ISSN: 2047 - 0398
SPECIAL ISSUE – V|4|N|3|, December | 2014

# CAPITAL GOODS INDUSTRY IN BRAZIL UNDER A SYSTEMIC PERSPECTIVE: Challenges and Strategic Agenda

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## ABSTRACT

*The capital goods industry is the great responsible for the technological diffusion in the industry in general. A well-developed capital goods sector means quicker access to new technologies and, consequently, a greater efficacy of the industry. Therefore, the capital goods industry acts like a propeller towards the national economic development. This sector is fundamental to boost the national industry and economy, thus being among the strategic sectors of the national policy for industry, technology and foreign trade (PITFT). The importance of this sector justifies a study of which challenges are being currently faced and which strategic agenda might be proposed to allow the national capital goods industry to overcome these challenges and to help strengthen the local industry. As a means of achieving the expected results, this work conducted a survey on the capital goods sector in Brazil by specifying its current situation. A macro-environmental analysis was performed based on a systemic approach by using the Soft Systems Methodology (SSM) to better understand the problem faced by the sector. As the main result, one can highlight that it is important for the sector to reduce its dependence on palliative measures by the government. To achieve this, it is necessary that the sector strengthens itself. This strengthening can be achieved by means of long-term governmental measures (that are beneficial to the sector) rather than the current short-term measures. These long-term measures would include improvement of the infra-structure to decrease the production costs as well as modernisation, innovation and technological improvement of the capital goods industry, enabling the sector to be more competitive by manufacturing cheaper and better quality products.*

**Keywords**: *Capital goods sector, innovation, competitiveness*

## 1. INTRODUCTION

The capital goods sector plays a key role in both industrialisation and technological diffusion, especially in the developing countries. For Gür (2004), there are three premises supporting this importance: machines increase the work productivity; the sector has the advantage to get more productivity gains compared to other sectors; and the technology diffusion provided by the sector contributes to increasing the overall productivity within the economy.

Both labour productivity and increase in the industry's productivity are closely related to the level of machine technology, which makes these factors crucial for the competitiveness of an economy (Weise, 2000).

Despite this great importance of the sector within the economy, however, Alem & Pessoal (2005, p.78) report that "the Brazilian industry has characteristics different from those observed in industrialised countries, mainly regarding the small participation of the capital goods sector in the whole economy", and in the international trade as well.

One point favouring the expansion of the capital goods sector in Brazil is precisely to collaborate with the increase in both efficacy and technological capacity of the industry. In Brazil, however, the capital goods industry turned towards the production of lower-technology goods by importing more sophisticated products (ALEM; PESSOA, 2005).

As a result of an intention to improve the industry's efficacy and technological capacity, there is a point that deserves attention: innovation of the sector. The innovation of the capital goods sector is an important way to increase both viability and flexibility of industrial economies (Gür, 2004).

The innovation of this sector can happen through two ways: 1) by the national innovation system and 2) by foreign direct investments. The national innovation system consists of an articulated group of technical, human, organisational, managerial, and financial resources aimed to support initiatives of innovation and entrepreneurship. The foreign investments are aimed to increase competitiveness among the companies, encouraging more investments in research and development (R&D), and giving prioritisation to training and qualification of human resources (ALEM; PESSOA, 2005).

Because of the importance of the capital goods sector in the Brazilian industry, as well as in this country's economy, the present work describes which challenges are being currently faced by this sector. It is important to characterise this sector for the development of this study, which involves a brief history and investigates how the capital goods industry is doing in Brazil. By fully and correctly understanding the sector's situation, it is possible to identify its challenges and then propose an agenda of actions.

## 2. RESEARCH PROBLEM & OBJECTIVES

The main problem in this study is to identify the following: "Which are the major challenges faced by the capital goods industry in Brazil?"

The general objective of this research is to investigate which major challenges are being currently faced by the capital goods industry in Brazil and to propose a strategic agenda for the sector.

The specific objectives are the following:

- To survey the situation of the capital goods industry in Brazil;
- To identify and analyse the major challenges, under the developmental perspective, of this sector in Brazil;
- To propose a strategic agenda for the sector.

## 3. METHOD

The present study is quantitative and based on bibliographical research. The data for research, which are already available for the general public, were gathered from 1) agencies studying capital goods sector, such as IBGE, BACEN, ABIMAQ, CNI, IPEA, among others; 2) scientific journals; 3) articles, theses, monographs, and dissertations on themes related to the present study; and 4) congress publications.

Next, a macro-environmental analysis was carried out, under a systemic perspective, by using the Soft System Methodology (SSM) to understand and propose suggestions for this sector. The use of SSM is justified by the fact that this systemic methodology is "projected to help formulate and solve the so-called soft situations, including complex problems usually involving various human components" (MARTINELLI; VENTURA, 2006, p.163), or even to bring new thinking or guides on how to deal with the complexity of the real world (ZEXIAN; XUHUI, 2010).

