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Building and Sustaining Successful Complex Research, Education, and Engagement Collaborations

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Global Trade Analysis Project

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Abstract

Truly making progress on the widely cited ‘grand challenge’ issues facing society today demands productive collaboration and partnerships among academics and stakeholders both within and across disciplines and sectors. To help facilitate such collaborations, higher education institutions convene a variety of organizational structures intended to promote productive interactions among scientists and educators. These structures carry a variety of names: centers, institutes, collaboratives, and laboratories, to list a few. Based on observation of the academic landscape for several decades, few of these entities realize their full potential to make a real difference on the issue(s) they were created to address. In this paper we review the experiences of two University-based Centers that have had sustained impact over more than three decades. We offer some thoughts on key success factors for cross-mission, cross-disciplinary and disciplinary convening structures that may be useful for those looking to establish such entities and/or re-boot existing Centers. Key elements discussed include a clear need for the Center; institutional support; incentives for faculty to engage; access to essential resources; a viable revenue model; flexibility and adaptability; and effective leadership and governance. Specific examples for how each of these elements have been operationalized in the Global Trade Analysis Project and the Center for Food and Agricultural Business, both at Purdue University, are provided.

Building and Sustaining Successful Complex Research, Education, and Engagement Collaborations

Introduction

Truly making progress on the widely cited ‘grand challenge’ issues facing society today demands productive collaboration and partnerships among academics and stakeholders both within and across disciplines and sectors (Helms 2023). In this paper we review the experiences of two University-based Centers that have had sustained impact over more than three decades. Economists would say such productive collaborations demonstrate ‘economies of scope’, where individuals of diverse backgrounds come together, demonstrating complementarity across disciplines, backgrounds, skills, perspectives, and ultimately, enhanced productivity (Koshal and Koshal, 1999). Likewise, disciplinary activities can benefit dramatically from ‘economies of scale’ – with multiple individuals from the same discipline coming together to work on a common problem. To help facilitate such collaborations that create scope and/or scale economies, institutions convene a variety of organizational structures intended to promote productive interactions among scientists and educators. These structures carry a variety of names: centers, institutes, collaboratives, and laboratories, to list a few. Here, for simplicity, we will refer to such entities as Centers.

Based on observation of the academic landscape for several decades, few of these Centers realize their full potential to make a real difference on the issue(s) they were created to address. We offer some thoughts on key success factors for cross-mission, cross-disciplinary and disciplinary convening structures that may be useful for those looking to establish such entities and/or re-boot existing Centers. We utilize the Center for Global Trade Analysis (GTAP) and the Center for Food and Agricultural Business (CAB) at Purdue University as case studies. Both Centers are long-lived entities that, by most measures of success, have thrived over an extended period of time (more than three decades), creating and exploiting economies of scope and scale in the process.

Case Presentation

This case report focuses on key success factors for two long-lived Centers: the Center for Global Trade Analysis (GTAP) and the Center for Food and Agricultural Business (CAB). Each will be presented in turn.

The Global Trade Analysis Project (GTAP) is housed in the Center for Global Trade Analysis in the Department of Agricultural Economics at Purdue University. It was founded in 1992 with the mission to improve the quality of quantitative global economic analysis through the provision of data, models and training. It comprises a network of 29,000+ individuals in 175+ countries and is guided by a consortium of 33 multilateral and national organizations, including a number of private companies. The GTAP Data Base, now in its 11th release, is the centerpiece of the Global Trade Analysis Project, is free to consortium members and data contributors, and is fee-based for all others. The Center is self-supporting with revenues coming from consortium memberships, data base sales, research projects, and courses. GTAP-University has trained more than 1,600 individuals and currently offers six different courses through a combination of in-person and online instruction. The Center also holds annual conferences on global economic

analysis and publishes the *Journal of Global Economic Analysis* (www.jgea.org), a highly cited, peer-reviewed journal on applied general equilibrium modeling.

The Center for Food and Agricultural Business (CAB) at Purdue University conducts non-credit professional development programs and applied research for the food and agribusiness industries. An on-line graduate degree program – the MS-MBA in Food and Agricultural Business - is offered in partnership with the Indiana University Kelley School of Business. Founded in 1986, the self-funding Center now employs 8 full-time professional staff and conducts 100-120 days of on-campus/hybrid/online educational programming annually engaging more than 1000 food and agribusiness managers. Program offerings include public programs open to any food and agribusiness professional, as well as custom programs designed to address the specific needs of an industry client. The MS-MBA has two cohorts in session at any point in time, serving a total enrollment between 50-70 in the two classes. Center faculty and staff also engage in applied research focused on specific topics of interest to the food and agribusiness industries. Some of these projects are industry-consortia projects, where a number of firms come together to invest in a specific research topic. The overall Center is self-funding through program fees, tuition, and research funding – the University does not invest funds in the Center.

