

A Literature Review on Research on the Causes and Resolution of Adverse Selection from the Perspective of Asymmetric Information

Anyi Lu^{1*} and Yifei Wang²

¹*Suzhou Foreign Language High School, Suzhou, China*

²*Ulink College of Shanghai, Shanghai, China*

**Corresponding author: Anyi Lu.*

Abstract

Asymmetric information exists when one party possesses more accurate information and holds a more advantage position over the other in a transaction. This information gap often leads to adverse selection, further causing problems such as reduced product quality, distorted market prices and low market efficiency. This article reveals how adverse selection appears in different fields of the market, analyses the main causes of adverse selection and addresses several solutions the researchers have proposed. Different aspects are discussed, including the used cars, insurance companies, the education market and CEO compensation structure. Other topics, such as moral hazard, are also considered. This review examines experimental studies carried out by researchers which tested various strategies to address adverse selection, for example, screening, signaling, reputation mechanism and after-sale guarantee. It provides a practical guidance for future policymakers, firms and individuals, who want to mitigate the negative impact of adverse selection. In addition, it points out areas that require further investigation, which can in turn optimize resource allocation and improve market efficiency. This article may improve the understanding of asymmetric information phenomenon in economic market.

Keywords

asymmetric information, adverse selection, lemon market, screening and signaling, market efficiency

1. Introduction

This article reviews the theory and empirical studies of asymmetric information. Asymmetric information describes a situation where one party possesses more accurate information in a transaction, while the other party is at a disadvantage position in terms of information. It deeply analyses the common logical patterns, differences, and harms of adverse selection in various markets. It breaks through the limitations of single-market research, using cases such as the lemon market and the insurance market, combined with effective signals, moral hazard, and other solutions, to construct solutions for adverse selection problems applicable to

multiple scenarios. These provide theoretical references and practical ideas for optimizing market resource allocation, improving market operation efficiency, and avoiding market failure.

2. Literature Review

2.1 Lemon Market

Asymmetric information exists in the lemon market, which is defined by the fact that the sellers hold superior information relative to the buyers. This is reflected in multiple market scenarios. It distorts resource allocation and weakens market efficiency.

One well-known example is the used car market [1]. In this framework, the seller has complete knowledge of the vehicle's true condition, including its maintenance history and hidden mechanical defects. However, the buyers lack the ability to distinguish between high-quality cars and lemons (low-quality cars). Faced with this uncertainty of incomplete information, the buyers will offer a price based on the average quality of the vehicles in the market. (The expected value of a randomly selected vehicle is obtained by calculating the weighted average of the values of high-quality and low-quality vehicles based on the respective market shares.) This average pricing strategy will cause the sellers of high-quality cars to exit the market, as the valuation of the cars is higher than the offer price of the buyers. As high-quality cars exit, the buyers' expectation of the average quality drops, and the transaction price continues to decline. This vicious cycle intensifies continuously, eventually leading to a significant market contraction, or even a complete collapse. For instance, Emons and Sheldon conducted an empirical test on the problem of adverse selection in the used car market using vehicle registration and maintenance data from the canton of Basel in Switzerland [2]. The research results showed that the average quality of the vehicles sold on the market was significantly lower than that of the vehicles that the owners intended to keep for own use. The maintenance frequency was 12% - 18% higher, and the failure probabilities of key components such as engines and transmissions were also higher. This result directly confirmed Akerlof's lemon market theory, indicating that in the case of information asymmetry, sellers are more likely to put low-quality vehicles on the market, while buyers can only bid based on the average quality, ultimately resulting in high-quality vehicles being pushed out of the market.

Apart from the used car market, similar adverse selection problems also exist in other markets where sellers have information advantages. In less developed economies, quality uncertainty and dishonest transactions are even more severe. Quality problems are widespread in the markets. For instance, rice sold in the Indian market is often adulterated with stones and impurities, and nearly 85% of export goods require strict quality inspection [1]. Sellers are fully aware of whether the product meets quality standards, while buyers struggle to identify hidden defects or adulteration. This information gap increases the cost of quality verification, such as hiring professional appraisers or spending extensive time comparing products, which diverts resources that should be used for production. In the absence of effective constraints, dishonest sellers will pass off inferior or adulterated products as qualified ones for sale, while honest producers with genuine quality cannot obtain reasonable profits. Therefore, in the long run, high-quality suppliers will exit the market, market quality will decline, and transaction confidence will be weakened. In such an environment, the information asymmetry dominated by sellers directly distorts resource allocation and hinders the normal operations of the market.