The application of SSM is subject to seven steps ranging from the real world to the systemic one (MARTINELLI; VENTURA, 2006, p. 163) as follows:

1) Investigation of the problem situation by observing the ill-defined problem situation so that maximum pertinent information can be gathered;
2) Definition and structuralisation of the problem situation by relating structure to process and identifying the issue of concern to people, the roles they play, hierarchy of power, and the highest number of relationships as possible in order to capture the existing essence;
3) Formulation of the key definitions existing in the system in order to better understand it and to reveal its main elements, namely: objects, relationships, attributes, environment and its constraints, transformations made by the system, and world view. Checkland (1990) proposed the use of the mnemonic CATWOE as a guide;
4) Elaboration of conceptual models, that is, ideal situations in which each of the key definitions can meet the expected objectives;
5) Comparison between step 4 and step 2 so that the "systemic world" (ideal situations) is abandoned and there is a return to the real world as issues are raised to discuss problems and solutions, including changes suggested from the differences found;
6) Selection of changes to be implemented after discussing and examining whether they are desirable and feasible; according to Checkland (1990), these changes may be structural, procedural or attitudinal.
7) Proposition of actions to solve the problem and implement them.

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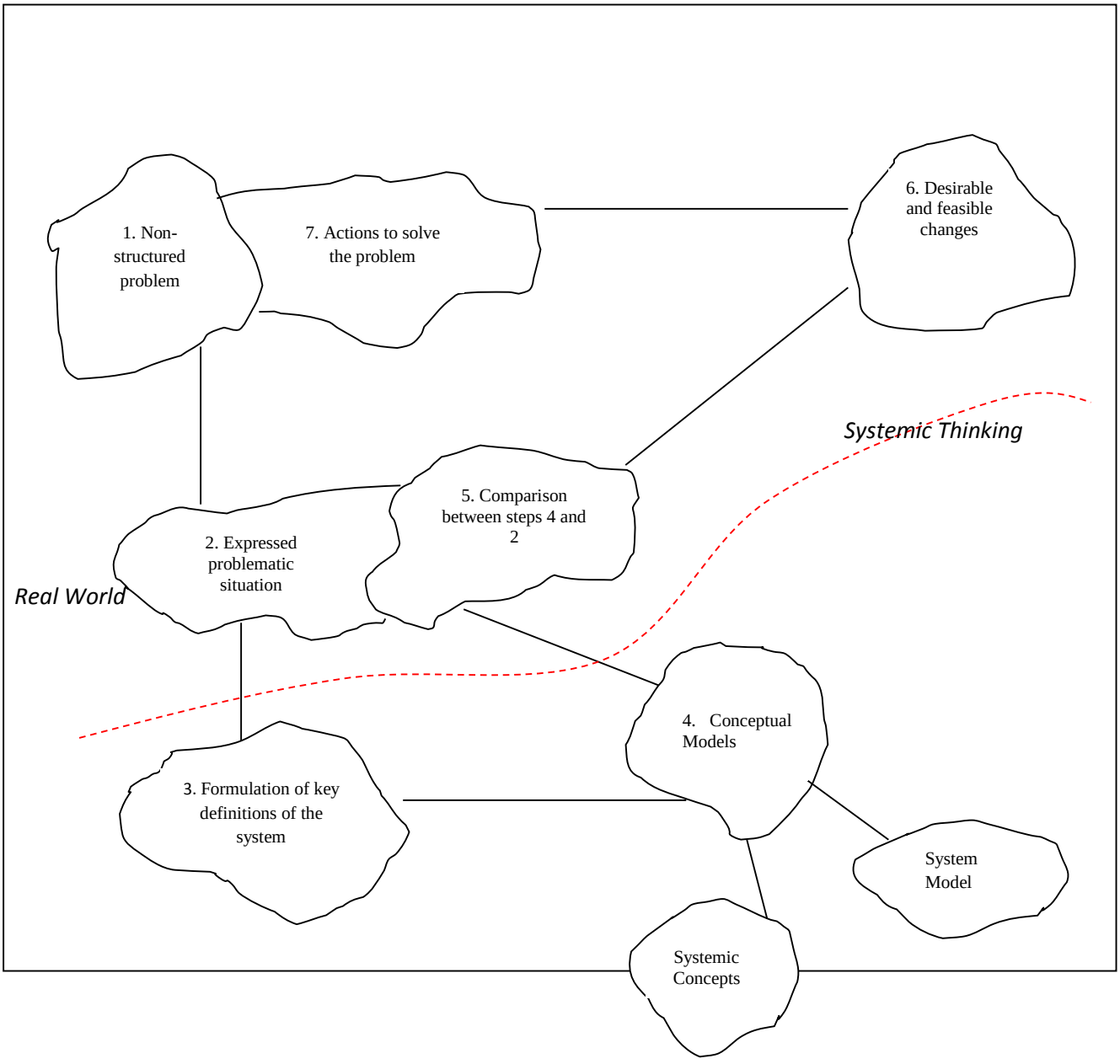
According to Martinelli & Ventura (2006), one of the most relevant aspects of the SSM during its application is that there is a high level of details regarding the system in question and its functioning, which often enables occult features to be perceived, thus helping organise the thinking". Therefore, with the information gathered by means of interviews and search for secondary data, the SSM can be used to structure the knowledge so that one can better understand the problem situation, including suggestions and propositions for changes.

**Figure 1** – The seven steps of SSM for real and systemic worlds




*Real world:*
1 - Non-structured problematic situation
2 - Expressed problematic situation
5 - Comparison between steps 4 and 2
7 - Action to improve the problematic situation Systemic thinking:
3 - Formulation of key definitions of the system
4 - Conceptual models
4a - Formal system model
4b - Other systemic concepts
Adapted from Checkland, 1981.

## 4. ANALYSIS AND CHALLENGES OF THE CAPITAL GOODS SECTOR

### 4.1. Macro-Environmental Analysis: The Political-Legal Environment

The capital goods industry, as seen in the literature review, has historically had its results influenced by governmental policies. There exist many governmental policies that cannot be made to either stimulate or discourage the productivity and development of the sector.

