economic or managerial science, has hypothesized on the development of the industrial society, which can be used to analyze the new industrial society brought forth by the Industrial Revolution.

Finally, although this article may not dramatically change the Japanese traditional labor theories, it may change the existing a negative image of Japanese labor management.

## 1. The Industrial Revolution in England

### 1-1 The second wave of a drastic change

Toffler claimed that industrial society is the second wave of the civilization, following the first wave of an agricultural society.[1] However, ten thousand years ago, human beings were hunters and gatherers. Since ten thousand years, humans changed their lifestyle to agriculture and cattle farming. This radical change of human society was termed as the first wave by Toffler.

In general, this change from hunting-gathering to agricultural society was understood as the development of human civilization. However, Rifkin opposed this general explanation.[2] He argued that a critical crisis must have caused such a radical change. A serious shortage of food brought about through the hunter-gatherer life motivated this drastic change of the lifestyle.

Rifkin's understanding is probably correct because it is based on the theory of decision-making created by Simon who held that successive decisions are rapidly programmed as ordinals or operational decisions because of the limited rationality of humans.[3] Humans' limited rationality is largely economized by programming decisions, which are repeated without evaluating the causality of each action. When successful decisions are repeated, they become stable and programmed.

Based on the decision-making theory, if humans could have gained enough food by hunting-gathering, their lifestyle would not have changed but continued as it was prior to radical change. Agricultural life is more complicated than hunting-gathering because of the hard work required for planting, breeding, and constructing various equipment for maintenance of water and soil, among others. Thus, the drastic change to the more complicated lifestyle must have been triggered by some crisis.

Rifkin's logic can also be extended to other sweeping social changes. The crisis of the agricultural lifestyle can be said to have ushered in an industrial society. For example, Malthus claimed that agricultural productivity decreased based on the development of cultivable land[4] and that the marginal production rate decreased due to the shortage of good quality land. Agricultural machines were created to overcome this crisis.

### 1-2 Human ignorance created civilization

A key theory on which this article is based is that our civilization was created by human ignorance. If humans had unlimited rationality like omniscient and omnipotent God, we would be able to make the best decision every time. Consequently, civilizations would have been limited through the diversity of climate, which would result in less variety. However, we did not find the best solution to any problem *a priori*. Tremendous trial-and-error for a long period is required to find acceptable solutions, which may lead one to accidentally find the acceptable one, while others would imitate the successful solution thoughtlessly. This tendency has resulted in civilizations growing in bounded locations by the seas, rivers, mountains, and deserts, among others.[5]

Although humans have limited rationality, they did achieve several objectives, such as, inventing tools to hunt large animals, which improved their hunting efficiency. However, this advancement increased the shortage of animals, which stimulated the development of new hunting weapons. These mutual accumulative interactions of animal shortage and development of hunting instruments resulted in the disappearance of several species of animals, which was caused by human ignorance.

Faced with the shortage of animals, humans had two main alternatives. The first was to follow big animals to new continents. The second was to change their lifestyle into that of an agricultural civilization.[6]

In the agricultural lifestyle, the relationship between ignorance and civilization continued. This lifestyle was more complicated than hunting-gathering. However, it offered stability, which had great benefits for future generations. Therefore, in an agricultural community, humans reproduced and the population grew exponentially, which resulted in serious starvation. For the next ten thousand years, the demographic quantity remained constant. However, some starvation crises might have stimulated the creation of tools and machines to cultivate the land, thereby resulting in the emergence of the industrial lifestyle.

Therefore, we can hypothesize that the last stage of the agricultural lifestyle, prior to the industrial lifestyle, was not nostalgic or pastoral as posited by romanticists. For example, Nardinelli introduced data on the rate of infant and child mortality in England before the 19$^{th}$ century that was estimated by Wrigley and Schofield.[7] The data showed that for every 1,000 newborn children, around 200 – 300 failed to live past the age of ten.

In ancient Japan, the estimation was almost similar, with more than 20% of children dying of sickness and abandonment caused by the limited rearing ability in the agricultural society. Yanagida

has compiled folktales concerning the abandonment of the children and the elderly.[8]

### 1-3 Iron manufacturing industry at the beginning of the industrial society

Iron tools or instruments drove the improvement of agriculture and cattle productivity. The early stage of the Industrial Revolution in England was summarized in Ashton's work.[9] During the first decades of the 18th century, charcoal was the main fuel for the iron manufacturing industry. However, by the middle of the 18th century, the forests around London disappeared due to indiscriminate afforestation. Furthermore, coal mining began in the mid-18th century, and coke produced from coal became the main fuel for the iron manufacturing industry.

The iron manufacturers supplied steel to the tool and machinery industry. At that time, iron tools or machines were primarily used for agriculture. Moreover, iron tools or machines for horses and traffic instruments were also necessary. Subsequently, the machine industry was founded around the iron manufacturing industry. This Industrial Revolution was sustained by several inventions or innovations concerned with the mining, iron manufacturing, and metal-working industries. For example, toward the end of the 18th century, all shallow coalfields had been mined. Coalfields of more than 200 feet were then being mined by various tools or machines produced by the metal-working industry.

