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Georgia's Academic Innovation Ecosystem & Recommendations for How to Improve It

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Current Landscape

The Republic of Georgia has all the necessary elements for the creation and commercialization of innovative research originating in academic institutions, however these elements are fragmented, poorly coordinated, and lack incentives. As a result, they do not produce the desired outcomes. The current report offers proposals for remedying this situation. To begin, consider the current lay of the land in Georgia's innovation ecosystem.

Georgia has a long tradition of entrepreneurship and innovation, reaching back to the industrial concerns of the late nineteenth century. According to the Global Entrepreneurship and Development Institute (GEDI), the Republic of Georgia, when compared to countries like Germany, Poland, or Latvia, has high scores for Entrepreneurial Attitudes, Abilities, and Aspirations, as well as for Educational Level. However, Georgia scores far lower than other countries on indicators such as Product Innovation, Process Innovation, Networking, and Risk Acceptance.

	PILLARS		INSTITUTIONAL VARIABLES		INDIVIDUAL VARIABLES	
Entrepreneurial Attitudes	Opportunity Perception	0.39	Market Agglomeration	0.52	Opportunity Recognition	0.56
	Start-up Skills	0.20	Tertiary Education	0.43	Skill Perception	0.44
	Risk Acceptance	0.07	Business Risk	0.09	Risk Perception	0.67
	Networking	0.15	Internet Usage	0.42	Know Entrepreneurs	0.32
	Cultural Support	0.48	Corruption	0.58	Career Status	0.67
	Entrepreneurial Attitudes	22.94				
Entrepreneurial Abilities	Opportunity Startup	0.22	Economic Freedom	0.47	Opportunity Motivation	0.24
	Technology Absorption	0.31	Tech Absorption	0.34	Technology Level	0.55
	Human Capital	0.60	Staff Training	0.60	Educational Level	0.81
	Competition	0.18	Market Dominance	0.36	Competitors	0.40
	Entrepreneurial Abilities	28.64				
	Product Innovation	0.13	Technology Transfer	0.37	New Product	0.41
	Process Innovation	0.08	GERD	0.30	New Tech	0.25

Contemporary Georgian universities are a site of significant primary research and innovation, especially in the life sciences, physical sciences, clean tech, agro-tech, and new materials. This is largely thanks to successful reforms and mergers of educational and research institutions that

have taken place since the collapse of the Soviet Union. Yet, there is currently very little infrastructure connecting research, innovation, and entrepreneurship. Several universities and research institutions are generating groundbreaking research, but the outcome of this work is usually limited to academic publications or conference presentations. This has the result of leaving research and potential innovations that stem from it in the lab, rather than on the market.

The Rustaveli foundation, Georgia's primary source of funding for groundbreaking research, offers commercialization grants, but even here, the deliverables sought at the end of the grant period take the form of academic publications. Once again, this doesn't contribute well to bringing this research to the market.

Georgia has created a centralized Tech Transfer Office, which makes sense for a country of this size and scale of economy. However, this office is far removed geographically from the researchers, and it requires universities to deliver projects at TRL4 — essentially, ready to be licensed to industry. There are no programs offered to help bring technologies to this level of readiness.

The current report offers proposals for the creation or improvement of the current ecosystem in order to stimulate the commercialization of innovation and merge entrepreneurship and research, helping to realize Georgia's unexploited potential for innovation.

The Need For Early Disclosure and Protection of IP

One major handicap for effective transfer of technology and dissemination of research findings in Georgia relates to the lack of a process for creation, disclosure, and protection of Intellectual Property (IP) or an Intellectual Property Policy (IPP) at most Georgian universities. A sound IPP is a first requirement for a smooth approach to commercial activities related to innovations and inventions. The presence of an IPP cannot only stimulate the articulation of innovations and inventions within universities but also alleviate any tension or suspicion that may exist between a university administration, the community of researchers, and, to some extent, representatives of industry.

Policy governing the distribution of income from royalty and licensing is of crucial importance. In the absence of a sound policy, faculty often fear that they will get a raw deal from the university if they include the university in discussions of potentially valuable research outcomes. This leads some university faculty to solicit consultancy work on an individual basis, even regarding inventions that were conceived in university laboratories and using university resources and funding. This is clearly a losing proposition for the universities. Yet it is also often not the best path for researchers. "Going it alone" usually is not a very successful strategy, since most organizations prefer to work with institutions rather than individuals. Of course, some clever representatives of industry take advantage of this situation to gain access to innovations and inventions without paying for them.

