

Macroeconomic Environment for Technology Development in Bulgaria

The role of the State in ensuring sustainable economic growth is to create an environment wherein companies are encouraged to develop their corporate strategy for competing on the basis of long-term technological advantages rather than taking advantage of the transitory characteristics of market conditions. This is the only way Bulgaria can secure for itself a place among the developed world and attract foreign investments.

Under the terms of a bilateral agreement for technical co-operation between the Governments of Bulgaria and Germany the Bulgarian Government is implementing a project for the establishment of a macro-framework for promotion in the technological area. The project is funded by the German Government through the German Agency for Technical Co-operation and is managed by Fraunhofer, a leading German institute in the area of research and technology management. The Center for Economic Development (CED) is a partner of the German consultant in this project for Bulgaria.

The final objective of the project is to draft a macroeconomic framework to enhance the technological level of the Bulgarian economy as a whole and that of small and medium-sized enterprises (SMEs) in particular.

Presently, we have a satisfactory outline of the overall framework and an analysis of the technological development of Bulgaria. The research team consists of established experts in the respective fields whereby the methodology and a good part of the analyses have been prepared by the Center for Economic Development (CED) with the advice and assistance of Fraunhofer.

The method is based on the SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis with the purpose of meeting the information needs of the project. It constitutes a key phase in achieving the main goal, namely: **Drafting the Macroeconomic Framework for the Technological Development of Bulgaria.** For this reason, it differs in form and content from the classical SWOT analysis. The weaknesses and threats are treated as problems, which in the presence of adequate policies, could turn into new opportunities for the development of technology in Bulgaria. On the other hand, the strengths and the weaknesses make up the potential available in the country while the opportunities and the threats shape the development in the future. The classical SWOT analysis matrix has been reshuffled to meet these needs and is shown on fig. 2. The matrix is a brief summary of the main conclusions of the analysis as far as it is feasible to present in a table an analysis of over 150 pages prepared by twelve leading experts.

Fig. 1. SWOT matrix of the technological development of Bulgaria



The analysis outlines the major trends observed in the technological sectors of the Bulgarian economy over the past 3 or 4 years while at the same time comparing them to factors and indicators characteristic of Germany, the EU and countries applying for EU membership.

The approach used aims at producing **practice-oriented results** and structuring the paper in a fashion, which allows it to cover as many factors affecting the technological development of Bulgaria as possible. There are four main reference points in the analysis:

1. **Significance of the technological development for Bulgaria's competitiveness** and a study of the technological environment, incl. the general technological environment, information and communication technologies, transport infrastructure and energy intensity per unit of GDP.
2. **The economic analysis of Bulgaria's technological development**, compared to other European countries, incl. general economic framework, import/export of high-tech products and small and medium size enterprises.
3. **Factors for technological development**, incl. national policy in the high-tech area, education, financial and fiscal environment and national policy concerning small and medium sized enterprises (SMEs).

4. **Analysis of four promising structural technological sectors**, based on the expert evaluation of leading Bulgarian experts, incl. software, microelectronics, automation and biotechnology.

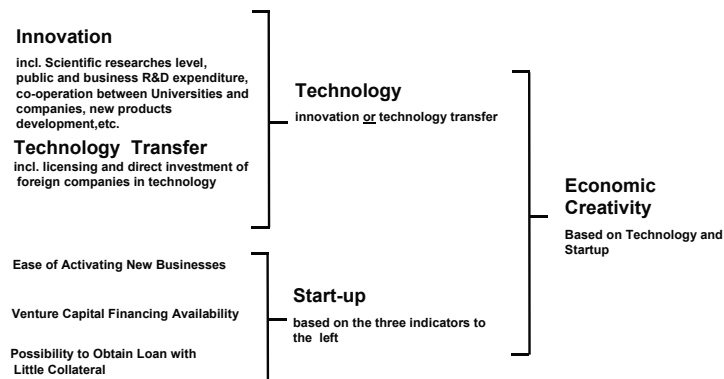
The information and data used in the study come from reliable sources, such as the National Statistical Institute (NSI), Eurostat, OECD, the World Economic Forum - Davos and others. A significant part of the data is structured and processed by the National Statistical Institute and the Center for Economic Development for the purposes of the study and has not been analyzed or published so far.