These new industries founded by the Industrial Revolution in London and the urban areas accepted many children from villages. In Britain in the 1820s, 10% of children aged 5 – 9 and 75% of children aged 10 – 14 worked in industrial shops.[10] Ashton pointed out that the rapid increase in population was due to the increasing number of young children, who were around five years old. They were the main labor force in the factories.[11] At the beginning of the Industrial Revolution, labor circumstances were poor. For many children who worked in these factories or mines, conditions were rather dangerous, dirty, and severe. The children could not survive in the agricultural society with the limited productivity in their family or village. However, a new industrial society could nourish them, even if the circumstances were not ideal.

As Nardinelli mentioned in the next section, the employment circumstances of child laborers in factories were not crueler or inferior to that of children toiling in agricultural work. For example, Nardinelli investigated the comparison of heights introduced by Horner in 1837, who found that children employed in factories were no shorter than their cohorts outside the factories. [12]

During the Industrial Revolution in England, the industry was sustained by child labor. Data in "Child Labour in Historical Perspective 1800–1985: Case Studies from Europe." indicates that child

workers aged 10 – 14 years comprised 28.5% of the total labor population in England in 1851. [13] However, the share of child workers decreased to 14% in 1911, which is most likely due to the increasing GDP per capita that enabled their parents nurture their families without sending their children to work. From 1851 to 1911, GDP per person increased from £ 3,000 to £ 5,000.[14] Moreover, several laws restricting child labor were introduced by the government.

The working conditions of the children were addressed by the English government with regards to sanitation, sexual order, and education among others. For example, the factory law in 1819 limited the maximum working hours of a child worker to 12. In 1833, they also prohibited the employment of children under the age of 10 in certain industries. By 1878, they had prohibited the employment of children under the age of 10 in all industries. Moreover, a compulsory education system was also introduced. After dozens of years, the new generation of humans constructed a new proletariat class as a result of capitalism. However, Hayek averred that they were not failed self-employed farmers or merchants exploited by capitalists, as claimed by Marx.[15] They were a new generation raised through capitalism, who could not exist in an agricultural civilization.

The industrialization process in England was characterized by a long period of trial-and-error by various inventors and innovators. For example, Watt invented the first steam pump in 1776, which was utilized for draining vertical shafts in mine. It took 28 years for Trevithick to invent the steam engine in 1804. It took another 21 years, before Stephenson innovated the practical steam engine train in 1825. From the first steam pump, it took 49 years of trial-and-error processes to realize the steam engine train. The first runner had no precedent technological model, which meant that the first challenger had to pursue numerous experimental methods.[16]

### 1-4 The case of child workers in England

When reconsidering Japanese labor management, first, the case of child workers' management in England should be investigated as an instance of labor management in a leading country of the Industrial Revolution. At the initial stage of the Industrial Revolution in England, child laborers assumed an important role, especially in the textile industry. Ashton indicated that two-thirds of all employees in the cotton industry were children in the late 18$^{th}$ century.[17] A total of 122,000 child textile workers aged 10 – 13 comprised 90% of all child workers in industrial employment, estimated at 135,555 between 1871 and 1874.[18] The remaining 10% of nontextile industrial child workers were employed in mining, metal, and pottery industries.

In this section, the theme of child labor will be investigated through an analysis by Nardinelli.[19] His fundamental focus was to examine the widespread negative image of child labor management in

England during the Industrial Revolution. He mentioned that although there were positive and negative testimonies of witnesses on child labor circumstances and management, only the negative views survived and became widespread.

Nardinelli pointed out that although the working condition of child workers in factories were not comfortable, safe, nor clean, it was not necessarily dangerous nor cruel. In fact, 8.3% of children aged between 10 – 14 in England and Wales worked in factories in 1871[20] and supported their families. Nardinelli also pointed out that manufacturing industrial child labor accounted for less than one-third of the total number of children employed, aged between 10 – 14. More than two-third of all child workers were employed in traditional industries such as agriculture and commercial services.[21] In other words, the Industrial Revolution created 30% additional employment for children.

Nardinelli explained that the negative image of child labor management in factories was perpetuated by the works of Oastler and Sadler, who were leaders of the Factory Movement. Nardinelli pointed out that their most influential work was the *Report of the Select Committee on the Bill for the Regulation of Factories* published in 1832.[22] The Factory Movement members strongly blamed the industrial factory system for the working conditions of child workers and their management by drawing an analogy of West Indian slaves. It was done to help them pass the Factory Act. The critical trend of cruel, immoral, and shameful management helped realize the Factory Act in 1833. The act prohibited employment of children aged under 9 in the textile industry（except for silk）and limited the working hours of children aged 9 – 12 to nine hours per day or forty-eight hours per week. Moreover, the act required all children to attend school.