Recommendations

A robust commercialization program starts with institutional support, incentives, and a straightforward process. The first step is to create trust between the administration and researchers and a mutual understanding that all parties are working towards the same goal — to bring innovation to society and to bring benefits to the institutions and individuals who create this innovation. In order to build this trust, the university needs, first of all, to create an awareness campaign aimed at researchers, helping them to realize the importance of early disclosure of innovations, as well as an office within the university to receive such disclosures and triage them. Creating the right marketing materials to explain clearly and in plain language how disclosure works, stressing that it is completely confidential, can lead to the generation and recognition of valuable intellectual property and allow the researcher, with the institution's help, to protect that IP prior to making any publications or public presentations. It is crucial to help all parties to come to a clear recognition of the importance of patent protection and how it leads to better outcomes in funding, as well as of the university's role in this process and how the institution can help to elevate the research and the researcher, leading to better funding of future research, labs, or departments and better results in potential commercialization down the line.

The university should also clearly state a policy regarding early research disclosures with regard to promotions and other incentives within the academic system itself. Faculty and researchers with an interest in entrepreneurship usually face unique challenges, given that traditional academic institutional environments often do not value entrepreneurial activities. Primary among these challenges is the appointment and promotion process, which typically privileges purely academic measures of success (e.g., grant funding, academic publications, presentations) over translational work and research implementation, along with the general university culture, which often promotes a single-minded focus on research, not commercialization. Universities can help by creating different "tracks" for researchers with entrepreneurial aspirations and supporting them by creating incentives and promotions tailored to these other goals of research activity.

Since this shift into generating, disclosing, and protecting IP will be a novel experience for faculty at Georgian universities, it may be helpful for them to come into contact with and learn from counterparts in the US regarding successful efforts to commercialize research. If faculty members see how other faculty members in their field have either started companies or created patents that are licensed to the industry, this may provide great motivation to do the same. One way to efficiently share this sort of experience would be to host an international conference on academic innovation. For instance, a conference on deep tech innovation and commercialization, hosted by Ilia State University, the US Embassy, and GITA, could attract high-profile speakers. Best practices in Tech Transfer could be discussed and promoted during the conference. One might also mention, in this connection, AUTM, a wonderful organization that could participate in such a conference and help devise a disclosure campaign. Any number of consulting organizations that work with Tech Transfer offices and universities around the world, such as WorldUpstart, can also add value at such a gathering, contributing to the creation of IPP or an awareness campaign within the university.

Summary:

- Establish new tracks with the right incentives for faculty and researchers (especially junior researchers) to innovate and create IP.
- Create a prominent awareness campaign to communicate the importance of disclosure of inventions and innovations and an easy process for this disclosure, leading to protection of IP within the University.
- Create or update existing university IP policies to clearly state the priority of generating and protecting IP.
- Establish an annual innovation and commercialization conference to invite researchers from the US to share their experiences in creating IP for licensing or starting companies. |

The university - GITA relationship and the "lack of innovation" problem

Following the creation of a disclosure–protection process that can identify and generate valuable IP, the next step in improving Georgia's innovation environment relates to validation and the engagement of GITA. The Georgian Innovation and Technology Agency (GITA) was created to prioritize and focus on the commercialization of innovation and technology in Georgia, to facilitate the growth of investment capital, and to encourage the participation of private businesses in commercialization of innovations and inventions. GITA is a crucial and professionally staffed organization, and these are the right goals. Yet GITA's expectations with regard to the innovations that the organization helps commercialize are far removed from current realities in Georgian universities. Within the framework of TTPP, GITA expects to receive project applications from various universities and research institutions. Based on a detailed evaluation process, the organization select those projects with higher commercialization potential. Perhaps the greatest current shortcoming of these programs at present is that GITA

focuses only on research projects that have reached a Technology Readiness Level (TRL) of 4+ and above. This means that the project should already have patents or the potential for them, and should also already have a prototype, business team and some indication of market traction. Yet no programs currently exist at the university level that can assist researchers to get to this quite advanced level of readiness for commercialization. It is largely left to the individual researcher to seek potential customers and validation from the market and to seek patent protection. Even if the researcher succeeds in one of these tasks, often through personal connections, he or she likely still lacks the skills to build a business case for the innovation to be ready for commercialization at TRL level 4.

