

EXECUTIVE SUMMARY

According to the Global Competitiveness Report, the fall in Armenia's international competitiveness came to a halt in 2009. The continuous decline in competitiveness ranking during the previous years pointed out the non-sustainable nature of economic growth drivers.

According to the Global Competitiveness Report 2009/10, Armenia ranks 97th out of 133 countries, registering no change compared to the 2008 ranking. The composition of Armenia's competitiveness "balance sheet" remains fairly stable. Armenia's competitive advantages are the low level of government debt, labor market regulations, agricultural policy costs, as well as the low level of business costs of crime and violence. The major disadvantages are the extent of market dominance and insufficient level of competition, which indicate the inefficiency of competition policy. Compared to the previous study, the list of major disadvantages also included the burden of customs procedures, government procurement of advanced technological products, the quality of management schools, the degree of customer orientation and the willingness of shareholders to delegate authority.

High GDP growth of Armenia during 2005-2008 was accompanied with falling international competitiveness, as measured by the GCR. This phenomenon was referred as "growth-competitiveness" paradox in the Armenia Competitiveness Report (ACR) 2008. The paradox highlighted the fundamental economic problems and no sustainable nature of growth drivers, which were expected to become apparent under negative external shocks, such as global economic crisis. In the context of competitiveness, Armenia has moved toward a new development stage, where the role of the competitiveness drivers is changed. The role of performance of macroeconomic indicators, institutions and basic infrastructure is more significant for countries in the first stage of development. Currently, economic efficiency and innovation capacities assume a growing importance for Armenia.

The crisis highlighted the systemic diseases of the Armenian economy

Since 1990, Armenia's fortunes have had three distinct stages: rapid decline and free fall, recovery and steady growth, and acceleration into double-digit growth. Since the global financial crisis began in mid-2008, the country has entered a fourth stage, the implications of which are unknown. It seems that the high-growth stage may have masked many of Armenia's competitiveness deficiencies. The main "macro diseases" were unsustainable growth drivers, narrow and resource-dominated export base and overdependence on private transfers.

The increasing FDI in the country's infrastructure results in improvements in infrastructure quality and growing competitiveness.

Despite these challenges, Armenia continues to perform well in FDI. Since FDI can become a major driver of growth, innovation, workforce development, and technology transfer, Armenia should try to expand the FDI beyond infrastructure.

Although the absolute level of productivity still lags behind many comparator countries, Armenia has been catching up.

The challenge now is to maintain this trend. One major driver of improved productivity is nurturing and developing the knowledge and skill base across different sectors of the economy.

Innovation is critical to the creation of a knowledge-based economy which in turn is vital to a country like Armenia that is landlocked, has scarce natural resources and faces high transportation costs.

Armenia ranked extremely low on innovation on the GCI for 2009—108 out of 133 countries—down 2 places from 2008 and with a lower absolute score. The only other indicators that were as low were two closely related to innovation: business sophistication (112) and technological readiness (105). A number of subindicators related to these categories were alarmingly low, especially perceived quality of math and science education and availability of venture capital. Armenia ranked also poorly in other innovation related

rankings such as the International Innovation Index (BCG, National Association of Manufacturers and the Manufacturing Institute) being at 75th among 110 countries.

A framework based on National Innovation System concept (developed by OCED) has been employed and adopted in this report for assessing Armenia's performance in innovation. It provides holistic picture by looking at innovation process as combination of different elements of innovation system: inputs, outputs, policy framework, institutions, actors and the interactions among these actors.

Armenia performs slightly better in output than input factors of the innovation

The aging of the research personnel, low enrollment in science and engineering, low inflow of young talent into R&D sector are the major challenges in innovation inputs. In per-capita terms, Armenia holds a middling place among comparator countries at 1,481 researchers per million, but underperforms notably in terms of enrollment ratio in science and engineering.