There are some factors that can be highlighted as crucial for the evolution of the sector: taxation, investment financing, foreign trade, and trade defence.

Taxation in Brazil is complex. It involves several taxes at federal, state and municipal levels, in addition to frequent changes in the taxation laws. This scenario is harmful for the competitiveness of the national industry in relation to international competitors.

The national taxation system can impair the competitiveness of the industry by the following: reduction of the investment rate, anti-export bias, pro-import bias, artificial incentive for verticalisation, and poor spatial allocation.

According to a proposition made by the National Industry Confederation (*CNI*), there are two points that should be given priority to improve the situation for the sector: investment tax exemption and competitiveness with foreign products.

Also, according to the same proposition, investment tax exemption is important because several indirect taxes burden the final price of the capital goods, thus raising the final cost of the investment. For the CNI, the Productive Development Policy (PDP II) should focus on the tax exemption for productive investments by allowing, for example, immediate tax credits (e.g. ICMS, PIS/PASEP and CONFINS) for the purchase of capital goods, aliquots reduced to zero, or IPI credits on capital goods. Moreover, it is necessary to introduce a rapid and ample mechanism for depreciation of the assets.

The CNI further states that it is necessary that the national industry not only becomes more competitive in relation to the foreign products but also, and not less important, develops a competitiveness at the level of the foreign industry. In this sense, the PDP should seek a full and effective tax exemption for exports – with implementation of efficient mechanisms for tax credit recovery – and elimination of distortions that prevent the Brazilian companies from competing with competitors from other countries on an equality basis. This is the case of the fiscal benefits granted to imported products, such as ICMS exemption, and the high taxation on salaries.

Another important point has to do with the financing of the industry. For the CNI, there exist two problems related to the long-term investment in Brazil: high interest rates and difficult access to financing. This affects the industry and therefore it is necessary to create solutions allowing a sustainable industrial growth.

In Brazil, there is a very strong dependence on the BNDES for long-term investment financing. For this reason, it is necessary a greater involvement of private sources for these resources and improvement of the public financing mechanisms as well.

Another issue raised is that there is the need of more modern lines of financing in conditions similar to those of the industrialised countries.

In addition to the taxation and financing of investment, another important point is the foreign trade. This work has already shown that one great problem for the Brazilian capital goods industry is the big negative difference between imports and exports. Over-valuation of the exchange rate and competition with Chinese products favour the growth of imports while exports do not grow at the same level. There is a need for improving the conditions of competitiveness so that the national industry can compete more favourably with the foreign industry.

There are some measures that are supported by both CNI and ABIMAQ. One of the important measures is the reduction of customs procedures and trade simplification. According to the Global Enabling Trade Report (2009), Brazil is ranked 98$^{th}$ among 121 countries regarding customs procedures. This shows the presence of bureaucracy and difficulties the companies face in exporting their products. In addition, it is necessary to support the internationalisation of the Brazilian companies through measures, such as protection of direct investments in foreign countries and reduced taxation on overseas investments, since there is no fiscal benefit for Brazilian companies who invest in other countries.

One of the most critical issues for the capital goods industry has to do with the trade defence. The strengthening of trade defence becomes important at the moment imports increase. There exist important anti-dumping and compensatory measures that should be impartially analysed within the period established by the World Trade Organisation (WTO). Another point to be highlighted is the industry's exports. Brazil suffers with the non-tariff trade barriers that difficult the national exports. Within this context, it is important to reinforce the multilateral trading system in order to favour the trade between countries and to reduce the protectionism in the international trade.

However, the Brazilian government is taking measures to stimulate the development of the national industry, which in turn has an impact on the capital goods industry. The industry policy of the current government's administration (2011-14) is termed "Brasil Maior".

One of the measures taken by the government, which must influence positively the capital goods industry, is to shorten the time for refund of tax (PIS-PASEP/Confins) credits on capital goods, that is, from 12 months to immediate appropriation. This means a reduction in the investment cost in terms of fixed capital.

The government has also taken measures relative on the financing of investments. One fundamental measure for maintenance of the investments was to extend the Investment Support Program (*PSI*) until December 2013. The PSI is a program launched by the government in 2009 with the aim to decrease the effects of global crisis on the national industry. This program was developed by the BNDES, the agency accounting for approval and release of credit lines to the industry sector, including reduction in interest rates for acquisition of capital goods by large companies. Nevertheless, although this measure does not help increase the competitiveness of the sector because it is actually the extension of an already established measure, it leads to a greater support for aggregation of values through innovation and acquisition/production of capital goods/components. Therefore, this is an important measure that should always be extended despite not adding any significant novelty to increase the competiveness of the capital goods industry.

Another measure was to increase the working capital for micro, small and medium enterprises through the BNDES program called PROGEREN, resulting in reduction in the cost of working capital and generating more resources and better credit conditions for working capital. This measure also increases the sector's competitiveness as the interest rate is relatively low compared to that practised by the Brazilian financial market. However, a few companies are benefited by such a measure.

The government has also implemented the Qualification Program, developed by the BNDES as well. This is a program aimed to support the expansion of private career and technical schools according to regulations by the Ministry of Education and Culture (MEC). This measure leads to an increase in the supply of qualified human resources, thus indirectly enhancing the sector's competitiveness.