2.2 Insurance Market

The insurance market exhibits the same problems as the lemon market, but in an opposite direction: the buyers become the information-advantaged party, while the sellers become the information-disadvantaged party. If market information is symmetrical, both the insurance company and the policyholder are aware of the policyholder's personal medical history, potential chronic diseases, and expected medical expenses. The insurance company can set different premiums based on the actual risk of the policyholder. High-risk groups use high-protection plans and pay higher premiums, while low-risk people choose lower-cost ordinary plans. This achieves the optimal allocation of resources and perfect risk-sharing. At this time, the insurance company can provide a wide variety of products, without the need to conduct risk-screening. Therefore, there will be no adverse selection, and all groups can obtain suitable protection at reasonable prices, and the market operates efficiently and stably.

However, in reality, information asymmetry is the norm in the insurance market. Policyholders have private information about customers' own health risks, while insurance companies do not have complete data and are unable to distinguish between high-risk and low-risk individuals. Such policy can only set premiums based on the average risk level of the market. The average premiums would be too high for low-risk individuals. Therefore, low-risk individuals will choose not to purchase and leave the market, and eventually, only high-risk individuals remain. As low-risk individuals continue to withdraw, the overall risk level of the remaining insured individuals rises significantly, pushing up the average compensation costs of the insurance company. This, in turn, forces the insurance company to further increase premiums. This cycle continues to intensify, eventually triggering an adverse selection death spiral. A typical case is Harvard University's health insurance program in the 1990s: In 1992, Harvard University offered two health insurance options, a generous PPO and HMOs. The PPO was more expensive than the HMOs, and its enrollment remained stable at about 20 percent. In the mid-1990s, to reduce its deficit caused partly by rising health costs, Harvard introduced an equal contribution rule and pushed its health insurers to cut premiums [3]. HMO premiums dropped sharply while PPO premiums stayed the same, meaning Harvard had to pay more for the PPO. This led to a significant drop in PPO enrollment; those who still chose the PPO were on average 5 years older and 20% unhealthier than those who left. Higher illness risk caused the PPO to lose a huge amount of money, forcing it to raise premiums again. This led more healthy people to leave, with only unhealthy employees willing to pay the extra costs for it, and the PPO was ultimately disbanded in 1996.

2.3 Education Market

The adverse selection phenomenon in the insurance market and the lemon market demonstrates that information asymmetry leads to market failure. When the scenario of information asymmetry shifts to the labor market, the authors find that through effective signal transmission, the information barriers can be broken, and the education market is a typical application scenario of this solution mechanism.

Asymmetric information exists in the labor market, as only the candidates themselves know their own skills and abilities fully; the abilities and other hidden traits, such as perseverance and motivation, usually cannot be directly observed by employers, creating an information gap between the employers and employees. Under the situation of information imbalance, it's difficult for employers to distinguish the high-ability workers who are truly productive from the low-ability ones. Due to asymmetric information, the employers are unable to set different wages that match each worker's productivity, and a wage based on the average productivity of the labor market may be introduced. High ability workers are unwilling to accept the wage that underestimates actual contribution, but the low ability workers are satisfied because such workers true productivity is below the wage given. The high-ability workers withdraw from the market, and the market is crowded with low-ability workers, which leads to serious consequences: the total productivity falls, and the firm may collapse. Due to the information asymmetry, employers may choose to screen workers by personal characteristics such as gender and race. Races represent social background, school qualities, and work abilities to some extent. Then there will be an increase in discrimination in the employment of minorities. Minority groups may have fewer educational resources and lack formal certificates. The talent of high-ability applicants from minority groups may be ignored, and minority groups may receive lower wages that do not match workers' contribution. This increases the problem of racial discrimination and income inequality.