On July 4, 1838, 26 child workers aged between 7 to 17（15 boys and 11 girls）were killed by the disaster of inundation at Huskar Colliery mining caused by heavy rainfall. This miserable and painful accident naturally accelerated the legislation of child labor in the mining industry. In 1842, the Mines and Collieries Act was enacted, which prohibited the employment of children below the age of 10. *The White Slaves of England* by Cobden in 1854 also further perpetuated the negative image of child labor management.[23]

As mentioned in the previous section, the amended Factory Act in 1878 prohibited the employment of children under the aged of 10 in all industries. The number of child workers and the percentage of total employment in industrial factories decreased after the amendment of the Factory Act. However, Nardinelli claimed that the child labor legislation played a limited role in the decrease of the child workers. He analyzed that the long-term decline in the employment of children was caused by technological innovation and increasing family income.

The Industrial Revolution paved the way for child employment through mechanization in the first stage by creating auxiliary work for the maintenance of machines and other secondary tasks, including cleaning, oiling, and arranging parts of machines. Young children were useful for maintaining machines as they could squeeze into the gap of the machines. Nardinelli also pointed out that the child workers' most important task was piecing together broken threads.[24] They probably gathered broken threads under the textile machines and pieced them together.

However, advanced machines, such as the self-acting spinning mule developed by Roberts in 1830, was widely equipped through technological innovation. High-quality machines with automatic maintenance produced less waste and fewer broken threads. Well-organized factories decreased the demand of child workers by reducing the secondary tasks for children. Moreover, the new high-tech machines demanded a higher level of manipulation by adults.

The technological innovation increased the wages of adult workers by improving their productivity. After the mid-19th century, the family income of the working-class laborers increased. Therefore, these families did not need to make their children work in the factories. The increasing family income decreased the supply of child workers, which was the most important factor behind the reduced number of child workers.[25]

Nardinelli indicated that child labor was widely utilized in the agricultural society before the Industrial Revolution. Children over age of 6 generally assisted or supported the agricultural and cattle farming lifestyle by weeding, fetching water, washing, cleaning, caring for livestock, crop processing, and so on. These tasks were no easier than that of the industrial factories, especially in severe weather conditions, such as hot summers and cold winters.

Nardinelli concluded that young children workers needed the extra income because of the poverty in their families. The severe poverty and the necessity of child labor existed long before the Industrial Revolution. If child labor was indeed evil, it was not caused by the Industrial Revolution or the textile factories but by the poverty in the agricultural society.[26]

Contrary to the Marxists hypothesis, the Industrial Revolution, industrial society, and capitalism created employment and extra income for farmers in the last stage of the agricultural society rather than exploiting them. Eventually, industrial society sufficiently increased family income, so that children could attend schools instead of going factories by the beginning of the 20th century. Proletariats were then born and raised from the superabundant population of the agricultural society aided by the new industrial capitalism.

## 2. Spreading Industrial Society through the Imitation of Backward Countries

### 2-1 What is the competitive advantage of backwardness?

Several backward countries have imitated the developing industrial society or civilization in England. For example, the United States of America（USA）quickly followed the industrial development process of England. Gerschenkron analyzed the competitive advantage of backward countries,[27] and found that they could imitate the successful technologies, manufacturing process, or industrial institution of the advanced countries. The USA imitated relevant and innovative technologies, such as the steam engine system, the steam engine train, and iron manufacturing technologies among others.

Backward countries can rapidly accomplish successful technologies by imitation. This aspect is their competitive advantage, as indicated by Gerschenkron. However, Gerschenkron also showed that each backward country had its own unique process or method to improve industrialization. In America, the mass production system accelerated the progress of the industrial civilization.

Indeed, imitating the advanced technologies or processes was a new way of technological development adopted by backward countries, which could not have been possible without forward countries. For example, although backward European countries imitated advanced technologies, they also utilized their unique and traditional skilled workers system, also known as the craftsman system, for the advancement of the modern industrial civilization.

Japan also leaned on occidental technologies and industrial systems used in the USA or Europe. However, it created a unique cooperative system between governments and private enterprises.[28] In Japan, large private companies existed before the Meiji period that began in 1868. Mitsui, Sumitomo, and Konoike are famous private enterprises that, along with Mitsubishi（founded at the beginning of the Meiji period）, were called Zaibatsu, or a conglomerate. During the first stage of the Meiji era, the Japanese government created large textile, steel, and shipbuilding factories in cooperation with advanced countries. After several years, the government sold the factories to the Zaibatsu at very low prices. The Japanese government then tried to foster capitalism. Instead of being private enterprises, the Zaibatsu cooperated with the government and were deeply committed to governmental policies.[29]

Russia also imitated advanced technologies and methods. However, it employed socialism to rapidly improve industrialization through governmental leadership and authoritarian totalism.[30] Gerschenkron explained that Russia did not have any traditional private enterprises. In the 19$^{th}$ century, Russia consisted of landed aristocrats, a functional government, and paysans. The private

sector was not considerable enough to manage the large size of the capital and organizations. Therefore, the government continued to manage large factories that were created through governmental leadership.

Gerschenkron mentioned that backward countries were more inclined towards the rapid totalitarian government-oriented industrialization. Backward countries could observe the successful technologies and methods of industrialization of more advanced countries. If backward countries had repeated England's long and slow process of trial and error, they would not have been able to progress so fast.