The government's industry support program called "Brasil Maior" has also taken measures to help the companies' foreign trade activities by implementing the so-called "Reintegra Regime", in which up to 3% of the residual credits accumulated throughout the productive chain of the exported goods are returned, thus reducing the export costs. Therefore, there is an increase in the sector's competitiveness. With regard to the trade defence, a series of measures have been taken. For instance, measures to strengthen the trade defence regarding actions of anti-dumping and safeguards; compensatory measures to shorten the investigation time from 15 to 10 months and from 240 to 120 days for provisional right application; measures to combat the circumvention and widen both anti-dumping rights, including import compensatory measures, thus preserving the trade defence measures in force; and measures to combat false origin declaration and under-invoice prices. All these measures try and must reduce the unfair foreign competition. One measure that increases the sector's competitiveness is the requirement for mandatory certification of imported products and increased customs control in cooperation with INMETRO, SECEX, and RFB, which can result in isonomy between national and imported product.

### 4.2. Macro-Environmental Analysis: The Economic Environment

As shown earlier, the present work has demonstrated the pro-cyclic factor of the capital goods industry. Therefore, the macro-economic variables are thought to strongly influence the result of the industry, either positively or negatively. One can observe important indicators by analysing the macro-economic scenario. Next, we analyse some of these indicators to find out how they can affect the capital goods industry.

One of the major challenges faced by the capital goods sector is how to increase its exports and decrease the imports from foreign competitors, that is, improve the commercial balance, as seen elsewhere here.

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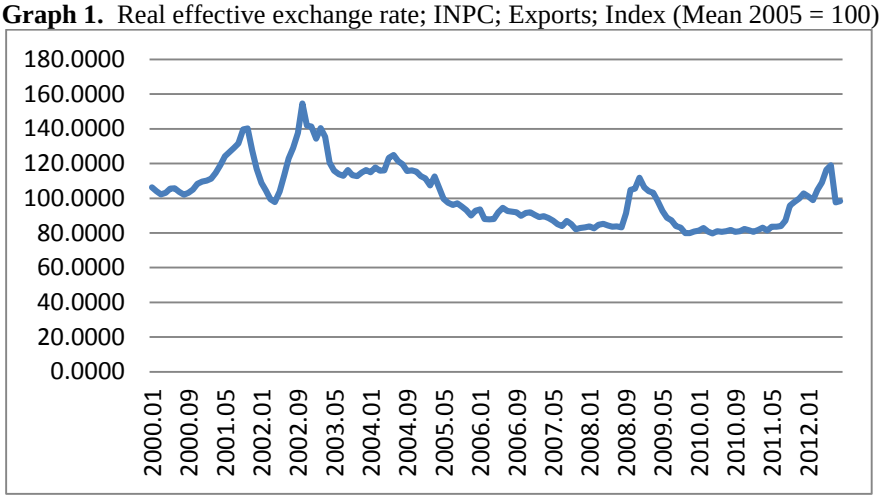
Graph 1 shows the evolution of the exchange rate for export of products in Brazil. One can observe that there has been an under-valuation of the exchange rate since 2005, which has a negative effect on the industry's exports.

**Graph 1.** Real effective exchange rate; INPC; Exports; Index (Mean 2005 = 100)

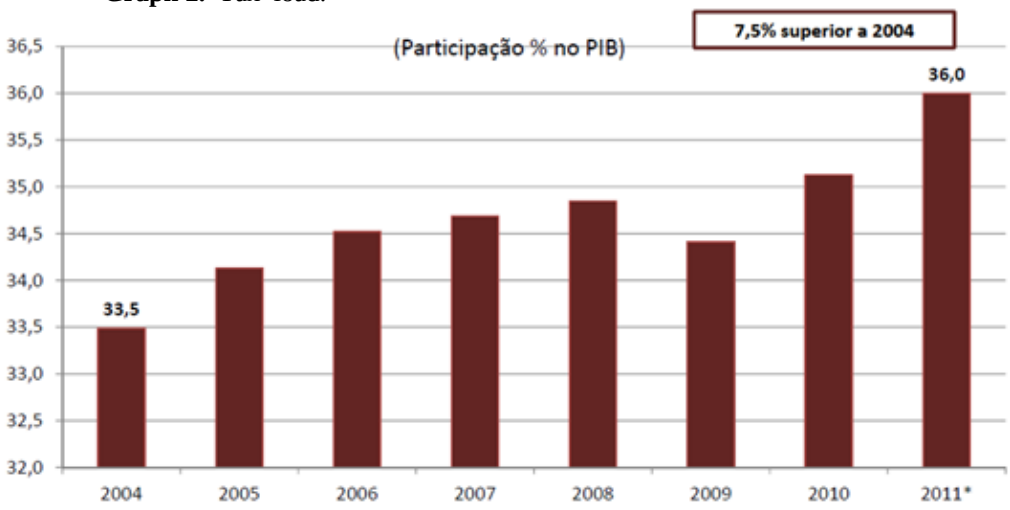



Source: IpeaData

An under-valued exchange rate makes products and services more expensive and less competitive, which in turn favours the import of them as they are cheaper. In Brazil, the cost to export machines and equipment is 66% higher than the cost to import them.

The fiscal policy also has a strong effect on the sector's result. The higher the tax load for the sector, the higher the cost, which has an indirect impact on the competitiveness of the industry before its foreign competitors. Despite some measures taken by the government (e.g. Blasil Maior program), the tax load is still very high and keeps rising. Graph 2 illustrates the evolution of the tax load.