2.4 Compensation Structure

The principal-agent problem is a conflict-of-interest issue that arises when the principal delegates tasks or decisions to the agent who acts on their behalf, but the agent's personal goals don't perfectly align with the principals due to different incentives. One typical example is the conflict between shareholders (principals) and company managers (agents), where the shareholders want to maximize profit or share values, while the managers want to maximize net utility (considering both wage and the cost of effort).

The principal-agent problem arises from information asymmetry, which leads to moral hazard. Theoretical models establish two wage constraints to motivate CEO effort: compensation should not be excessively high, to preserve principals' incentive motivation, nor too low, to ensure CEO exert high effort. This framework yields a reasonable compensation range consistent with real-world fixed salary practices. Persistent information asymmetry and misaligned incentives can intensify negative outcomes, including CEO shirking and excessive on-the-job consumption, ultimately diminishing corporate value.

In summary, the principal-agent problem is rooted in information asymmetry, divergent incentives, and high monitoring costs. Performance-based pay and clear contracts could theoretically alleviate the conflict, but the effectiveness is weakened by executive power and inherent flaws in incentive tools, making real-world resolution far more complex than theoretical expectations.

3. Implication

In the Lemon Market scenario, there are three primary solutions to mitigate the market failure caused by the information advantage of the sellers. First, provide product warranties and after-sales guarantees. This can transfer the quality risks of the products to the seller, alleviating the concerns of the buyers due to information asymmetry. Cross-border e-commerce platforms like Wish and domestic shopping apps have introduced services such as seven-day no-reason return and exchange, as well as guarantees of genuine products, allowing buyers to return or exchange inferior products and strictly requiring sellers to control the quality. In the used car market of the United States, the extended warranty services provided by dealers have been proven to significantly increase the transaction price and sales volume of vehicles. By transferring the risk to the sellers, such warranties directly reduce the uncertainty for buyers and encourage to participate in the market transactions [4]. Second, brands and chains. These build consumer trust through stable product quality and long-term accumulated reputation, which becomes a powerful way to reduce information asymmetry. If a well-known brand has quality issues, it will suffer huge losses. Therefore, merchants will strive to maintain stable quality. In underdeveloped markets, chain stores with unified quality control can break the predicament of the lemon market by relying on standardized supply chains, allowing consumers to consume without having to inspect products one by one. Large retail chain enterprises such as Walmart and Carrefour have successfully mitigated the problem of adverse selection through brand reputation. Consumers are willing to pay a premium for the products sold by these brands because the consistent quality control of the chain enterprises serves as a credible signal of product reliability [5]. Third, introduce third-party evaluations and quality certifications. Conduct quality evaluations and certifications by authoritative third-party institutions to build an information bridge between buyers and sellers, transmitting effective and trustworthy signals, which can reduce market adverse selection. For instance, taking the product-level quality certification launched by Wish, certified products have an average sales increase of 10.5% and a price increase of 3.0%. This helps consumers quickly identify high-quality products and increases purchases [6].

In the insurance market, there are some solutions to the problems of asymmetric information. The first solution is experience-rating. If insurers can identify risk types, different markets develop for different types, which leads to Pareto-efficient outcomes. This can be based on personal characteristics such as age and gender, as well as medical history. However, there will be no insurance available for a high-risk type. This is efficient but unfair and inequitable, as it carries the risk of statistical discrimination. Another solution is screening or rationing, where lower-risk types are offered cheaper but limited coverage in order to make plan sufficiently unattractive to higher-risk types [7].

Regards to Education Market, Spence argues that education often acts as an alternative signal of employees' innate ability, skills, intelligence, and unobserved traits [8]. Applicants will signal the ability to employers by choosing years of education, and employers will use the level of education as a proxy to sort and screen workers. Applicants with a longer length of schooling are more likely to be recognized as high ability ones, thus higher wages in turn. This is known as the signaling effect of education, where education acts as a tool to combat asymmetric information. Empirical evidence shows that such a signaling value of education does exist in the real world. Tyler, Murnane and Willett use the "difference in differences" method to estimate the signaling value of the GED [9]. GED is an exam in the US for school dropouts to get a second chance to receive an alternative high school diploma. But GED passing standards are different in various US states, so economists are able to compare individuals who have the same GED test scores, but some people received GED certifications and others did not. These people are considered to have the same level of abilities but only differ in diploma attainment. The impact of human capital is almost removed from the estimates, so by observing these marginal people, the authors could identify the pure signaling effect of the GED. The chosen US states are divided into two kinds: one is the "treatment states", those with lower passing standards and the students there get a GED, and the other is the "comparisons state", where students with the same scores cannot pass due to higher passing standards. This paper shows that the 1995 earnings of young white dropouts with GED status rose by 10 to 19 percent, while the wages of minority groups did not increase significantly. According