Finally, according to Gerschenkron, Marx's perspectives that forward countries provided a blueprint for backward countries to follow was only a half-truth regarding the history of industrialization. The other half is that each backward country employed its own unique process or method to realize rapid industrialization according to the prevalent conditions.[31]

**2-2 Backward countries imported advanced welfare systems**

At the beginning of the industrial civilization, when the Industrial Revolution emerged in England, the working conditions were relatively poor and severe. For child workers from the countryside who comprised a majority of the workforce during the first period of industrialization, the working conditions were rather dangerous and poor. However, the conditions were not as cruel as portrayed by humanitarians at that time, as investigated by Nardinelli, and discussed in Section 1-4. Progressively, the working conditions got better as governments and private enterprises improved workers' circumstances.

In some cases, workers organized riots against the cruel working conditions. For example, silk craftsmen in the city of Lyon, France organized rebellions in 1831, 1834, and 1848.[32] They resisted their harsh work conditions where families had to work 15 - 18 hours per day for paltry wages. The French government suppressed each rebellion; 5,000 people were still injured or dead in the rebellion in 1848. The government and private companies tried to improve their working conditions after their aggressive rebellions.

As an example of an imported advanced welfare system, it is useful to introduce the case of a Japanese silk spinning factory — Tomioka Seishi-jou —, which was founded in 1872.[33] French executives managed it for three years in the beginning, from 1872 to 1875. Hundreds of teenage girls were recruited from across Japan. The working conditions in this factory were better than in other Japanese factories. For example, they only worked 8 hours a day, compared to the usual 11

hours in other Japanese factories. Moreover, they also had Sundays off and ten vacation days at the end of the year and in the summer. All meals, accommodations, and medical costs were free. Furthermore, schooling and shopping were also permitted for workers. These high levels of welfare may have been due to the rebellion in Lyon. Nonetheless, Japanese executives changed the working hours to 11 hours in line with other Japanese factories after 1875. However, as Tomioka Seishi-jou was the first governmental model factory, all Japanese factories were naturally influenced by its management.

Similarly, backward countries also introduced advanced technologies and advanced management or welfare from the advanced countries. Therefore, we hypothesize that backward countries adopted high-level management and welfare because they could draw from the experiences of the more advanced countries.

Just as the works of Oastler and Sadler created a negative image of child labor in 19th century England,[34] some works in Japan also contributed to the negative perception regarding the management of teenage girl workers. For example, Hosoi wrote a book titled *Jokou–aishi*（Miserable History of Girl Workers）in 1925, which continues to be well known in Japan.[35] Throughout this book, Hosoi severely blamed the welfare policies of companies from the perspective of communism. As he was an earnest communist, he criticized the workers who agreed with the company's policies.

However, according to his book, a high level of welfare was confirmed in Japanese factories from the late 19th century to the beginning of the 20th century, compared to American factories in the same period. For example, at the beginning of the 20th century, the average working hours were 11 per day, with a break of around 20 minutes in the morning and afternoon, and 30 minutes at lunch time. Moreover, visits to shops, clinics, grand-baths, barber shops, theaters, parks, schools, and various cultural clubs, such as tea-ceremonies, cooking, clothing, flower-art, and dancing, among others were permitted for workers. Especially, large scale factories used high-quality equipment for the welfare of the employees, as explained by Hosoi.[36]

Furthermore, Japanese factories organized festivals of sports and films with special meals and drinks for workers. Companies also conducted questionnaire surveys among workers. About 60% of the responses agreed with the companies' management or welfare, while 20% were critical toward the companies. Hosoi severely criticized the 60% positive respondents for their naive responses and attributed it to their low level of education.[37] Nevertheless, the situation indicated that the Japanese factories' welfare system was better, compared to the American management of factories in the same period.

In 1924, Mayo and Roethlisberger, who were professors at Harvard University, investigated the extraordinarily high turnover rate（250%）of the spinning department at a textile plant.[38] Other departments' turnover rate was 5 – 6 %. They confirmed that the working hours were 10 per day and five days per week, similar to the other departments. Other physical conditions of work such as wage, temperature, humidity, light, were also similar. Mayo's team then focused on the repetitive, monotonous, and lonely work at the spinning department. Finally, they demonstrated that communication among the workers during 10 – 15 minutes breaks granted 3 – 4 times per day, helped the high rate of turnover. Once the breaks were introduced in the spinning department, only two workers left during the year.

From 1925 to 1929, Mayo's team also implemented Hawthorne experiments to investigate the relationship between workers' motivation and physical circumstances.[39] Through this experiment, they concluded that social working conditions were far more important than physical conditions. Their investigation focused on how companies obtained workers' emotional sympathy or maintained comfortable workers' relationships. Mayo's team created a new paradigm concerning the theory of human relations in the 1930s. Therefore, we confirm that the Japanese management and welfare of factory workers were of a high-level at the beginning of the 20th century.