This year, GITA received only 12 projects for the TTPP program. Only three out of these 12 were selected for commercialization. Of the 9 projects that were selected over the last three years, only one was licensed. This reveals that there are not enough projects at the level of readiness that GITA expects, which in practice means that very few projects coming out of the university research are destined for commercialization. Universities complain that they don't have enough innovation projects to commercialize. Yet we know that innovation is happening! The problem is not the researchers, but the absence of structures and programs to help them realize their potential. To increase the number of projects and to get them ready for GITA's process, I propose the following short-term and long-term recommendations.

Recommendations

Short-term: develop a pilot course on innovation and entrepreneurship for faculty and researchers at Ilija State University that can be replicated at other universities

Because it may seem daunting to an academic researcher to enter the world of commercialization or entrepreneurship, many universities in the US provide classroom instruction offering a guided introduction to this topic. Such courses often provide a broad overview of the principles of innovation and entrepreneurship and are targeted toward individuals with limited prior exposure to this field of activity. Some of these courses are interdisciplinary and involve team-based

projects with “students” of diverse educational backgrounds, thus providing an immersive experience in entrepreneurship.

Developing and pioneering such a course at Ilija State University, using the resources of the institution’s Business School for researchers from the Medical School and the School of Engineering, would be an important first step in assisting and stimulating academic innovation. I suggest not to import a ready-made course from the US, but rather to develop a custom course for the Georgian audience, keeping in mind Georgia-specific challenges.

Some examples of courses of this kind in the US include, for instance, those on offer at Northwestern University’s McCormick School of Engineering through the Farley Center for Entrepreneurship and Innovation. This course walks researchers through the steps required to bring a medical innovation from an idea to the bedside; interdisciplinary teams of “students” work through the intellectual property, regulatory, and business processes that bring a medical innovation to market. The Stanford Biodesign Innovation Fellowship is perhaps the most established such training program, focusing on health-technology innovation. It centers largely on experiential learning rather than classroom-based activities.

When we think of invention, we think of the “eureka moment,” however, the process of invention is like exercising any other muscle in the body. Even though most researchers in Georgia are not currently trained in innovation, the skills of invention can, in fact, be taught and learned. The course should include the elements of ideation, design thinking, identifying unmet need on the market, customer discovery, and basic market research. The aim of such a course will be to stimulate inventions even in the course of basic research and to help researchers get their innovation ready for commercialization.

Additionally, it will be highly beneficial to foster the creation of interdisciplinary teams between the three schools, perhaps with small grants, in order to encourage these teams to participate in the course with a specific project in mind. Below is a table detailing what each team member can bring to the project.

University Division	Offer to the program
medical school	knowledge of the problem and specific needs
business school	entrepreneurship education, business development skills
engineering school	collaborators, prototype developers testing/technical analysis fabrication/ instrumentation
student groups	help with prototype development, market analysis, competitive landscape
university hospital	needs analysis, testing, and end user

Longer-term: a nationwide proof-of-concept program

Once universities begin to generate and protect IP, a smart nationwide proof-of-concept (POC) program should be established to help with its commercialization. Today, researchers are left to their own devices to understand the needs of industry and where their research can apply in the real world. They lack the business skills and knowledge to assess customer needs, market size, competitive analysis, or the regulatory landscape. All of these lacks could be ameliorated with a short but effective program that will allow GITA and the Rustaveli Foundation to select 5-10 projects each year and create working groups with advisors from industry, entrepreneurs and invited experts, in order to help researchers think through all necessary steps. A POC Program is needed to bridge the gap from research to commercialization—the passage that sometimes called "the valley of death": the absence of an industry sponsor and the lack of funding to build a prototype of a product or service that could then be used to solicit investment for a new company or license a new product. At the end of such a process, GITA and the Rustaveli Foundation will have several projects that are better prepared for commercialization and funding.