By nearly any measure, financial inputs from the public and private sector are also lacking. Gross domestic expenditures on research and development comprise only 0.2 percent of GDP, which is small in absolute terms given the modest size of Armenia's GDP. Armenian R&D relies mostly on public expenditure and international research grants and there is very little venture capital or business expenditure on R&D. As a result, there is a real gap between research performed and the needs of the market.

In terms of scientific results (scientific and technical journal articles and patent registrations) Armenia performed moderately in some cases outperforming most of CIS countries. Although, despite growing high-tech exports its share in total exports is negligible - only 1% of total exports. Similarly the low share of the high-tech products in import structure indicates the limited extent of the technological upgrade of the current production capacities. The commercialization of the scientific results is negligible due to lacking skills and necessary infrastructure.

The good performance of the Armenian school children in International Mathematical Olympiads is promising, although the public expenditures on education is significantly below the average of the comparative regions.

Worrisome is the low interactions and cooperation between the business and research communities, insufficient institutional capacities such as protection of the intellectual property rights and lack of the strategic vision. However, the Government is currently in active search of the viable strategy for boosting innovation.

Armenia faces significant challenges in improving its national innovation system.

It must halt the erosion of inherited assets and competitive advantages; strengthen inputs and institutional capacities; devise a coherent and comprehensive innovation policy and strategic focus; improve cooperation and linkages among actors; encourage trust between businesses and researchers; and improve commercialization capabilities to capture value from its solid research and scientific abilities. Armenia's strong tradition in math and science, world-class scientists, and inherited R&D capacities—when combined with proper inputs, supporting mechanisms, and strategic focus—can provide a good base for Armenia to become a knowledge-based economy.

Armenia needs a holistic approach and demand-driven initiatives to boost innovation

Armenia needs a strategy for its own circumstances, but that strategy should take into account how other countries have achieved high levels of innovation. Some key lessons and success factors include the following:

- Innovation programs require a systems approach by integrating elements rather than trying to implement best practices through piecemeal projects.
- Innovation requires interaction not isolation; it occurs most readily at the border of disciplines, in the interaction of firms, universities, and technological facilities.
- Innovation requires feeding demand, not just cultivating supply. Developed countries, such as the United Kingdom and Finland, are moving to policies that use public sector interventions to foster demand for innovative products, create “lead markets,” and view the market as a reference point.

Different countries have achieved success in innovation by stressing different elements of the innovation system

There is no one model for a national innovation system. According to the OECD, “countries tend to develop along certain technological paths or ‘trajectories’ determined by past and present patterns of knowledge accumulation. Which path a country takes is determined largely by institutional factors, often specific to a country, including the broad range of interactions which characterize the national innovation system”. The path a country takes is based on leverage points that policymakers can use to enhance innovation performance and overall competitiveness. A key leverage point is the demand source that triggers innovation activities. Determining Armenia’s “trajectory” is becoming a central issue for policymakers for two reasons: (1) Armenia possesses disproportionately scarce resources, and (2) Armenia’s science and technological assets are troubled because of sharp disruptions in their development after the breakup of the Soviet Union.

On the basis of creating a lead market, the ACR distinguishes four strategic trajectories by the relative importance of policy focuses and actors.

Jumpstart Strategy 1: Domestic Corporate-Led

This strategy promotes domestic corporations as market creators for innovations provided by companies or research institutes and universities. Innovation meets the needs of the local economy by raising the productivity and competitiveness of leading sectors. Large local companies are now becoming the drivers of innovation, followed by SMEs. The focus of this policy is collaboration among industry, academic, and research communities with intensive financial support from the government to foster relationships. This strategy resembles the model employed by Finland at the start of its innovation policy. Other examples include Japan and Korea.