The authors believe that **the essence of the economic growth and the high level of competitiveness of the countries lie in the innovative capacity and the efficient implementation of modern technologies.** This is particularly true of the potential of the countries to increase their competitiveness and attain strong economic growth. Fig. 2 is a graphic representation of the formation of economic creativity of a country. The author of this methodology, published in the Global Competitiveness Report 2000 of the World Economic Forum in Davos, is Andrew Warner from Harvard University. According to it, the countries' economic creativity is affected by two main factors.

The most significant factor is the technological development based on the country's potential to generate innovations or its capacity to adapt new technologies - the transfer of know-how.

There are also two main approaches for technological transfer: direct foreign investments in technologies or licensing. The second key factor outlines the opportunities to start up new business and relates most closely to the business, investment and administrative environment.

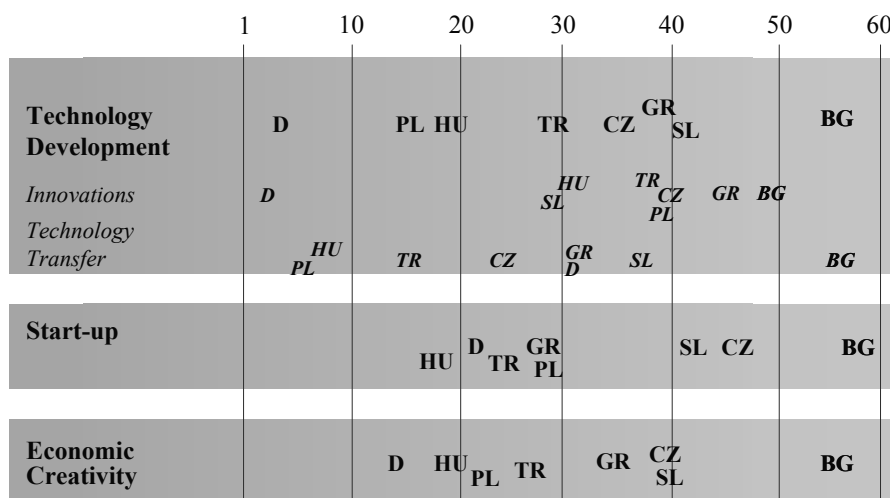
Fig. 2. Mechanism for formation of the economic creativity index



Source: Global Competitiveness Report 2000

Regrettably, the Davos Global Competitiveness Report 2000 ranks Bulgaria in the lower bottom-table position out of 59 countries, with regard to its technological development level and particularly the opportunities it creates for new businesses. This assigns the country the deplorable 56-th place in economic creativity. Fig.3 shows that Bulgaria has been outperformed by Poland, Hungary, the Czech Republic, Slovakia, Turkey and Greece on all indicators while the most advanced countries in transition such as Hungary and Poland rank by far ahead of Bulgaria (by about 30 positions) thus outstripping Greece and climbing close to Germany.

Fig. 3. Economic creativity - Bulgaria's rating in comparison with other European countries



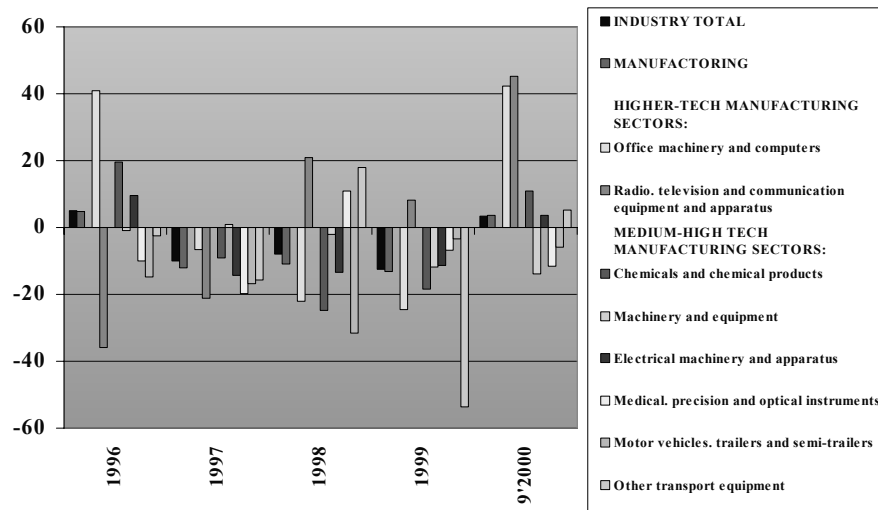
Source: Global Competitiveness Report 2000

According to the above quoted report, the conditions in Bulgaria are the least conducive to starting new business and most favorable with regards to innovations. We have to bear in mind, however, that this negative rating is based on statistical indicators from 1998 (the most recent year with available statistical data on all the 59 countries participating in the study) and a poll among the business community from January 2000. The past two years mark a wavering in the negative trend of the technological development in Bulgaria.