to Table V, the “difference in differences” estimates indicates that the annual earnings of young white dropouts increased by about 1500 dollars (1473 and 1531 dollars). It filters out the pure signaling effect of education.

For compensation, Incentive-based pay and performance-sensitive compensation structures are primary mechanisms for addressing the conflict between shareholders (principals) and CEO's (agents). Compensation design attempts to bridge this gap by balancing incentives and controls, but the effectiveness of these mechanisms is contingent on the quality of information and monitoring available to shareholders. In practice, companies employ various compensation packages, including bonuses tied to financial metrics, long-term incentive plans, and severance agreements, all intended to motivate CEO to act in the best interest of the firm. Data on U.S. CEO from 1974 to 1986 shows extremely low pay-performance sensitivity: CEO compensation changed by only about \$3.25 for every \$1,000 change in shareholder wealth. At that time, cash compensation accounted for an overwhelmingly high proportion, while stock and option compensation made up less than 1%. Severe agency problems existed, and the interests of CEO's and shareholders were weakly aligned. A substantial increase in the proportion of equity and option incentives in CEO's compensation structure follows [10]. As from 1980-1994, the proportion of stock options has increased from 20% to over 50%, and the compensation structure of the CEO has shifted from "cash-dominated" to "equity-dominated". This significantly enhanced performance sensitivity: For every \$1,000 change in shareholder wealth, the CEO's wealth changes by approximately \$25. Empirical evidence has shown that the widespread adoption of equity/option incentives has significantly enhanced the alignment of interests between CEO's and shareholders. For example, the leisure consumption / laziness was measured by the number of times the CEO played golf (with 22 or more rounds per year indicating the high-laziness group), the lower the equity incentive, the more often the CEO plays golf; for every 1% increase in equity share, the annual golf rounds decrease by approximately 0.5 rounds [11]. Although the incentive-based compensation is effective, there are certain nuances in the implementation process. For example, both stock prices and company performance are influenced by exogenous shocks (such as market sentiment, macro policies, and industry cycles), and the phenomenon is irrelevant to the efforts of the CEO. When the stock price deviates from the accounting performance, shareholders are unable to distinguish whether it is because the CEO is being lazy / not working hard, or it is due to external noise causing fluctuations in the results.

4. Discussion

This review has some limitations. First of all, most of the studies are based on simple models. These studies assume that there is only one kind of information that is unknown to one party in a transaction, but neglects buyers and sellers face different kinds of uncertainties. Secondly, these studies mainly focus on traditional markets, while new digital platforms in the modern era, such as e-commerce did not get much attention. Thirdly, in some cases, strategies like screening and signaling could be mixed.

Future research can address the above limitations and enrich existing findings in multiple ways. First, more sophisticated comprehensive models should be built to incorporate heterogeneous uncertainties for both transaction parties instead of single-uncertainty assumptions, enhancing real-world fitness and theoretical rigor. Second, greater attention shall be paid to emerging digital-economy scenarios to study information asymmetry and governance on digital platforms and complement traditional-market-centered research. Third, mixed uses and differentiated effects of screening and signaling strategies deserve further exploration. Researchers also need to refine incentive-compensation mechanisms by isolating external disturbances from managerial efforts to establish sound performance evaluation systems and reduce governance mistakes from market noise.

5. Conclusion

In conclusion, information asymmetry is not a single market phenomenon but is present in various transaction scenarios. Together, the analysis confirms a core conclusion: the information gap could be a significant root cause of the inefficient allocation of resources, but the governance strategies must vary according to the specific characteristics of information asymmetry in each market. Whether it is information transparency, risk adjustment, or signal transmission and compensation contracts, the effectiveness depends on whether such factors precisely match the specific features of information asymmetry in that market.

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Conflicts of Interest

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