**Graph 2.** Tax load.




GNP participation
7.5% increase in 2004
Source: BACEN and IBPT. Elaborated by ABIMAQ

When the main macro-economic indicators are analysed, one can note that the majority of them have a negative impact on the capital goods industry. Both heavy tax load and under-valued exchange rate make the Brazilian capital goods sector less competitive in relation to the foreign competitors. Graph 3 shows a comparison between imports and exports in the capital goods sector.

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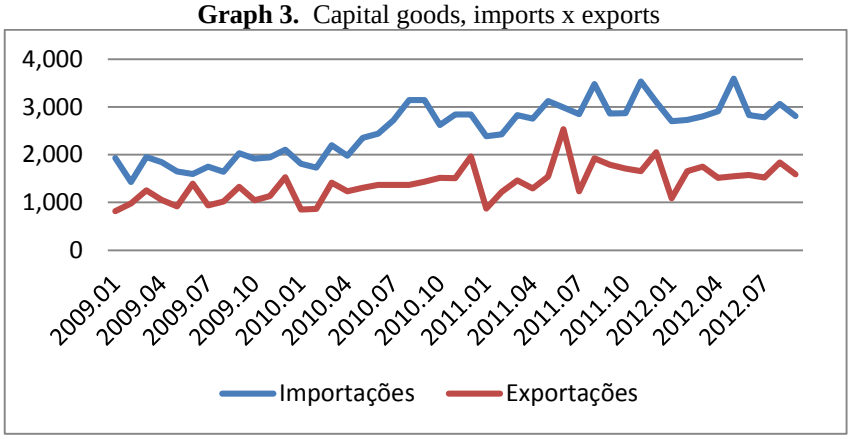
**Graph 3.** Capital goods, imports x exports




Imports x Exports
Source: IpeaData

### 4.3. Macro-Environmental Analysis: The Sociocultural Environment

The capital goods sector is also influenced by the sociocultural environment. This part of the work is focused on analysing two aspects of this environment: education and how it can help the sector recruit more qualified professionals; and demographics, i.e., how demographic growth can favour the consumption and possibly have a positive impact on the sector.

There are some factors to be considered regarding the level of education in Brazil. The first fact is that the schooling years of the population have been increasing year by year, including the school attendance rate.

In fact, the teaching is evolving in Brazil. This, allied with a better distribution of income, makes access to education easier for people. Moreover, the government has been developing programs aimed to improve people's qualification, such as the "BNDES Qualificação", as cited elsewhere. These signals show that there exists a trend of improved education level in the Brazilian population, affecting positively the capital goods industry as more qualified personnel are more likely to be hired. However, this is a long-term reality in Brazil because the difficulty in qualifying the workers is still expressive.

With regard to demographic data, it is possible to state that Brazil is experiencing a transition period, that is, the mortality rate is stable while the birth rate is decreasing. As a result, the adult and elderly population is increasing and the child population is decreasing. This leads to a decrease in the demographic dependency rate, that is, there are fewer dependents in the population, which makes the economically active people spend less with dependents, thus saving more money. In addition, there is a higher availability of labour because of the greater number of adult people – another positive factor for the sector.

### 4.4. Macro-Environmental Analysis: The Technological Environment

Much has been discussed on the importance of the capital goods sector in diffusing technology to the entire industry sector. Innovation, with its technological development, is important to increase both productivity and product quality, thus favouring the sector's growth and development. In addition, it helps enhance the competitiveness with foreign companies.

According to CNI and ABIMAQ, there are some aspects that should be improved to favour innovation in Brazil. The legal hallmark of innovation should be revised to grant the industry more incentives. It is necessary to attract R&D centres of the transactional companies to Brazil. The internationalisation of Brazilian companies is important because they will be obliged to increase their investments in innovation and R&D.

For ABIMAQ, some measures have already been taken by the government through the Brasil Maior program, and these will be analysed below. The BNDES has a pre-approved credit line for companies planning innovation. This is a measure that boosts the sector's productivity in the medium-term, but having access to this credit is not easy at all. With regard to the legal hallmark of innovation, there are more other measures too. Technology task orders, whose contracts are allowed to use technological risk clauses as established by the Law of Innovation, lead to the development of frontier technologies by public purchases. This makes high-risk task technology orders easier and enhances the competitiveness in the medium-term. There is also the modernisation of the legal hallmark by INMETRO, which widens the fiscal control of imported products and enables further partnerships with and

mobilisation of outer experts. This enhances the competitiveness of the sector by making it difficult to import foreign goods, since imported capital goods have to meet the regulations for the national industry.

In conclusion, the capital goods sector needs help from the government to improve its innovation process and thus become more competitive with foreign products.

Box 1 – **Summary of the macro-environmental analysis**

| Political-Legal Environment | Economic Environment | Sociocultural Environment | Technological Environment |
|---|---|---|---|
| Complex taxation impairs competitiveness. | Undervalued exchange rate affects exports. | Education level increasing in the country, which favours the creation of qualified labour. | The legal hallmark of innovation should be revised to increase incentives to the industry. |
| High interest rates and difficulty in having access to credits for long-term investments. | Heavy taxation. | "In the people's perspective, the situation was never so favourable (in terms of economic growth), for in this sense the country overcame the threshold of underdevelopment", according to Alves (2003, p.3). | It is necessary to attract R&D centres of the transactional companies to Brazil. |
| Heavy customs procedures that affect the foreign trade. | High Selic rates to refrain inflation, which does not favour private investments. | | The internationalisation of Brazilian companies is important because they will be obliged to increase their investments in innovation and R&D. |
| Trade defence is an important tool to combat unfair policies by foreign companies. | Capital goods imports greater than exports. | | The BNDES has a pre-approved credit line for companies planning innovation. |

Source: Elaborated by the authors.