Here is how the program may work:

1. Project Selection

   Researchers from participating institutions submit brief project "white paper" proposals. For a proposal to be eligible, its intellectual property must already be established or at least identified with high potential by one of the program's participating institutions. A Selection Team made up of industry and investment professionals reviews the proposals and recommends 5-10 finalists to move to the next stage.
2. Finalists are matched with business advisors who provide mentoring and commercial perspectives in developing full-fledged Proof-of-Concept Plans over three to four months. These finalist teams are connected with additional expertise in intellectual property law, regulatory requirements, and other key areas as needed through "specialist clinics." Business advisors can be invited from the network of successful alums from participating universities (see the section on alumni network cultivation in this report) and could be located outside of Georgia. It is crucial to invite business advisors from industries directly related to the research in question. Business advisors can also come from other sources, not related to the university community. Eventually, it will be a matter of prestige to be invited to become a business advisor to such a program, especially if it offers a networking opportunity and perhaps a trip to Georgia for a finalist's presentations.

   The deliverable at the end of this stage is a 15-slide pitch deck from each team that addresses problem that the invention is solving, the size of the market, the technical validity of the solution, the strength of the team, competition analysis, go-to-market strategy, regulatory pathways, and a detailed account on how a proof-of-concept grant would be used in order to help with commercialization of the invention.
3. The POC Selection Team, with input from technical reviewers, evaluates the finalists' Proof-of-Concept Plans and recommends projects to receive awards to implement these plans over a 12-month period. Following the award, teams develop milestone plans and continue to receive support from business advisors and GITA and Rustaveli Foundation staff for one year.

4. GITA personnel and additional industry and investment representatives review the progress of projects during proof-of-concept implementation and work with technology transfer offices to facilitate the successful transition of technologies into the private sector.

Long-term strategy on starting spin-out companies out of universities

For the past few decades in the US, but also in the UK and elsewhere in Europe, technology transfer offices have mainly been occupied with licensing. Spin-off companies were treated with suspicion as overly complicated projects, in comparison to securing a nice, quick license to industry. In addition, it was feared that spin-offs would produce conflicts of interest, in which the academic is also a company shareholder and board member. It seemed safer for the university to stand clear of actual business creation, incubation, and acceleration, and instead to just sign simple license contracts and sit back to collect royalties.

The main problem with this attitude is that most university research doesn't result in a neatly packaged invention that is ready for licensing. University research usually produces a widget or process that works sometimes in the laboratory, but that requires significant development before it can be released onto the market. Unfortunately, most industries don't want to undertake such development work. It seems too risky and too expensive. And, of course, the fact that they will have to do all the development work means that they are unwilling to pay much to the university in those cases when industry does acquire rights to potentially significant, yet still untested innovations. The Association of University Technology Managers (AUTM) survey of US universities showed that the average advance payment on their licenses was on the order of $35,000. With an average of $1.5 million spent on research at these universities per project, to part with the best outcomes for only $35,000 is hardly an impressive return. The pharmaceutical industry used to be an exception to this rule, which is why the same AUTM survey shows that over 80% of university license income comes from life science inventions. Yet even the pharmaceutical industry seems to be backing off, requiring new lead compounds to have reached Phase 2 trials before they are interested. And as for gaining traction for untested innovations in

the engineering, chemicals, or information technology fields—forget about it. No one will pay to license it if it isn't well developed.

For this reason, in many cases, a spin-off company is a necessary step to develop the product and demonstrate its market potential, in order to take some of the early-stage risk out of the equation. A start-up company can raise the funds for development by selling some of its equity to venture capitalists or through small business grants. The licensing option always remains open if the potential of the innovation suddenly strikes home. Yet once the product is fully developed and an identifiable market is clearly engaged, larger companies will become very interested—and will start to offer much larger sums to acquire the start-up company, gaining exclusive rights to innovation, with its now proven traction.