- For the first time in many years, 1998 was characterized by **growth in the R&D expenditure in the country**. The growth of about 18% was a clear sign of an upsurge in the field of research and technologies.
- **The share of education expenditure in the consolidated state budget** for 1997 - 1998 **steadied** at about 4%, rising to 4.3% in 1999. This indicates a trend, which however slight, spells out some progress in the field of Bulgarian education and its capacity to generate high skilled professionals.
- **The percentage of high technology services in the total Gross Value Added (GVA) has grown over the last few years** (such as telecommunications, software services and research and development). While in 1996 this share was about 1.8%, in 1998 it amounts to about 2.6%. The percentage of people employed in the R&D sector of high technology services out of the total number of employed in the Service sector was up from around 28% to about 50% for the same period. Although the data used as calculation basis for the years 1999 and 2000 have not yet been made available by the National Statistical Institute (NSI), it was likely that this trend would continue.
- **For the first time since 1996, the year 2000 was characterized by growth in most of the high technology sectors of industry**. The high technology industries such as Manufacturing of office and computer equipment as well as Manufacturing of radio, TV and telecommunications equipment indicated a growth rate of over 40% during the first nine months of the year 2000 (see Fig.4), compared to 3.6% growth in the processing industry. Some structural medium high-technology industries, such as the manufacturing of chemical

products, electrical machine and equipment and transportation vehicles, also register positive growth rate.

Fig. 4. Growth of industrial output in the high tech sectors of Bulgarian industry



Source: National Statistical Institute

The majority of the conclusions from the analysis also apply to the sectors under separate study in the SWOT analysis. The tendencies can be outlined as follows:

- **The software industry** in Bulgaria is highly competitive and in all likelihood will have rapid growth. Its main problem is high-skilled migration and the poor facilities for information and communication technologies in educational institutions.
- Despite the significant decline, some companies are making fast progress in **microelectronics** and are competitive on a global scale. Their products are used by world known companies in the field of car manufacturing, production of household appliances and others.
- **Biotechnology** has established traditions in Bulgaria. Its development is also characterized by an ascending trend, however, their potential for economic growth seems underestimated and underutilized.
- The negative trend observed in the manufacturing of **automation machinery and equipment** is due to the lack of markets, new products and poor competitive ability.

Tendencies in the Human Resource Sector

A major threat to the technological development of the country lies in the emigration of high skilled professionals. This indicator ranks Bulgaria last among the 59 countries participating in the World Economic Forum - Davos. The fact that it is increasingly difficult for the Bulgarian system of education to, at least partially, make up for the high skilled migration with a new generation of high tech experts is a cause of great concern. **The technical facilities and the level of expertise of Bulgarian teachers preclude students from using modern information and communication technology.** This restricts the practical high technology skills that can be

acquired in Bulgarian universities as well as the participation in joint R&D projects with businesses. On the one hand, research institutes and organizations are left with dwindling numbers of professionals with failing expertise to pass on their knowledge and experience to college graduates, and on the other hand - the graduates are to a great extent unprepared for practical work in the technological field. **It is precisely this combination of "brain drain", young professionals' weak practical skills, and the lack of close co-operation between universities, research institutes and businesses that will become the strongest threat to the boost of technological development in Bulgaria.**

Could these problems become opportunities for development? The practice in some of the fastest growing technological nations in Europe, such as Ireland and Sweden, shows that this process is perfectly achievable and not utopian. There is a chance that, provided we have conducive business environment, the professionals who left the country will return, bringing back their knowledge, skills and capital acquired overseas.