### 4.5. Systemic Analysis (Soft Systems Methodology)

The systemic approach is based on the principles of understanding the organisation as a whole, where both human and machine are given privileged conditions, of mutually inclusive elements within the organisational system (Dela Coleta, 1989, *apud* TRINDADE & CATÃO, 1997).

Among these, the methodology chosen in this work was the Soft Systems Methodology (SSM), which is a soft approach to addressing complex and problematic situations of all kinds. It is an action-oriented process that seeks to investigate the problem situation and whose users need to follow a learning path to understand the situation and take measures to improve it (Reynolds & Holwell, 2010).

**Step 1: Investigation**

It is important to know what has led the industry to thrive and what has led it to recede so that one can arrive at an idea of the actual problem faced by the sector.

The capital goods sector has already passed through different phases over the history of development in Brazil, with periods of growth in the 1950s as a result of the "Plano de Metas" program as well as in the 1970s due to the PDN II. On the other hand, in the 1980s, there was an unstable performance of the sector and trends towards

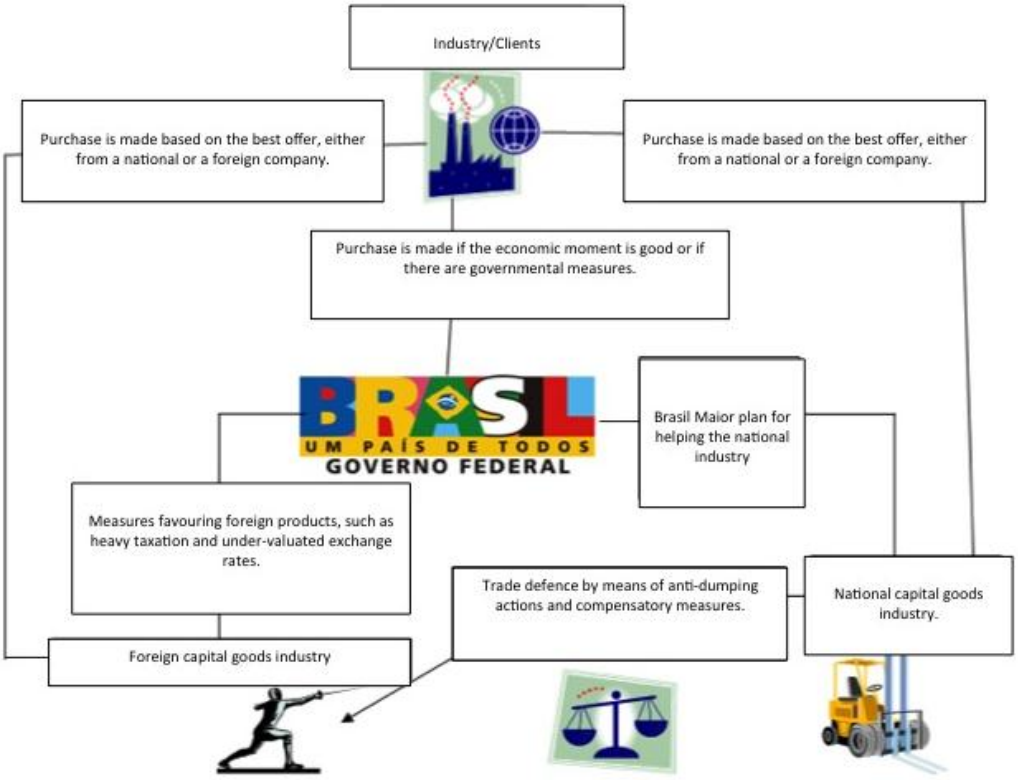
declines following the economic opening and "Real Plan". Today, the sector is experiencing a period of high competitiveness with the foreign industry.

One can observe that in both periods of growth of the capital goods industry, the government helped the sector significantly by implementing the Plano de Metas and PDN II, which were paramount for such a growth. However, in the following periods the government no longer helped the sector, letting it vulnerable to the external competitiveness, particularly after the economic opening.

It seems that the sector is still struggling to completely stabilise after the economic opening and consequent arrival of foreign industry. Based on our data, one can find that even today there is a huge deficit in the commercial balance, with imports tending to further grow and therefore harming the national sector.

**Step 2: Definition of the Problem Situation**
To understand more clearly the problem, it was developed a scheme illustrating the measures taken by the government, as shown in Figure 2.

**Figure 2.** Measures taken by the government.




Source: Elaborated by the authors

Figure 2 shows how the federal government strongly influences the situation being studied. Depending on the measures taken by the government, the industry can purchase more or less capital goods, which affects the sector's result. In addition, the macro-economic policies also have influence on the competitiveness of the national industry before the foreign ones. There exist two macro-economic biases: one that can either help or impair both imports and exports, and other that can increase the internal market consumption. It becomes clear that the main concern is with the external competition rather than with an increase in the internal market demand. Nevertheless, any increase in the internal market demand also favours the international competition, and paradoxically, it is against these foreign products that the national capital goods industry has been fighting.

**Step 3: Identification of Relevant Systems**
Taking into account what has been analysed about the present situation, relevant systems were established regarding moments and challenges faced by the capital goods sector. As seen before, the federal government is a very important player in this scenario as it is responsible for the macro-economic policies, which in turn affect the

final result of the capital goods industry. In addition, the foreign companies are also important players as they are dominating the internal market. The Box below shows the players involved within this system.