Jumpstart Strategy 2: MNC-led or R&D Hub

This strategy attracts multinational corporations and research organizations to outsource or set up R&D functions. Establishing linkages to their R&D capabilities can bring the most current knowledge, technologies, and research themes to Armenia and avoid “reinventing the wheel.” This strategy assumes a capability for very selective and focused investment attraction. Using such an approach, Armenia would seek to become a hot spot for R&D in a few niches. This would require developing a world-class pool of researchers and R&D facilities to attract investment from MNCs. The world-class human capital deployed in MNC-related sectors would eventually spur development of other local sectors.

Singapore used this strategy to become a regional R&D hub. Starting in the mid-1960s, it attracted MNCs first in labor-intensive industries by leveraging its low-cost advantages and then higher-value industries. Since the 1990s Singapore has targeted MNCs’ R&D capabilities. Ireland followed a similar strategy, first selling access to the European market then attracting high-value R&D jobs.

Jumpstart Strategy 3: Government-led

This strategy relies on the government’s leading role in triggering innovative activities. Once innovation clusters mature, they spread throughout the economy. Under this strategy, the government invests intensively in R&D for a few selected industries of strategic importance for the country (e.g., defense, transportation, energy generation and distribution, or health). These sectors then become hubs for commercial and civilian innovation. The success of the strategy depends on the government’s ability to withdraw at an appropriate time and allow market forces to determine the path for further development.

Israel’s unprecedented rise as a high-tech superpower was driven by spillover from government and military developments.

Jumpstart Strategy 4: Generic or Environment-Enabled

The fourth strategy is to create a free and fertile environment for innovation, one that can induce ventures from a variety of actors including universities, research institutes, industrial companies, spin-offs, individual

inventors, and innovative SMEs. It addresses the entire value chain from idea generation to establishing internationally competitive companies. It requires multiple enabling factors at various stages in innovation and is therefore the most comprehensive of our four strategies.

Components include excellent universities, research institutes that can generate commercially relevant innovations, business incubators, technoparks, business service providers, venture capital, seed funds, and strong IPR protection. Government only creates infrastructure and does not create lead markets directly. Lead markets arise from interaction between businesses and research communities.

California's Silicon Valley exemplifies this strategy, and a similar strategy is followed in the UK.

Choosing a strategy requires applying criteria and assessing each option vis-à-vis Armenia's current capabilities.

The relative importance of key proposed criteria for strategic decision making by different jumpstart strategies is outlined in the following table:

Criteria \ Str. Option	Domestic Corporate-Led	MNC-Led	Government-Led	Environment-Enabled
Resource Requirements	High	Low	Medium	High
Knowledge Diffusion Potential	High	Low	Low	High
Complexity of Approach	High	Low	Low	High
Time Required Before Results	Long	Short	Short	Long
Ease of Improvement of Strategy-Critical Components	Difficult	Easy	Easy	Difficult
Availability of Pre-requisites	Low	Medium	Medium	Low

While it would be natural for Armenia to stick to a single strategy economy-wide, the strategies, however, can be applied on a sectoral basis.

Applicability of Strategic Options by Sectors of Economy:

Strategic Option	Sector of Economy
Domestic Corporate-Led	Mining, energy generation
MNC-Led	IT, wide range of engineering services
Government-Led	Defense-related sectors (laser, new materials), health care, energy generation
Environment enabled	Natural supplements, food

Regardless of the strategy chosen, the framework will make clear gaps in education and R&D incentives.

Without a good education system, even adaptive innovation is not possible. If Armenia is committed to creating any innovation cluster, it must improve education. R&D incentives should become a part of the government policy agenda. The incentives, however, must be integral of the entire innovation system, not isolated components.

When implementing a comprehensive national innovation strategy, Armenia's decision makers must make choices based not on speculation but on evidence and analysis.

They must test initiatives and secure prerequisites—investing, for example, in *understanding market needs, creating networking and collaborating mechanisms, and developing skills demanded by the market.*

The state can initiate and support the creation of market testing mechanisms for innovative ideas and products. Among those mechanisms are Proof of Concept (PoC) grants, which have been used effectively in other countries. Moreover, the self-selection process spurred by the PoC mechanism can become an efficient means for identifying who can benefit from skill development programs.