Even at present, the conditions for human resource development in the high technologies area provide sustainable opportunities and strengths. **Bulgarian education in the field of mathematics and the sciences is still at a rather high level.** According to the World Economic Forum Report, this indicator positions Bulgaria ahead of countries such as the USA, the UK and others.

One of the key opportunities for technological development lies in the fact that young people in Bulgaria show exceptional interest in high technologies. Students applying to the Technical University in Sofia, for instance, chose the following subjects in their application forms, in the following order: computer systems and technologies - 3836, communication equipment and technologies - 1784, while the remaining 32 majors attracted between 12 and 530 applicants. Their minimum grade point average from the selection procedure is 19.85 and 19.60 respectively (at a maximum of 21).

It is thanks to the new companies in the area of information and communication technologies, which produce mainly for the prosperous markets of the EU and North America, that some of the professionals remained in the country to pass on their expertise to the new generation of Bulgarian computer scientists. **The Bulgarian experts in this field possess the unique mix of hardware and software skills.** Regrettably, in other areas of high technology these processes do not parallel similar rates of development.

The National Education Strategy in the field of information and communication technologies indicates the intention of Government institutions to advance Bulgarian education in the area of new technologies; the rates of improving the technical facilities and the professors' skills, however, are not effective enough to make up for the significant setback in the past.

Technological environment

The low level of R&D expenditure as percentage of GDP - 0.57%, poses a major threat to the development of the technological environment in Bulgaria. It is below that of most states in transition but still above the level in Greece and Turkey. The fact that only 19% of the R&D costs were invested in business in 1998, at an average of 64% for the EU, raises serious concern.

According to the World Economic Forum Global Competitiveness Report, Bulgarian managers are better aware of the need for R&D than their colleagues in the Czech Republic, Poland, Turkey

and Ukraine with Bulgaria's indicators ranking close to those of Greece and Hungary. Nevertheless, actual R&D expenditure is low. The main reason for the discrepancy between the understanding of R&D as a factor promoting competitiveness and the low level of such expenses in business is that, unlike most European countries, Bulgaria provides no incentives to companies to make and report such costs.

Companies, specializing in R&D report some positive changes, such as:

- There is an emerging new crop of small companies and research institutions set up by leading specialists in the respective field. The founders are in most cases, established professionals with long experience in their field who used to work for the large research and designer's institutions. Although still start-ups, these new units are characterized by flexible management, innovative thinking and entrepreneurial spirit.
- However small, the market for R&D products and services is increasingly focused on applied research with targeted funding from foreign companies and organizations at the expense of fundamental research typical of the recent past and financed by the state budget.

Despite the relatively high (two-digit) growth rate of the new information infrastructures, such as mobile communications and Internet, Bulgaria is far behind other countries with comparable indicators. For instance, the growth of mobile (cellular) phones measured by the number of subscribers per 100 inhabitants is outstanding - about 70% for the period between 1997 - 1998. Does it mean that Bulgaria has improved its position along this indicator on a global scale? If we look for the answer in the annual reports on global competitiveness of the World Economic Forum, we shall see that Bulgaria not only did not improve compared to the other 58 states included in the study but we observe significant deterioration - the country moved four positions towards the bottom of the table - from 46-th to 50-th according. It is left behind by countries such as El Salvador, the Philippines, Peru and others. **The opportunities for new infrastructure development, such as mobile communications and Internet are closely linked to the introduction of new operators, lifting of the BTC (Bulgarian Telecommunications Company) monopoly position and maximum deregulation of the IT market.**

The new technologies require dynamic statutory environment. Large number of legislative acts have been drafted over the past few years: Draft law of high tech activities and high tech parks, Draft law of digital signature and electronic documents, National education strategy for information and communication technologies, etc. Their final approval and implementation, however, is delayed which brings about delay in the development of new technologies in Bulgaria. **The country is short of technological centers and high tech parks, which meet European and world standards and can assist in business research and the implementation of these standards in the production process.**

A key feature of new technologies is that they make more efficient and rational use of natural resources, making products of better quality and higher price in the process. It seems reasonable to assume, that countries using more up-to-date technologies in the processing and manufacturing industries, achieve better ratio between energy resources consumption and the GDP figure.