**Box 2** – Identification of relevant systems.

| Relevant systems | Characterisation |
|---|---|
| Client | National and international industries (mainly of South America). |
| Players | National and international industries, national and international capital goods industries, federal government and governmental agencies. |
| Transformation | More competitive national capital goods industry by increasing exports and gaining space in the internal market (by decreasing imports). |
| World view | Improved performance of the national capital goods industry, which is strongly affected by the federal government. |
| Owners | Owners of capital goods industries and associations. |
| Environmental restrictions | Difficulty in influencing the federal government quickly and efficiently. |

Source: Elaborated by the authors.

**Step 4: Elaboration of Conceptual Models**
There is a clear conflict of interest between the players. The national capital goods industry will take a contrary position compared to that taken by the foreign ones. What is good for one is bad for the other. These two players are in constant conflict with each other, whereas the federal government is interested in favouring the national industry although no macro-economic decisions are made to favour only one sector. However, the government can take measures to help a certain sector. The industry should focus on this fact to improve the results.

Our work has shown that this sector is indeed extremely affected by macro-economic measures. Ideally, the government should under-value the exchange rate and reduce the tax load. Although changes in the macro-economic policies may be rather complicated, it is possible to create measures to help the sector. As it was the case with other plans like Plano de Metas and PDN II, it is possible that the government creates another plan to favour the industry as a whole, particularly the capital goods sector, since its results are reflected in all other sectors.

In addition, the capital goods industry is a sector that has not reached a technological stage yet. This lack of technology makes this sector's products more expensive and less competitive, and it does not seem that the sector can achieve such a technological level without the government's help.

Therefore, it is necessary to obtain support from the government to modernise the industry, making it more competitive and avoiding dependence on palliative governmental measures. Besides, the trade defence is a strong instrument to combat unfair practices by foreign companies.

Ideally, this system would consist of a proactive government constantly acting in favour of the capital goods industry. As a result, this sector would improve its technological performance and would become more competitive. This, allied with public policies for stimulating exports and discouraging imports, would lead to an optimal result for the capital goods industry.

**Step 5: Comparison between Step 2 and Step 4**
There is a clear gap between the real world and the systemic one. Ideally, in the systemic world, the government would favour the capital goods industry by influencing positively its exports and negatively the sector's imports. However, this does not occur in reality. One way to influence negatively the imports would be by over-valuing the exchange rate. But the government would not take a measure to over-value or under-value the exchange rate only to benefit a certain sector. Therefore, it would be very unlikely that the sector could influence the government to do so. Besides, it is necessary to stimulate innovation and improve the industry's existing technology. This is directly related not only to the incentives granted by the government, but also to the sector's interest. In the practice, we are far from an ideal system in which government would help enough and the industry would do its share in order to increase innovation in the sector.

**Step 6: Selection of Changes to be Implemented**
Some changes, which will be analysed below (Box 3), were suggested in the Step 4.

**Box 3** – Selection of changes to be implemented..

| Change | Desirable | Feasible |
|---|---|---|
| Under-vluation of the exchange rate | Yes | No |
| Tax load reduction | Yes | No |
| Introduction to the industry support plan | Yes | Yes |
| Technological evolution | Yes | Yes |
| Sector considered strategic | Yes | Yes |

Source: Elaborated by the authors.

The changes in the course of the government's macro-economic policy are extremely desirable for solving the problem. This would increase the competitiveness of the national capital goods industry in relation to the foreign products. However, the economic policy is something that cannot be often changed and benefit only one sector either. For this reason, such a change is not feasible, at least in the short/medium-term.

But despite this, there are changes that can be made, such as the introduction to the industry support plan, which already exists. It is necessary, however, a more aggressive plan like those implemented in the 1950s and 1970s, which helped the capital goods industry thrive and grow. Another important point is the technological evolution of the capital goods industry. This fact is fundamental for making the sector more competitive and capable to face the foreign industry in similar conditions.

In order to have more access to financing sources for innovation, the sector should be considered strategic by the government. This fact is both desirable and feasible as the sector is really strategic for the country, as demonstrated in the present work.

**Step 7: Actions for Improvement**

The capital goods companies need to unite and establish strong representative trade associations in order to promote these changes. Therefore, an important step is to gather the major companies to create a strong association with common interests. For instance, ABIMAQ are an association responsible for carrying out studies on what the government should do to help them and why. It is necessary to make it clear to both government and society that it is important for the country to develop this sector.

Another important point is that the industry's managers should be concerned about improving the productivity and the quality of their products, and to do so, it is necessary to investment in technology and innovation. Investment in the qualification of human resources, R&D centres, and partnerships with universities are ways to achieve this objective.

## 5. PROPOSITION FOR STRATEGIC AGENDA

After the due investigation of the situation, both by means of macro-environmental analysis and by means of systemic analysis, it is possible to draw a conclusion about what needs to be done to overcome the challenges.

**Box 4** – Strategic agenda.

| **Short-term** |
|---|
| Trade defence to combat unfair attitude by international competitors. |
| Strengthening of the foreign trade by governmental measures (Brasil Maior) for exports. |
| **Medium-term** |
| Investment in innovation and technology |
| Becoming a strategic sector to make credit easier for investment and innovation. |
| Strengthening of the governmental measures for foreign trade by decreasing the import bias. |
| Measures to increase tax exemption on investments. |
| Measures to increase tax exemption on exports. |
| Strengthening of the BNDES Qualification Program to increase the qualified labour. |
| **Long-term** |
| Continued investment in innovation. |
| Increase in production investment. |
| Search for governmental support to value the exchange rate and reduce the tax load. |
| Question the government to improve infra-structure and therefore decrease the so-called "Brasil cost". |
| Question the government to take long-term measures. |

Source: Elaborated by the authors.

