# Substitutability Analysis of Trade in Goods and Trade in Services Balances Based on Comparative Advantage Theory

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**Abstract.** It is found that there is obvious substitutability between the balance of trade in goods and services, which means countries with a surplus in services trade generally have a deficit in goods trade, while countries with a surplus in goods trade tend to have a deficit in services trade. This paper is based on the theory of comparative advantage, and joins the management of cross-border flow of factors, to further analyze the formation mechanism of trade balance substitutability. Due to the finiteness of production resources and factors, countries have differentiated comparative advantage in the production of products or factor services. By exporting goods or services with a comparative advantage and importing products or services without a comparative advantage, the overall balance of trade is finally realized. Therefore, the merchandise trade deficit is a reflection of the service trade surplus. The fundamental reason for the trade imbalance between China and the United States is the excessive focus on the merchandise trade deficit or surplus of a single country. To alleviate China's services trade deficit, it is crucial to improve the structure of services trade and enhance the international competitiveness of the services industry.

**Keywords:** trade in services and goods, differential substitutability, comparative advantage theory, trade imbalance

## 1 INTRODUCTION

With the development of the economy, the structure of the economy is gradually transforming into the service industry. There is a complex relationship between trade in services and goods, which influence and complement each other in the global value chain. Meanwhile, there is a certain competitive relationship between the two, according to international trade data statistics, the balance of services trade and goods trade shows obvious substitution[1]. At present, the research field is more from the empirical point of view to analyze the relationship, while this paper is based on the comparative advantage model to analyze the formation mechanism of the difference substitutability of


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the coexistence of trade in goods and trade in factor services, and then explore the reasons for the trade imbalance, which is an important reference significance for a country's trade structure and economic development.

# 2 LITERATURE REVIEW

Domestic and foreign studies show that there is differential substitutability between trade in goods and services, Xie Kang et al. (2000) analyzed the Gamma coefficient and correlation coefficient of the net trade in goods and services through three sets of data systems and pointed out that the net trade in goods and services are negatively correlated in general, and it is especially obvious in the developed countries[2]. Based on Melvin's improved model, Chen Zhaojun (2001) applied the Deardorf model variant and made further theoretical interpretation and empirical analysis of Xie Kang et al. (2000), which found there is an unusually significant complementarity between the broad factor service and goods trade, but there is no clear complementarity between the product service trade and goods trade. This suggests that there may be differences in the impact of different types of services trade on goods trade, and that more detailed empirical studies are needed to understand the interaction[3]. Discussing the nature of differential substitutability, Zhou Yan et al. (2007), based on the analysis of 1990-2003 data, pointed out that the differential substitutability of the two stems from the industrial structure between the two types of trade and the trend of the change of comparative advantages of countries, and that this substitution relationship is inevitable in the development of the economy[4]. Hildegunn (2009) analyzed the interrelationship between goods and services in production, which concludes that countries have different roles in trade when they have different technologies in the production of services[5].

These findings provide clues to the complex relationship between trade in goods and services. Based on this, this paper will take the U.S.-China trade imbalance as a breakthrough to analyze the applicability of the theory of comparative advantage in the trade in services, and to analyze the phenomenon of "trade imbalance", to provide useful references for the formulation of relevant trade policies.

# 3 DIFFERENTIAL SUBSTITUTABILITY ANALYSIS

## 3.1 Adaptation Analysis

In the study of the applicability of goods trade theory in services trade, economists usually have three academic views - "applicable", "improper", and "improved". The traditional comparative advantage theory has limitations in explaining services trade due to the objective characteristics of services being immovable as well as non-storable. However, it cannot be denied that factor endowment is important in determining the pattern of trade in both goods and services, and the "reasonable kernel" of comparative advantage applies to explaining international trade in factor services.

### 3.2 Overview of the Comparative Advantage Model

On this basis, this paper analyzes the adaptability of comparative advantage in the formation mechanism of trade in factor services and explores the differential substitutability of trade in goods and services. Model Assumptions:

(1) Assume that only two factors of production are needed, the factor of management K and the factor of labor L. Assume that the factor of management can be used not only for the production of goods, but can also be moved across borders. Labor does not satisfy the above characteristics and thus cannot move across borders as a service factor. (2) There are only two countries in the economy, country A and country B, where country A has a relatively more abundant managerial factor endowment and country B has a relatively more abundant labor factor endowment. (3) There are only two products in the economy, product X and product Y, where product X is labor-intensive and product Y is management-intensive. (4) Country A and Country B have identical demand profiles and preferences. (6) There are no transportation costs, tariffs, or other barriers to the free flow of international trade.

Based on conditions of pure merchandise trade, country A has a comparative advantage in the production of managerial factor-intensive product Y, while country B has a comparative advantage in the production of labor-factor-intensive product X:

$$(P_X/P_Y)_A > (P_X/P_Y)_B \tag{1}$$

That is, the relative price of domestic product X to product Y in country A is higher than the relative price in country B. Therefore, country A will export product Y and import product X. And country B is the opposite, export product X and import product Y, so that the two countries are profitable, and then the two countries of factor prices are equal. At this point, the two countries can realize the equilibrium state. When the management factor is a factor service directly involved in trade, due to the relatively more abundant endowment of management factors in country A, the relative price of management factors for labor factors in country A is lower than that in country B. The price of labor factors in country A is also lower than that in country B. Not only have that, the case where trade in services and trade in goods coexisted has: (where r is the price of the management factor K)