Incidentally, the average turnover rate per year in Tomioka Seishi-jou from 1872 to 1884 was 59%, which was rather high compared with other factories in Japan.[40] As mentioned above, Tomioka Seishi-jou was a governmental model factory. Therefore, girls had to go back to their home cities or villages to guide the manufacturing process and management of modern, new factories after they gained the required skills. This fact was one of the reasons behind the high turnover rate. The other reason was correctly analyzed by Hayamizu, who was the third factory manager of Tomioka Seishi-jou 1879–1880, and the fifth manager of the factory 1885–1893, reported monotonous work and lonely working conditions raised the turnover rate in 1875.[41]

### 2-3 Mass production systems as a typical feature of modern industrial society

Mass production systems are a typical feature of the modern industrial society constructed in the USA from the end of the 19th to the beginning of the 20th century. Chandler Jr. analyzed the modern industrialization process in the USA[42] and highlighted that mass distribution systems were necessary before mass production systems. Without a mass distribution system, mass production systems would only create non-distributable inventories.

Chandler investigated the initial period of industrialization, which he termed as before the beginning of the modern industrialized period, when various machines or tools utilized natural

power, such as human or animal power, wind, or water streams. These machines or tools were strictly limited in terms of credibility, durability, and regularity as their efficiency depended on the weather or season. For example, the water wheel was useless in the winter or the summer when the river was frozen or dry, respectively. Instead, artificial energy such as steam, gasoline, or electric power provided credible, durable, and constant energy without seasonal or weather limitations.

Chandler explained that modern industrial society was constructed by mass distribution and production systems that provided sustainable, credible, and durable sources of artificial energy. Mass distribution systems in the USA were realized using steam engine trains for transportation instead of the canal systems, which were restricted by the weather or season.

Mass production systems also involved the standardization of products, which was different from craft-working in Europe. Thus, it can be hypothesized that the American historical background of being a country of immigrants helped improve the standardization processes. Almost all labor in the USA consisted of unskilled immigrants, mainly from Europe. As their cultural backgrounds and languages were different, they probably could not understand each other easily. Consequently, standardizing products and dividing the partial productive arrangement was useful for the management of divided or isolated, unskilled workers.

Standardized stereo-typed products created through mass production were quite different from the high-quality products produced by skilled workers and prominent employees in Europe. Mass production systems could not compete with the crafting system in terms of quality. However, mass production procedures had a competitive advantage compared to the crafts-working system. Standard quality was achieved at low prices, which resulted from two important economic effects.

The first effect is related to the economies of scale[43], which states that large-scale production simultaneously reduces the unit cost. Unit cost is calculated by dividing the total cost by the total quantity of products. The total cost consists of fixed costs（e. g., cost of equipment machines）and variable costs（e. g., cost of energy and materials）. By increasing the quantity of products, the unit fixed cost decreases, thereby decreasing the unit cost.

The second effect is that of specialization consisting of the set-up cost elimination and learning effect.[44] In the mass production system, relatively simple and monotonal partial processes are divided, similar to the parts combination processes. Therefore, mass production systems realize both product and process standardization. As every worker is allocated their specialized role, no one needs to prepare and arrange for other types of work. This elimination of the set-up cost improves efficiency. Moreover, as every worker repeats the same work many times, their skills

improve rapidly. This learning effect by experience also improves the efficiency of mass production. Thus, the decreasing unit cost and increasing efficiency is naturally reflected in the low price.

While the mass-production system realized a huge competitive advantage due to their low prices, it introduced new social problems such as human alienation at their tasks. Workers could not feel a sense of accomplishment or fulfillment through their work in factories where they usually repeated the same and simple tasks every day. Moreover, the factories were dirty, noisy, and dangerous because of various large-scale production machines.

The mass-production system was based on mechanization. The first stage of the mechanization based on artificial energy was mainly sustained by steam engine systems. Steam engine-based production machines in factories were large, difficult to use, and dangerous. Although the improving machine electrification gradually realized the miniaturization of the production machines and safety procedures were adopted, the problems of noisy, dirty environment covered with oil and monotonous labor continued to exist.

Therefore, mass-production systems created new management problems of work efficiency and motivation for companies and workers. Industrial companies then faced the management problem, which they tried to resolve using management theories, such as scientific management, management science, and motivation theories. These theories naturally influenced backward countries as well.

## 3. Characteristics of Japanese Labor Management

### 3-1 Historical theories of labor management

In general, the traditional works of Japanese labor management in the Industrial Revolution period are critical for understanding Japanese management at that time. Major scholars who wrote the classical theories of management often used the technical term of “primitive labor relation” to imply a mixed concept of ancient master-slave relationship, tyranny, paternalism, and family principle between employer and employee.

This primitive labor relation was mainly utilized as a negative custom of an unscientific management style by scholars. For example, Ohkohchi believed it to be a tyrannical exploitation of laborers by employers at a period after the Industrial Revolution and before the Factory Act, implemented in the 19$^{th}$ century.[45] His historical perspective was in line with the Marxist view that capitalism brought about by the Industrial Revolution had ruined the rural cottage industry by employing a large number of young children and women from villages as cheap labor at large

factories.