Increasing the tax exemption on investments and exports are among some measures that should be taken by the government. Another important point is to reduce the interest rates and make long-term credit easier for the capital goods industry to become more competitive. In this way, the sector is encouraged to increase investment in the production. In this environment where the foreign industry is, literally, enemy of the national industry, there is an increasing concern about trade defence. The national industry, by means of the trade defence, seeks judicial protection against reportedly unfair practices (e.g. anti-dumping actions) by foreign competitors. The country's current exchange rate policy is favourable for imports, which in turn is harmful to exports. This occurs because under-valued exchange rates make products and services more expansive a less competitive in the external market. Another point to be highlighted is the innovation of the sector. One of the ways to become more competitive is to improve the sector's levels of technology and innovation, making the industry more competitive and capable of producing better quality products. For doing so, it is necessary that the industry makes more investment in R&P and receives more incentives from the federal government.

The use of SMS approach has sought to show on a systematic and wider basis the challenges faced by the sector, including suggestions of actions to solve the problem. By means of this approach, it has become clear that the capital goods industry is a sector that does little for its own, being highly dependent on the government to grow and solve challenges by itself. Therefore, it is recommended that the sector has strong trade associations with representatives in the federal government and society. This trade association should clarify to the society why it is important for the sector to be favoured and seek benefits from the federal government. In addition, the systemic approach has also shown that innovation and technology are crucial for improvement of the sector's result, and this can only be accomplished by investing more in R&D and recruiting more qualified personnel. Therefore, it is possible to improve both productivity and product quality, thus making the sector to be more competitive with its foreign competitors.

Based on the strategic agenda, it is clear that many issues about the improvement of the current situation of the capital goods industry will be determined by governmental actions. This scenario demonstrates how dependent on the federal government the sector is. In fact, capital goods industry depends on the palliative measures taken by the government, and it would be important for the sector to decrease this dependence to be successful in the long-term.

Initially, the government's help is still necessary. However, this help should come in the form of long-term measures so that the sector can carry out its plans more safely.

Additionally, the government should invest in the infra-structure to improve it, otherwise the cost of production ends up increasing as a result. Improvement in the national infra-structure would reduce the production cost in the long-term.

After managing to obtain more security for planning by means of the government's long-term measures, including infra-structure, it is necessary that the capital goods industry invest in modernisation, innovation and technology. This will lead to greater competitiveness of the sector, with cheaper and better quality products. Therefore, even if the government no longer takes helpful measures, the sector will be already strong enough to face the external competitors.

Over-valuation of the exchange rate would certainly be of great benefit to the sector. However, the government's macro-economic policies change over time and the measures are mostly taken to control inflation. Therefore, even if the government raises the exchange rate, it is difficult to foresee whether such a measure will last long. One can think of the tax load in a similar way. Of course the government can change some aspects of the country's taxation system, but these occur on a frequent basis and the government takes measures considering the national economy as a whole rather than benefiting the industry sector only. These measures are also taken because of political factors and are difficult to be controlled. Therefore, any change in these two factors can be considered transitory. As mentioned elsewhere, it is important that the industry invests in modernisation, innovation and technology, and allied with long-term measures and infra-structure improvement, the sector is more likely to reduce its dependence on the government's palliative measures in the future.

## 6. FINAL CONSIDERATIONS

The present work has shown that, today, the main challenge faced by the capital goods industry is the competition with foreign competitors. The macro-environmental analysis shows that there exist a series of small changes that can be made to increase the competitiveness of the national capital goods industry. However, the systemic analysis shows that the most important changes are those in the domain of the federal government. This means that the sector is highly dependent on how the government behaves in relation to macro-economic policies.

In addition, this work has sought to describe the path of the capital goods industry, the current situation of the sector, the challenges faced by the sector, and what can be done to solve these challenges.

It was important to understand the emergence of this industry and its main periods of growth and crisis. As a result, it was possible to demonstrate that historically the government has had strong influence on this sector's result.

It was also necessary to delineate the current situation of the sector so that we could understand which challenges were involved in the sector's growth and make suggestions that could be made to solve them.

The use of macro-environmental analysis, allied with a systemic approach, was important for the study because it made possible to understand the situation more deeply.

The macro-environmental analysis was also important to know which points should be changed by the federal government so that the sector can thrive and become competitive before foreign competitors. The systemic analysis, in turn, allowed a wider view of the problem and suggested actions for changes as well.

One can say that it is important for the sector to reduce its dependence on the government's palliative measures. For doing so, the sector needs to strengthen. This strengthening can be achieved by means of long-term measures (that are beneficial to the sector) taken by the government rather than short-long ones; by infra-structure improvement, thus reducing the costs of production; by modernisation, innovation and technology to improve the competitiveness with cheaper and better quality products. In this way, it will be possible to compete with the foreign industry in a stronger position as import decreases and export increases.

Two points become clear from the present work, namely: the current biggest challenge facing the sector is to improve its competitiveness with foreign companies by either decreasing imports or increasing exports. It is very unlikely that the sector will succeed in this challenge without the federal government's help.