Table 1 below summarizes the key success factors associated with these two Centers, as well as the potential pitfalls which threaten to derail such Centers or limit their long run impact. In the Discussion, we take up each of these success factors.

Discussion

A clear need – Why is the Center needed? What specific issue(s) is it trying to address? What are the tangible benefits of bringing a group of scientists and educators together? What can be achieved through a collaborative structure that can't be achieved through existing departments, units, and entities? What are the specific goals and objectives of the Center? These questions must be answered clearly at launch – and there can be many compelling answers including solving problems literally impossible to solve without the Center, bringing visibility to an area of work, convening individuals with common interest, utilization of common resources, and building capabilities to compete for funding, among many others. That said, too many such entities are launched without thinking deeply about what the Center is intended to accomplish – or if a Center is even needed to address the goals and objectives articulated. There are significant opportunity costs associated with a poorly visioned and launched Center – for the institution and for the individuals involved. These costs include the resources invested in the Center, but also the impact a failing/failed Center has on the motivation and morale of the individuals involved. Better not to launch such an entity than to stand a Center up without a clear and compelling rationale.

In the case of GTAP, there was no common data base or analytical framework to support economywide analysis of international trade agreements (Powell 2007). Periodically individual international or national agencies would mount a multiyear project to build a data base and modeling framework to assess a pending trade agreement, but there was little incentive to document the work or make it publicly available. After the inevitable changes in administration, these projects were typically abandoned, with little lingering impact. There were also academic teams who built such data bases and modeling frameworks. However, their incentives were for

Table 1. Success Factors and Pitfalls Associated with Establishing a Center

Success Factors	Pitfalls
Clear need, goals, and objectives	• Fail to develop a compelling response to the question ‘why is a Center needed’? • Founder has one vision, participants and stakeholders have other ideas
Institutional support	• Fail to build compelling case for Center at launch, fail to communicate/reinforce impact with institution over time • Administration changes and the institution moves on to the next exciting project • Bureaucratic barriers frustrate effective functioning of the Center
Incentives to engage	• Center does not offer clear, specific, sustained benefits to potential members • Early enthusiasm wanes as novelty fades; participants move on to other projects
Access to essential resources	• Don’t identify and secure the most essential resources needed for long-term viability • Lack of administrative support can quickly kill an otherwise attractive project
Viable revenue model	• No sustainable business model identified • Startup funding is exhausted without a clear path forward
Flexibility and adaptability	• Critical topics change, stakeholder interests evolve but the Center does not • Fail to respond to changes in institutional leadership, funding streams, etc.
Leadership and governance	• Center leadership fails to effectively engage Center members • Center does not retain control/influence over key strategic decisions
Lifecycle management	• No plan for the Center to survive departure of initial Founder/Director • Unwilling to shut down activities that are no longer adding value for the Center

publications and consultancies. Construction of the data base was an input to these publications and projects which teams were loath to share. Furthermore, there was not a strong mandate to stay up to date with the latest policies – a feature that is critical for continuing impact. In short, anyone seeking to make a contribution in this field had few options, and there was widespread reinvention of prior work. The Center for Global Trade Analysis was conceived as a publicly-funded project, based in academia, which leveraged the policy insights and data access of public institutions, while taking advantage of the continuity and disciplinary expertise offered by a university setting. By

tying the Center's funding to data base public releases, Center staff have a strong incentive to produce and document regular updates to the GTAP Data Base and models. Furthermore, by being at the frontier of these foundational developments, Center staff are often in a position to engage in high profile publications, as well as garnering many citations to their work. As of the writing of this paper, Google Scholar reports more than 50,000 citations to GTAP Center products.

In the case of CAB, the unmet need/opportunity pertained to educational programming and applied research for the food and agribusiness industries. Until the early 1980s, there was public funding available for this purpose. However, for a variety of reasons, primarily growing size and sophistication of food and agribusiness firms, this funding was reallocated to serve smaller firms where the use of such public funds was more appropriate. With no public financial support available, a different business model was required if the educational and research needs of this group of food and agribusiness stakeholders were to be served. CAB was conceived in 1986 as a fee for service entity where industry clients would invest in the educational programs offered and/or the research performed. The business model is simple: professional staff work with faculty subject matter experts and their students to develop and deliver programs and conduct research that is of sufficient value to industry such that costs are covered by revenue collected.

While an essential first step, having a compelling rationale for an entity is simply a necessary condition, it is not a sufficient condition for success.