As discussed in Chapter 1, the rapidly increasing population of children after the Industrial Revolution cannot be explained through the tyrannical exploitation by employers or the downfall of numerous self-employed farmers. In the Japanese context, this increase in the children population in the late 19th century was similar to that of the beginning of 19th century in England and Wales, as noted by Ashton.[46] For example, the Japanese birthrate increased from 16.3% in 1872 to 30.7% in 1889.[47]

Almost all scholars specializing in Japanese labor management were strongly influenced by a governmental report titled *Shokkou–gijou*（The Cases of Industrial Workers）, published by the Ministry of Agriculture and Commerce in 1903.[48] This 600-plus pages of investigation into the cases of labor management in various industries was concerned with recruitment, working hours, salary, hygiene management, lodging, leisure, education, meals, and other type of welfare. This massive report was edited by government officials who improved the Factory Act. They might have stressed the harsh state of labor management to accelerate the legislation of the Factory Act.

Clearly, the government officers at Ministry of Agriculture and Commerce were motivated by humanism to improve the labor circumstances of factory workers. They focused especially on restricting night work for children and teenage girls, based on scientific evidence that working during the night was inefficient and harmful for workers. Their efforts based on humanism and the scientific belief that a comfortable work condition was necessary to keep a healthy labor force overcame the resistance of industrial companies, and the first Japanese Factory Act was enacted in 1911.

While it did single out cases of poor management, especially in small sized factories, it also reported the cases of good management and welfare such as an incentive salary system, condolence money, sports and amazement festival, shops in factories, a medical system, work time management, dormitory houses etc., although most of them were still incomplete.

Moreover, the appendix of the report also included thirteen criminal cases against female workers, including kidnapping, fraudulent solicitation, rape, abuse, confinement, assault, and injury. These cases were extremely malicious, and the criminals were sentenced to heavy fines and imprisonment. However, these vicious crimes cannot be used to generalize the standard level of Japanese labor management in those days.

Mori was also influenced by *Shokkou–gijou* and had a negative image of Japanese labor

management in the Industrial Revolution. He recommended the scientific management created by Taylor in 1911.[49] He insisted that healthy physical working conditions, such as lighting, temperature, humidity, working hours, rest timing, leisure, and wages, could be identified through scientific management.

Sumiya analyzed the enacting process of the first Japanese Factory Act in 1911. Specifically, he focused on the concept of a master-slave relationship prevalent in the Japanese business society, after or during the enactment of the Factory Act. While Japanese executives often insisted on a family-like hierarchy or paternalism, which was a custom in Japan, labor unions gradually resisted this feudal norm through labor disputes.[50]

Okuda also focused on scientific management and Japanese paternalism. He found that some Japanese companies observed high efficiency and productivity from a combination of paternalism and virtually executed scientific management. For example, even if executives were situated in a rational work condition in their company based on paternalism, it still motivated them to naturally accomplish high performance.[51]

Hazama analyzed traditional Japanese paternalism and family principles in private enterprises from a relatively positive perspective.[52] He explained that traditional paternalism and family principles have existed in Japanese companies prior to the Industrial Revolution. He indicated that "Noren-wake" was the most symbolic form of paternalism and family principles in private enterprises in the 17th century. "Noren" means brand of the company, and "wake" means divide. Employees who have worked hard for many years promoted the family-like hierarchy, and eventually they were permitted to manage branch companies using the same brand.

Nardinelli mentioned that Japanese businessmen found a new way to fight factory legislation through the renowned system of "employer paternalism".[53] Businessmen who opposed the Factory Act insisted on preserving the Japanese custom of paternalism based on family principles. They succeeded and a new way was not adopted. Paternalism thus continues to flourish in Japanese business society.

### 3-2. An international comparison of labor management

In this section Japanese labor management during the Industrial Revolution is compared with that of other advanced countries. Per the discussion in 2-1, Gerschenkron insisted that backward countries tried to catch up with forward countries through two ways: the imitation of advanced countries' performance and their own original devices. In the case of Japanese labor management,

Japan also adopted both of these ways to chase forward countries' labor management system.

First, Japanese companies imported advanced machines and managerial systems from forward countries such as England, France, and the USA. For example, as mentioned in 2–2, Tomioka Seishi-jou introduced advanced French spinning machines and labor management systems after three riots by silk craftsmen in Lyon.

Second, Japanese companies utilized traditional family principles and paternalism management in modern industrial companies to avoid severe conflict between employers and employees. For example, labor unions organized by each company was based on family principles and a family-like hierarchy.

*Shokkou–gijou* showed that in 1900, spinning, textile, and matches industries employed child workers aged below 15 to comprise 15% of their workforce, which was roughly similar to that of England and Wales.[54] Japan did not need child labor to comprise the 60% of their industrial workforce as required in 18th century England because it imported advanced machines from the initial stages of Industrial Revolution. Thus, secondary children work such as piecing together broken threads were not required.

Brunat went to great length to found Tomioka Seishi-jou, and he managed it for three years from 1872 to 1875. He introduced advanced spinning machines, steam engine systems, various building materials, building skills, and others from France.[55] Moreover, he also introduced advanced management systems, as mentioned in Section 2–2.