It turns out that Bulgaria's energy intensity per unit of GDP, expressed by the purchasing power parity is twice as high as that of the EU and OECD member states. The gap grows by about six times if we take the GDP as a basis without factoring in the purchasing power parity calculation. Compared to the other countries applying for EU membership, by virtue of this indicator Bulgaria

runs only ahead of Romania, the Czech Republic and the states of the former Soviet Union. **Indirect indicator as it is, the high energy intensity of the GDP is a sign of the poor technological level and inefficiency of the Bulgarian economy.**

Development of the Market Environment for High Technologies

An important conclusion on both macro and micro level is that **the Bulgarian market for high tech products is severely restricted and does not provide generous opportunities for development of local companies.** Most of the successful high tech companies operate mainly for export making use of the opportunity to sell their products and services to a fast growing global market. While Bulgarian entrepreneurs in the field of information technologies, and partially in microelectronics manage to some extent to avail themselves of this opportunity, in the field of biotechnology, the existing potential is almost unutilized. In addition, most Bulgarian producers of IT products have flexible distribution systems and offer relatively high quality products at competitive prices. **On the whole, we may conclude that the production potential of all the high tech sectors is underutilized.**

In Bulgaria, trade in high tech products is largely free and most world-known companies have offices in the country, which makes the Bulgarian market strongly competitive and places Bulgarian companies and their overseas counterparts under comparable market conditions. Unfortunately, in the trade of hardware products there are some signs of unfair competition, expressed in dumping of prices at the expense of tax evasion and distribution of pirated software. These practices exist in selling to, mainly non-corporate customers (very small companies and individual customers).

A study of the import/export data on high tech products for 1997 and 1998 shows some positive and some negative trends. The positive tendencies include:

- increase in the total value of high tech products import, as well its relative share in total imports;
- 20% increase in high tech products against the background of a slight drop in other imports;
- faster growth in the import of motor vehicles, office equipment, television and communication equipment, in comparison to chemicals and household appliances;
- a positive trade balance of high tech products for 1997, four times higher than the total positive trade balance.

The negative tendencies include:

- decline in total exports of high tech products;
- decline in the percentage of high tech exports in total export from Bulgaria;
- decline in the percentage of high tech exports exceeding the drop in total export;
- decline in the prices of major Bulgarian high tech products - the chemicals;
- a negative trade balance of high tech products for 1998 making up 70% of the total negative trade balance.

Only 11 technological products rank among the 50 most important Bulgarian exports (as a percentage of total export): lubricants - 5.32%, soda - 1.57%, medicines - 1.34%. These 50 leaders make up 46% of total export or nearly half of it.

The level of development of high technologies in Bulgaria is represented not only by the export of high tech products but also by the demand for them. Over 50% of Bulgarian exports for 1997 - 1998 were intended for the sophisticated and demanding EU market. The main markets for Bulgarian high tech products were the EU member states, the former socialist countries of Central and Eastern Europe, and the Balkan states. **The EU share in Bulgaria's high tech product trade is a reliable indicator of the competitiveness of Bulgarian products, keeping in mind that the high tech demand for Bulgarian commodities poses very high standards to their quality.**

Financial Environment

The key deficiencies of the banking sector in the lending area - **the conservative approach of the banks and their strongly restrictive lending criteria have a negative impact on technological development.** What is more, high tech companies have more severe funding needs because of their faster turnover, more frequent replacement of their equipment and the need for long-term funding of R&D.

There are no sector specific lending criteria for technological companies. These industries, as a rule, need medium term and long-term loans under initially preferential conditions, while currently over 85% of all extended loans have a one-year maturity.

Apart from the large companies in the technological sector, all others find it very difficult to get access to loans.

Access to lending is made particularly cumbersome for new and start-up high tech companies. Most of the commercial banks require companies to have financial statements for 2-3 year historical period and to show profit. It is practically impossible to get a loan to fund a business plan with little collateral. Regrettably, start-up companies have little access to the stock market, either. The poor investment culture of company managers also poses a problem. These factors represent a serious threat to innovative companies from the technological sectors.