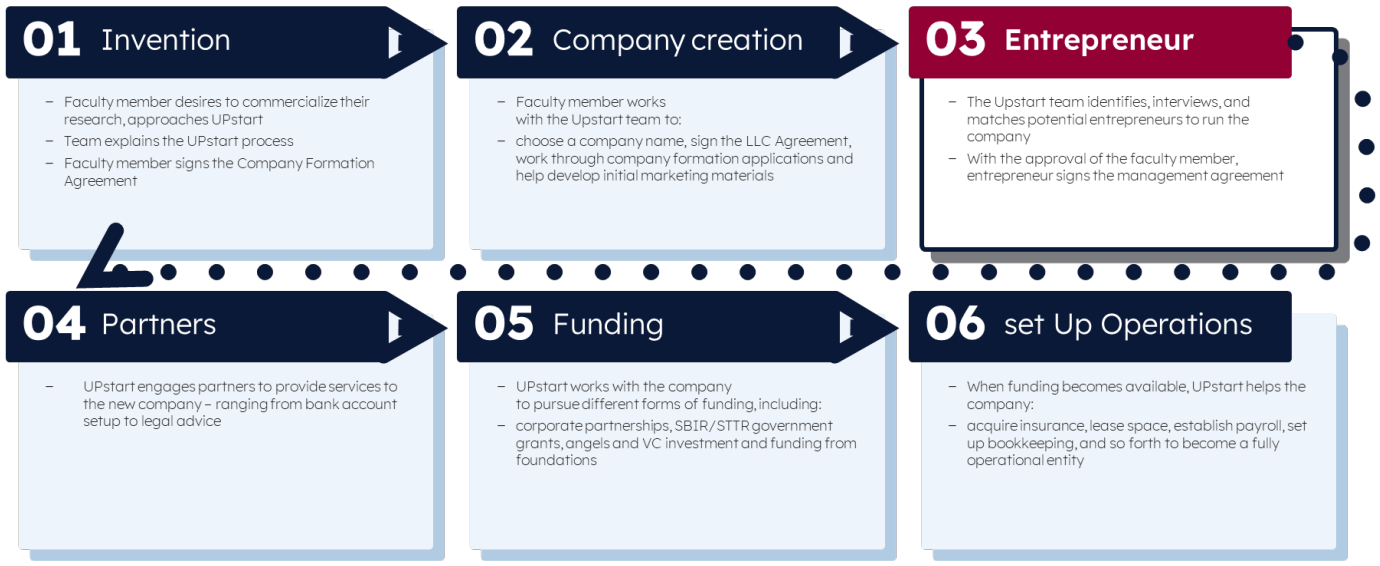
As a result of a shift in thinking in response to the realities of the industry context, many universities in the US, Western and now even Eastern Europe are developing programs to help start spin-off or start-up companies based on faculty inventions. In Georgia, GITA is also only focused solely on creating licenses based on university research. I think a robust program to help universities start deep-tech companies and to support these companies through their early development will produce better results for the commercialization of inventions.

In conversations with senior management and academics in Georgia, I heard the objection that university acquisition of equity in such companies would present a financial risk to the university and is not supported by law. However, a quick bit of research and a conversation with GITA revealed that the law has been changed and is now in support of such an arrangement. The biggest objection I met in these conversations stemmed from the notion that the university will somehow be punished if the company fails. Keeping a separation between the university and the company is very important. Shareholders are not responsible for the management of the company. All the shareholders lose is their original investment. If the shareholding has been acquired by the university not for cash, but for making the intellectual property available, then the university has no financial liability. Finally, as one who has worked my entire career in American start-ups, I must repeat the oft-cited wisdom that most start-ups fail. The reason for all parties to engage in start-ups is not because any given project will succeed, but that the returns

for a single success are enormous. (One successful exit from the University of Pennsylvania's start-up creation programs, literally, returned exponentially more funds than the total operating budget of the university's innovation programs over the course of a decade.)

I have quite intentionally placed this recommendation as a long-term undertaking. To start a spin-off company around university research, researchers need first to understand the importance of the creation and disclosure of IP and to gain a basic understanding of commercialization principles. Once the steps outlined above are taken—creation of an IP strategy and process, awareness campaigns for entrepreneurship, proof-of-concept programs—spin-off creation programs will be the next logical step.

For an example of how the process of company creation and growth may work within the walls of the university, consider the Upstart program of the University of Pennsylvania (in which I formerly worked):



This is just one of the examples of a high-functioning program. Many similar programs are now running across the US and Europe. The University of Warsaw program may also be a good example of adaptation at Georgian universities. WorldUpstart can help build a custom program for

Universities in Georgia take into consideration areas of research expertise and specific cultural differences.