Establish Process for Choosing National Innovation Strategy

A National Innovation Strategy Working Group comprised of representatives of the government, private sector, business associations, and academia would be best suited to choose and implement a strategy. The composition of the group would be subject to the Government's approval but could be open to nomination by different stakeholders.

Institute Coordination Mechanism to Execute Strategy

Armenia's scientific and policy landscape requires a more centralized and empowered organization for innovation strategy execution. The innovation strategy coordination body should organize policies across multiple public or private stakeholders. A high-level innovation policy platform can be created as a separate body but can also be tied to the existing governance structure. A detailed stakeholder mapping analysis is required before any decision is approved since the policy platform must be on the agenda of all stakeholders: the government, the business community, and the research community.

INTRODUCTION

According to the Global Competitiveness Report, Armenia's economy has moved to a new development stage, where the improvement of economic efficiency and innovation capacities are important preconditions for further development. The establishment of a competitive and innovative economy is one of the Armenian government's priorities. Crafting a viable strategy for innovation system development is another on the government agenda. Therefore, the second National Competitiveness Report aims to serve as an informational and analytical basis, and contribute to the process of establishing and choosing a strategy for national innovation system development.

The global economic crisis has highlighted the systemic weaknesses of the Armenian economy: resource intensive exports, immature industry structure and strong concentration of sales markets, low levels of productivity, and dependence on external resources (export of mineral resources, private transfers). These were already highlighted in the first Armenian Competitiveness Report. At the time of publication of second report, the rate of economic decline in Armenia was the highest among CIS countries, although Armenia had exhibited a double digit growth rate during the past decade, and was classified as one of the most dynamic developing countries. We have therefore encountered the "economic growth – competitiveness decline" paradox - economic growth was not accompanied by the establishment of basic conditions for an increase in competitiveness.

In comparison to the first report, this publication has a thematic focus. As a result of a number of discussions with key economic policy decision makers, and initial deliberations, the authors decided to address Armenia's innovation performance in this 2009 Report. This choice is also derived from the logic of the previous report, where an innovation system is viewed as one of the main components of a leverage system for strategic breakthrough.

Continuing the tradition of the first report, this one also performs a broad and comprehensive analysis of Armenia's competitive position using abundant statistical data, ratings and evaluations from reputable international institutions.

The Armenian National Competitiveness Report is the product of a team effort from the Economy and Values Research Center. The authors believe that the report will foster discussions around economic development strategies between the government and the business sector. It will also serve as a source of reference and will help in comparing and rating Armenia's progress, and the economy's strengths and weaknesses.

The report can be useful for students, professors and researchers, in order to find valuable and up-to-date information and analytical material about Armenia's economy, competitiveness and innovation systems. It can also serve as the basis for a generation of new research ideas.

Finally, as an independent and objective analysis, it can be used by non-governmental organizations to advocate the interests of the private sector and in various initiatives aiming to solve issues inhibiting business development.

The report consists of four chapters. The first two chapters present Armenia's competitiveness performance and main macroeconomic metrics, and highlights major changes from 2008. It focuses particularly on the impact of the economic crisis on Armenia's economic system by revealing its specifics which is the result of the peculiarities of the country's economic system.

The last two chapters of the report are dedicated to assessing the performance of Armenia's innovation system by employing the most widespread analytical frameworks of national innovation systems and the elaboration of possible strategic options.

By studying the experience of leading countries that have succeeded in building innovation-driven economies (USA, Israel, Singapore, Finland), especially at the initial stage of national innovation system establishment, four possible scenarios for building Armenia's national innovation system were identified. For each scenario, the significance of key elements of an innovation system and the applicability of those strategies to different sectors of the Armenian economy are evaluated.