Institutional support – Clear goals and objectives must be in place for a Center to secure institutional support beyond merely tolerating the entity's existence. Here, we define institutional support broadly, including not just the 'host' institution, but any institution that may be a stakeholder for the Center. The standard the Center must meet will depend on what it needs from the institution; the greater the 'ask' for support, the higher the standard. Note that the need for, and type of, institutional support will likely evolve as the Center moves from launch, through growth, to maturity, to sunset. And, one of the most important ways an institution supports a Center is continuing to ensure that faculty members with expertise in the areas of focus are hired.

It is important to recognize that institutions (and their leaders) have their own set of motivations and ambitions, and the Center must be able to communicate how it supports those institution-specific motivations and ambitions. Perhaps it is academic reputation, perhaps it is leveraging an institutional strength, perhaps it is finding efficiencies in resource allocation, perhaps it is making progress on a grand challenge. Centers demonstrating scale and scope economies can contribute to any of these motivations/ambitions, but unless the linkage is made explicit to the institution and its leadership, institutional support will be difficult to obtain and/or sustain. For individuals engaging in Center activities, having the institution view the Center as an integral part of its long-term goals and making appropriate investments in the Center can be a major contributor to success.

Given the Center for Food and Agricultural Business (CAB) is self-funding; one might dismiss institutional support as not relevant to its viability. Nothing could be further from the truth. Entrepreneurial units such as CAB need freedom to operate. They need institutional flexibility in processes, policies, managing funds, etc. to serve private sector clients accustomed to tailored responses, tight deadlines, and rapid turnaround. Purdue has provided such institutional

support to CAB – and without it, CAB would have likely become mired in the bureaucratic structures required to serve a campus of 50,000 students. Likewise, Purdue has been willing to continue to hire faculty in the area of food and agribusiness management, and more broadly, been willing to make decisions that have supported CAB's success. In addition, the institution did offer important cost-share support when the on-line MS-MBA in Food and Agricultural Business was launched in 1999. To date, 441 students have earned a graduate degree at Purdue through this program. While it does not provide on-going funding for the Center, a willingness by Purdue to embrace and promote CAB and its mission has certainly contributed to its success. In return, and beyond the specific programs and research conducted by CAB, Purdue has benefitted from deep relationships with industry partners – relationships that enhance undergraduate and graduate student recruiting, provide employment opportunities for students, and research and educational project opportunities for other academic units. Beyond these more tangible benefits, the broad recognition CAB enjoys with the food and agribusiness industries has reputational value to Purdue University.

In the case of GTAP, institutional support from Purdue University was absolutely essential in getting the project off the ground. At the time the project was established (1992), the idea of a publicly funded consortium, based in the university, was novel. The first external members of the GTAP Consortium were public agencies – two from Australia, one from the US government (USDA), and one multilateral institution (World Bank). Drawing up the first consortium agreement and getting it approved by lawyers at each of these institutions, as well as at Purdue, was a grand challenge in its own right! However, the investment paid off, as there are now 33 dues-paying consortium members – including many more government and multilateral public institutions as well as a handful of private companies. Research (non-tenure) faculty from the Center are full members of the Agricultural Economics Department, participating in faculty meetings and serving on committees. The Department is also involved in the hiring of GTAP's research faculty members as well as the Director, and the assistant and associate research professors go through the Department's primary committee and promotion process. In short, Center faculty and staff are deeply embedded in the Department.

Incentives to engage – If a Center is intended to take advantage of scope and scale research and education economies and thereby realize its ambitions, there must be strong incentives for individuals to engage with the Center. Far too many such entities are launched without careful consideration of the question: 'why should an individual researcher/educator invest their time and talent in the Center?' Entities that simply convene individuals who have a common interest in the issue of focus have a relatively loose connection to their members. And, the half-life of such Centers is relatively brief. Far stronger connections are built when participants have a compelling professional reason to fully invest in the Center. Examples here could be funding, physical infrastructure, equipment, data, and/or staff infrastructure that members of the entity have access to that they would not otherwise. Some Centers have mechanisms for faculty to supplement their compensation and that provides another form of incentive to engage. Certainly, the ability to work with high profile individuals is an incentive to participate in such an entity, but there must be some tangible reason for such high-profile individuals to also engage. Likewise, the visibility and reputation of the Center may be a reason for an individual to engage, but typically the entity must earn this visibility/reputation before that reason becomes compelling.

Institutional leadership must recognize that how the Center forms will impact faculty incentives for engagement. A grassroots Center that comes together around faculty interest at the unit level likely already has faculty commitment. An institution launching a Center from the top will need to give more thought to the incentives needed to deliver faculty engagement. Regardless of how they start, the strongest such entities emerge when the incentives are so great that the members invest more than their time in the Center, bringing other resources to the table and making the entity's objectives part of their individual professional objectives. How engagement with the Center will further their specific professional ambitions should be clear if productive engagement is expected.