$$(r/P_X)_A < (r/P_X)_B \tag{2}$$

$$(r/P_Y)_A < (r/P_Y)_B \tag{3}$$

The equation above shows that the relative prices of the factor and commodity X are lower in country A than in country B. If the trade between countries A and B is only between factor K and commodity X, since country A has an advantage in factor K, country B has an advantage of commodity X. So country A exports management services and imports good X, while country B exports good X and imports management services. This is consistent with the core idea of the traditional theory of comparative advantage, and will eventually lead to trade equilibrium, where the prices of goods and factors will be equalized. At this point, country A has a trade deficit in goods and a trade surplus in services, while country B has a trade surplus in goods and a trade deficit in services. In terms of trade in goods or services only, there will be a surplus or deficit imbalance between the two countries. However, in terms of the country's overall trade situation, the trade balance is still balanced. To summarize, country A's trade deficit in goods is due to the investment of factors of production in the direct export of managerial services rather than the export of managerial resource-intensive goods Y.

Therefore, the deficit in goods trade reflects the competitive advantage of services trade. If it is further assumed that good X is not tradable, there is still an incentive for country A to export managerial services due to the price advantage. After importing managerial services, country B can use them for the production of managerial-intensive goods Y, which can be exported to country A. The trade deficit in goods is directly due to the competitive advantage of trade in services. This fact may seem to contradict the theory of comparative advantage in terms of resource endowment, but it exists in reality, and this pattern of trade leads to a more efficient allocation of the world's resources.

In this case, an overall balance of trade can also be achieved. But the essence of trade behind this is also based on the theory of comparative advantage, with the management-intensive goods being replaced by the relevant management factors.

# 4 TRADE IMBALANCE BETWEEN CHINA AND THE UNITED STATES

## 4.1 Analysis of the Current Situation

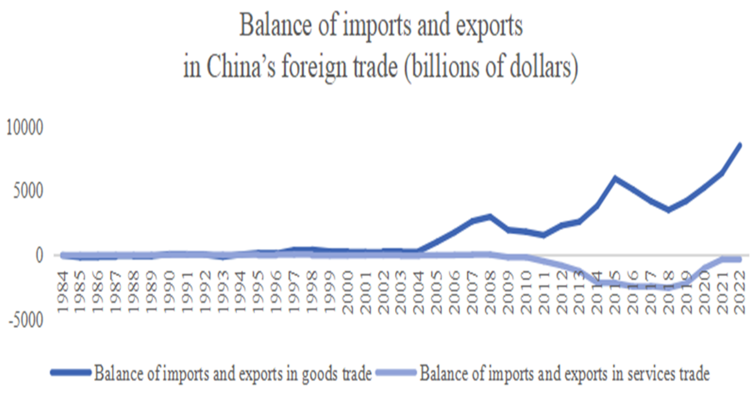


**Fig. 1.** Balance of imports and exports in China's foreign trade.

Figures 1 and 2 present data on the export-import balance of trade in goods and services of the United States and China for the period 1984-2022. It can be found that the difference between the two may be complementary to some extent. The United States' surplus in trade in services may partially compensate for its deficit in goods trade, while China's surplus in goods trade may compensate for its deficit in services trade, thus maintaining the overall balance.

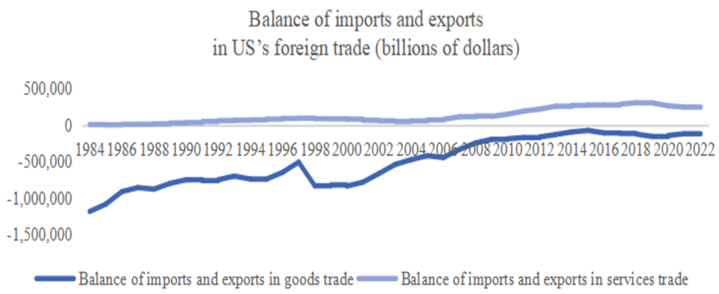


**Fig. 2.** Balance of imports and exports in the US's foreign trade.

### 4.2 Policy Recommendations

When it comes to the trade imbalance between China and the United States, the differential substitutability of the trade in goods and services needs to be taken into account. Since China and the United States have different strengths and needs, the benefits of economic cooperation between the two countries outweigh political confrontation, which means that China and the United States should actively seek cooperation rather than focusing solely on trade imbalance. Therefore, when a country faces a trade deficit in services, the government can improve international competitiveness by formulating an open service trade policy, lowering entry barriers, and encouraging foreign investment[6]. The Government can also promote trade liberalization and facilitation by facilitating bilateral and multilateral negotiations. In addition, the government should encourage service enterprises to engage in international cooperation, support and guide enterprises in technological innovation transformation and upgrading through the establishment of service industry innovation bases and incubators[7]. And the government needs to strengthen regulation and standardization. The establishment of standards and certification systems can also improve the overall level of the service industry and enhance the international competitive advantage. Among other things, improving the level of intellectual property protection can protect the innovations and know-how of the service industry and attract more international investment and customers[8].

## 5 CONCLUSION

Based on the theory of comparative advantage, this paper finds that countries with abundant service factors will choose to directly export factor services and import other commodities, at which time the deficit in trade in goods to a certain extent can be seen in the country's competitive advantage in trade in services. Therefore, when judging whether a country realizes a trade balance, such as the U.S.-China trade imbalance, we should take into account the country's import and export performance in trade in goods and services. And in response to the trade imbalance, the government can make up for the deficit in goods trade with the surplus in services trade by improving the international competitiveness of the service industry, to realize a "trade balance".

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