The opportunities for the banking sector in the short- and mid-term perspective lie mainly with the increasing competitiveness on the financial services market and the positive tendencies thereof for bank customers and the sector as a whole. The completion of the banking sector privatization and the ensuing post-privatization restructuring of the banks launch a new stage in the development of the banking system. Investing in new banking products and services becomes a priority for the banks, since the only way to make progress on the market is through constantly improving the bank's policy and marketing strategy. **It is natural for companies using high technologies to apply the new financial products. They are more open and competent to adopt the new technologies in both the technological and financial aspects.**

It is indicative, that Prosoft Plc. - a high tech company, has issued the first corporate bonds on the Bulgarian Stock Exchange. Depository notes - a new type of securities tradable on the Stock Exchange have appeared over the past few months. Among the first foreign companies trading depository notes on the market there is again a representative of the technological sector - the Deutsche Telecom. **These examples show that technological companies in Bulgaria generate innovations not only in the technological field but also in the approaches used to fund their**

operations. They are the customers who will motivate the financial sector to become more flexible.

Fiscal Environment

The Bulgarian accountancy standards interacting with the tax laws are similar to the rules and standards adopted by countries with advanced market economy. This is an important positive trend along with financial stability and the reduction of corporate tax rates.

The key problems of the fiscal environment relevant to high technologies can be grouped as follows:

➤ **High taxes on labor compensations and high social security contributions**

The rather high taxes on labor compensation and the relatively high social security contributions to be paid by employers affect the opportunities to open new jobs and provide training for employees.

On the other hand, **representatives of software companies claim that their highest cost is paying high skilled compensation, not corporate tax.** Salaries are relatively high and they openly state that they are looking for ways to avoid these taxes in order to minimize their personnel costs.

➤ **Taxation of expenditure on software products**

There are, at present, no special regulations on the taxation of software products. The Corporate Tax Law (CTL) does not stipulate whether these inflows shall be treated as fees for copyright transfer or trade revenues.

Since the volume of payments for software products is likely to increase, they will have to qualify as either trade income or copyright fee. This has to be regulated by the law. We should point out that on September 29, 1998, the OECD issued the revised Comments on Article 12 of the OECD Convention including examples of software products taxation. According to the OECD comments, the compensation for acquisition of partial copyright (without absolute transfer of copyright by the transferor) is an author's fee. Granting the right to use a software program without the transfer of copyright is considered a violation of copyright.

➤ **A need for further discussion of depreciation rates**

Acknowledging the positive changes in the regulation of tax deductible rates of depreciation, there is still a serious need for their further elaboration to make them adequate to economic realities.

➤ **There are no tax preferences for investments and depreciation is recognized as expense only to the extent determined in the Corporate Tax Law.**

Frequently the rate of depreciation, applied to computers and software products is considered unreasonably low by the business representatives. They believe that the business life of computers and software products is in fact much shorter. Most of the developed countries apply the 100% accelerated rate of depreciation.

➤ **Discriminatory VAT treatment of software exports as compared to traditional export**

The export of software products is not recognized as taxable turnover for VAT purposes. Software companies producing mainly for export would not be able to draw tax credit as stipulated under the VAT Act. The fastest growing companies operating in a rapidly expanding global market complain of being "penalized" for their competitiveness in the export of intellectual products.

➤ **Unstable and Unpredictable Taxation Policy**

Taxation policy in Bulgaria is frequently unstable and unpredictable. The problem stems from the inability to do tax planning. Tax laws undergo frequent and often unfair amendments. The laws are accompanied by the, so-called guidelines for implementation which, explain or interpret them.

Long-term tax incentives for foreign investors have been approved and soon afterwards repealed on two occasions during the past six years. Indeed, thanks to the implementation of favorable transitional measures this did not affect the current investments. It, however, upset the plans of some strategic investors.

Conclusion

The analysis of the technological development of Bulgaria leads us to the conclusion that in the years 1999 - 2000 the negative tendencies in the technological sector were largely undermined and a certain improvement of the technological environment became apparent. Regrettably, on the one hand, this comes after a long-drawn recession or technological backwardness of the Bulgarian economy, while on the other, it cannot be referred to any significant Government initiatives in the three key areas, leading to the establishment of a viable economic environment, conducive to sustainable growth: innovations, transfer of know-how and promotion of start-up businesses (incl. funding, fiscal burden, bureaucratic restrictions and others). The upturn in the technological sector indicates that a vigorous policy of technological advancement would give further boost to the technological development in Bulgaria along three main lines:

- Higher competitiveness of business entities in the country and fresh investments in technological industries and services.
- Greater number of high skilled jobs in industry and the services and decline in the rate of "brain drain", thereof.
- Sustainable economic growth.