Moissonnier mentioned the miserable working condition of silk craftsmen that included children and females in Lyon in the 1830s.[56] Long working hours which ranged from 15 – 18 hours per day, especially nighttime work, destroyed their health. After three riots, work conditions and management were improved. Brunat introduced this new advanced management to Tomioka Seishi-jou.

Through comparisons between Tomioka Seishi-jou and other factories, as indicated in *Shokkou–gijou*, some authors such as Hosoi, insisted that Tomioka Seishi-jou was an exceptional case of industrial management. Most of the young female workers at Tomioka Seishi-jou belonged to the elite class back in those days. As the factory was the first governmental model factory, many of the female workers taught and guided other factory workers in Japan after they were trained. Therefore, the management style and welfare system of Tomioka Seishi-jou naturally influenced all other Japanese factories in varying degrees.

Japanese companies also utilized traditional family principles in Japanese society. Nakane analyzed the Japanese characteristic of intra-organization, vertical mobility system and inter-organization immobility in comparison, with occidental societies.[57] In Japanese society, workers are promoted to the executive class depending on their efforts within the organization unlike usual occidental societies. The "Noren-wake" was the typical case of vertical mobility, as mentioned in the previous section.

In occidental societies, both executive and worker classes are fixed. Moreover, they exhibit class consciousness and solidarity beyond the company's boundary. For example, occidental unions are organized by inter-company laborers on a nationwide basis, such as the unions of chimney sweepers, lathe turners, painters, melders, and so on. On the contrary, Japanese unions are usually organized by company.

Therefore, conflicts between executives and workers in occidental society are more severe than that of Japanese society. Japanese companies managed to avoid severe conflicts between workers and executives through advanced occidental management systems and traditional paternalism.

### 3-3 Reconsideration of Japanese labor management

As mentioned in Section 3-1, most historical theories of Japanese labor management were strongly influenced by Shokkou-gijou which was published by the Ministry of Agricultural and Commerce in 1903. Many cases of miserable labor conditions included in this government report were corroborated in the negative theories of Japanese labor management.

*Jokou–aishi*, (introduced in Section 2-2) perpetuated a negative image of Japanese labor management in the Industrial Revolution period similar to the works of Oastler and Sadler, which perpetuated an undesirable image of child labor in England in the 19th century. Other famous, influential works in the 19th century were *Nihonno–kasoushakai* [58] (The Underclass in Japan), and Ah *Nomugi–touge*[59] (Oh, Nomugi pass). Although scholars seldom explicitly quoted sensational documentary novels such as *Jokou–aishi*, these works widely influenced society and developed a negative image of Japanese labor management in the Industrial Revolution period.

In this section, Japanese labor management in the 19th century is reconsidered through the investigation of the following two works, namely *Nihonno–kasoushakai* and *Ah Nomugi–touge*. In Section 2-2, the cases that indicated a high level of welfare system of Japanese companies in the 19th century were identified during the investigation of *Jokou–aishi*, contrary to the author's intentions. Investigating other influential works is important when reconsidering the case of Japanese labor

management.

*Nihonno–kasoushakai* was originally published in 1899 by Yokoyama, based on investigations of the underclass in Japan from 1896 to 1898. In this work, cases of the livelihood of underclass individuals were investigated, who engaged in various occupations such as picking up scraps, rickshaw pulling, day labor, entertainment, working in small silk, cotton spinning, or textile factories, matches, or metal-working factories , or farmland, and so on. The circumstances of their lives, work, and family were reported by each region from the eastern side of Japan including the capital city of Tokyo, and the western side including Osaka.

Most of these documents narrated the living conditions of such individuals before the Industrial Revolution. In other words, the miserable conditions and the poverty existed since the epoque of agricultural society. Yokoyama mentioned that these miserable conditions were not a result of industrialization; rather, they created various new earning alternatives for underprivileged individuals. He also proposed the importance of education for these individuals and the organization of labor unions to overcome poverty in modern industrial society.

*Ah Nomugi–touge* was published by Yamamoto in 1977 based on his interviews with 580 female workers, who went to work in spinning silk factories in Nagano prefecture from Gifu prefecture around 1910. Notwithstanding the sensational expression at the beginning of the book, Yamamoto insisted on the importance of corresponding documentation to historical facts without sentimentalism.

He recorded many testimonies of good working conditions in silk spinning factories. In the route from Gifu to Nagano prefecture included Nomugi pass which was a steep mountain pass, that could only be traversed by foot, especially severe in the winters, with thick a snow cover. However, working circumstances and labor management of factories were neither miserable nor cruel. Most girls felt anxious and helpless about working away from homes. However, many testimonies indicated that they were able to return to their homes happily with a considerable amount of money. Someone even testified, "We went in tears, and returned with a smile". Table 3-1 clearly summarizes the numerous testimonies, as follows.