Summary:

- Encourage the formation of multi-disciplinary teams with small grants. Offer those teams a research commercialization course.
- Create a course for entrepreneurial-minded researchers to help with ideation, market needs, and understanding of commercial aspects of research.
- Utilize business school resources but encourage the formation of teams from the Medical and Engineering Schools.
- Establish a full Proof-Of-Concept program to help the GITA and Rustaveli Foundations to select and fund the most promising research and increase the success rate of licensure and commercialization.
- Establish a process for the creation and support of spin-off companies from within universities

Fostering relationships and engaging alumni in entrepreneurship at the university

Institutions in the United States have a long history of university-alumni relations. These relationships are predominantly focused on increasing university endowments. Universities create and support longstanding alumni networks through newsletters and other outreach, alumni reunions, and the like. These networks help recent graduates find jobs and promote their careers as they become members of such networks in turn. Creation of such an alumni network takes cultivation over a long period and may not ever generate similar results in Georgia. It will take time for alumni to perceive the value in participation in such a network and in “giving back” to their educational institutions.

Instead, I propose to begin cultivating alumni relations around entrepreneurial activities and to involve alumni located outside of Georgia, stimulating them to invest their time (and sometime money) to help commercialize university innovation. Focusing alumni relations around innovation, commercialization and entrepreneurship can create an entirely different set of university-alumni interactions with rewards for both sides.

Today, Georgian Universities neglect not only the unrealized intellectual properties that I address early in this report, but also leave behind one of their most valuable resources – their alumni. Over the last decade, Georgia has experienced a "brain drain" of professionals who graduate from Georgian universities but then depart to build careers elsewhere around the world. The silver lining to this situation is that these universities already have a potential network of "champions" scattered around the world – successful professionals in various fields who may retain an affinity to their alma mater, but who have no way to express this affinity.

Recommendations

The first step universities should undertake in building new alumni networks is to create a database of graduates who have achieved a high level of excellence and prominence in their fields. Universities can then start reaching out to successful alumni in various industries, inviting them to serve on Innovation Advisory Committees for various departments and on an Innovation Advisory Board for the university. This board will be a prestigious place to serve and advise the university on commercialization and entrepreneurship. It will allow the university to gain from the wisdom, experience, and connections of alumni. And it will allow alumni to retain meaningful contact with their home country and educational institution, and also to gain access to cutting-edge innovation and research with potential market value. Positions in advisory committees should be rotating and held for no more than two or three years, to increase the network's scale efficiently. Here is what Alums can offer to the University:

- Organization of seminars, workshops, and conferences.
- Partnerships and collaborations on research projects (virtually and in-person).
- Resource sharing — providing access to funding, data, research, and technology.

- Serving as mentors and advisors for researchers who seek to commercialize their innovations.
- Advice to the university on building entrepreneurial programs and developing the ecosystem to support innovation.

Additionally, once a company spin-off program is created within the university, this program could begin to offer support to entrepreneurial alumni seeking to start their own companies. This could be a two-way relationship, in which universities invite alumni to mentor and advise, but also, in turn, offer them university resources, labs, and students to help with the creation of products and services. This is a new way to build a strong alumni network and relationships around entrepreneurship.

Summary:

- Create and maintain a database of graduates who have achieved a high level of excellence and prominence in their fields.
- Invite them to serve on the Innovation and Commercialization Advisory boards for each department and the university as a whole.
- Ask them to serve as mentors and advisors to the Proof-of-Concept programs.
- Offer support for their entrepreneurial projects in the form of labs and student market research projects.

Conclusion

As I stated at the beginning of this document, Georgia has an enviable capacity for research and no shortage of inventions, but a lack of infrastructure, support and education for researchers on how to bring their inventions into the market, hindering the commercialization progress in the country.

The recommendations presented above provide a framework for how to start building such an infrastructure and describe sequence of building block that will lead to the formation of a robust ecosystem for the commercialization of research.

In my conversations with researchers while I was in Georgia this fall, I heard many times that the commercialization process that is now a standard practice in the US universities will never work in Georgia because of differences in academic culture. I have two thoughts in response to this pessimistic view.

Firstly, Eight to ten years ago, the same objections were raised in the United States. No one thought that it was possible to overcome entrenched conservative academic culture and foster a turn to entrepreneurship. Yet look where US academic institutions are now.

Secondly, it's ironic to hear such an objection from a society that has, in one generation, successfully transitioned from state socialism to market capitalism. Success breeds success. Georgia has many successes ahead.