Yamamoto pointed out that most former girl workers unanimously testified that agricultural work in their homes were harsher compared to the labor in the factories, and their home meals were more miserable than that served at the workplace. In short, the last stage of the agricultural civilization prior to the Industrial Revolution witnessed the limited survival of humans with an impoverished standard of living. Therefore, the Industrial Revolution and industrial society did not

Table 3-1 Teen-aged girl workers' impression of work condition (%)
in the late 19th century to the beginning of 20th century[60]
(*Ah Nomugi-touge*, p.332)

| | High | Normal | Low |
|---|---|---|---|
| Quality of meal | 90 | 10 | 0 |
| Severity of work | 3 | 75 | 22 |
| Wage | 70 | 30 | 0 |
| Severity of product inspection | 90 | 10 | 0 |
| Quality of medical care | 10 | 50 | 40 |
| Total impression of the quality of the migrant | 90 | 10 | 0 |

create crueler or more miserable work conditions than the agricultural society.

## 4. Conclusion and Implications

By reconsidering the case of labor conditions, we identified two illusions concerned with the Industrial Revolution and industrial society based on the notion of advanced and backward countries. The first illusion is based on romanticism, and the second is from Marxism.

The illusion from romanticism was based on the fictional image of an agricultural civilization where life in the village was calm, pastoral, and idyllic, and people were surrounded by the blessings of nature. A different illusion was observed in the industrial civilization. Life was nothing but harsh and cruel work for paltry wages as slaves of machines and capitalism, and the environment was dangerous, noisy, and dirty.

However, agricultural civilization actually had severely limited productivity and a low regard for human welfare. Agricultural and livestock work without machines were harsh and cruel. Furthermore, this society had more serious hygiene problems than the first stage of industrial society. In fact, Ashton pointed out that the cause of the rapidly increasing children population in late 18th century England included improved productivity and wealth, as well as mass production, distribution, and diffusion of clean clothes, gauze, cotton, and soap.[61]

As mentioned in Section 1–4, contrary to the romantic image, the children's working conditions in an agricultural society were severe, especially in cold winters and hot summers. Moreover, meals for children were poor and strictly limited by their bounded productivity.

On the contrary, child workers in an industrial society could support families by doing secondary, simple tasks. For example, Nardinelli introduced Smelser's investigation of child workers in the

early stages of the Industrial Revolution in mid-18th century England. As most of the child workers in those days worked with their parents or other relatives, children were supervised and protected.[62]

It was found that Japanese child workers, including children aged between 12－15, in matches factories in the late 19th century could earn a fairly high wage[63], while those aged between 7－8 in spinning factories were supervised and protected by their parents or sisters. An employer of a factory testified that even though the young children employed in the factory worked for 20% of the day and played for 80%, company still paid them a salary and provided other benefits.[64]

In general, in both advanced and backward countries, child workers were not miserable, unprotected victims, nor were they cruelly treated by greedy capitalists. Similarly, agricultural villages were not a paradise as portrayed by romanticists. Human life was sustained by severely limited nutrition and various types of harsh labor in the last of agricultural civilization.

The second illusion of the Industrial Revolution and industrial society came from Marxism. Marxists usually hypothesize that industrial society and capitalism ruined cottage industries by free farmers, introduced the famers' family members as proletariats, and exploited them. Marxists were also brainwashed through romantic hypotheses about agricultural society.

However, as Hayek indicated in Section 1-3, industrialization created new employment for many children who would otherwise be abandoned in an agricultural society. At the beginning of the industrial society, a large number of light and secondary machine work required numerous children and teenage girls. While there were some greedy employers who abused and exploited the young workers, most of them were either imprisoned or they went out of business because of their failure to recruit labors.

The cottage industries were not affected by the exploitation of capitalism but replaced through a highly productive process and the resultant improved wages. Most free farmers and their family members preferred the new industrial jobs in factories compared to traditional agricultural tasks or livestock rearing, because of easier work processes and higher wages.

By reconsidering some famous classical works concerned with labor management, the high level of Japanese labor management was found to contradict the fictional dramas, novels, or movies aiming to achieve commercial success by sensationalizing the truth.

An image or imagination is useful to economize our bounded rationality. The image is concerned with our long-term memories, such as impressions without the details of short-term memories. Simon noted that long-term memories contributed more to making correct, intuitive

decisions.[65] As such, in scientific investigations, images or imagination must be carefully treated, as the images are sometimes inclined to stereotyping, fixed conceptualization, and prejudice, contrary to the facts. They are, thus a double-edged sword that can economize limited human rationality to understand affairs and also cloud our judgment.

**Note**

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2) Rifkin, J. *Entropy*　Bantam Books 1980
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54）*Shokkou-gijou* showed that child labor less than fourteen years old occupied high percentage in spinning, textile, match industry in 1900 counted 12–16%. See Ministry of Agriculture and Commerce op. cit. p.44–45. While Nardinelli indicated the rate of children aged 10–14 of non-textile industries in England and Wales in 1901 was 16.9% in Ibid. p.119. The rate of child workers in England silk factories 1890 was 7% in Ibid. p. 110, in textile factories 1890 was 4% in Ibid. p. 113.

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56）Moissonnier, M. op. cit. Chap. Ⅲ La "Fabrique" Lyonnaise: Les Canuts pp. 75–97

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60) Yamamoto, S.　Ibid. p. 332　Yamamoto estimated, and totalized girl workers' impression based on his own interviewing to 580 persons who were girl workers more than 65 years ago.
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