In the case of CAB, because the Center is self-funding, professional staff members have every incentive to develop and deliver educational programs and research of the highest quality that will drive repeat clients and build CAB's reputation more broadly. The professional staff have been the single most important reason for the Center's long-term success, providing a set of capabilities that creates a compelling reason for faculty focused on food and agribusiness management to engage with the Center. Faculty have a strong incentive to work with the Center given the professional staff's capacity to conduct needs analyses, manage client relationships, support development of educational material, provide research and technical support, and in general allow faculty to focus on their strengths as subject matter experts. Faculty can also earn 'compensation' in the form of funds from program/project revenues that they can use for their discretionary purposes. The industry relationships developed through CAB have generated applied research opportunities, access to data, and insights into industry issues that have led to peer-reviewed publications as well as provided a source of funding for a form of research that is not easy to fund – all strong reasons for faculty to engage. CAB has also played a role in attracting high-quality graduate students to Purdue, along with giving rise to a novel on-line MS/MBA program.

As with CAB, the professional staff for GTAP have been the single most important reason for the Center's success, ensuring continuity of services, outstanding organizational capabilities, and providing an important point of connection for thousands of network members. As a self-funded entity, the Center's professional staff have a strong stake in the Center's success. Importantly, they take great pride in the impact which GTAP has, worldwide. In addition to the professional staff members, the Center was among the first in the Purdue College of Agriculture to hire research faculty members. The GTAP Director is a research faculty member, and the Center now employs two additional research faculty. These non-tenured individuals can supervise graduate students, serve as PI on grants, and represent the Center at professional conferences. Their position is contingent on bringing in 50% of salary support, with the balance covered through their Center-related contributions, including data base and model development, as well as instruction in GTAP-U courses. There are also incentives for network members to engage with the Center. With more than 150 countries represented in the GTAP Data Base, maintaining a network of national contributors is essential, as these national data bases must be updated every few years, which can require several months' time for each country. Data base contributors receive free, early access to the full data base – on par with the GTAP Consortium members. By keeping the national information current, along with up-to-date information on bilateral trade, land use, and greenhouse gas emissions, the GTAP Data Base has become the premier vehicle for conducting analysis of global trade and environmental policy questions. Network members also benefit from exchange of

knowledge through GTAP conferences, courses, and seminars, the GTAP website, and an active presence through a listserv and social media, the latter three of which attract many announcements for professional opportunities.

Access to essential resources – The first three key success factors are central to obtaining the fourth: access to essential resources. Clear, compelling answers to the points listed above provide the foundation for a strong business case to secure needed resources. That said, it is essential that the Center secure the resources that are most critical to its success. Too often, such resource requests go straight to faculty lines, post docs, graduate students or some other ‘standard’ academic resource without enough thought given to the question: what are the most important resources needed for the entity to fulfill its purpose and provide the incentives individuals need to engage with the entity? Maybe the answer is faculty lines, or post docs, or graduate students. But maybe the answer is high performance computing capacity, data analysts, a specific piece of equipment, space for labs and offices, staff support resources, etc. Maybe it is strong institutional backing through making needed contacts, development support, giving the entity visibility and communications support, and/or raising the profile of the work. In general, such targeted, well-argued resource requests rooted in the fundamental purpose of the Center and aligned with what it needs to build value for its members have a far greater likelihood of a positive reception than generic ‘asks’.

Beyond Center-specific investments, institutions should also consider strategic investments that support Centers across the institution, providing appropriate resources at different stages of the individual Center’s lifecycle. Such investments might include strategic planning support, communications support, pre- and post- award support, coaching and mentoring, etc. Such centralized institutional support is far more efficient than every Center self-providing such resources and capabilities. That said, it must be possible for the institutional support to flex with the specific needs of the Center – rigid, uniform approaches simply will not be effective and will constrain the entrepreneurial leadership and energy needed for Center success. Likewise, resource needs will vary with the stage of the Center’s lifecycle. Needed institutional resources at launch will likely look different than institutional resource needs during the growth and maturity stage of the Center.

Any institutional investment in a Center means those resources are not available for other worthy purposes. Hence, institutional leadership can play an important role here by asking hard questions about the resources most essential to the success of the Center. Taking stock of what individuals will bring to the entity, what they have and don’t have, and what they need to make the entity viable will ensure the right resources are acquired to support the success of the entity.

As mentioned earlier, the most important resource of the Center for Food and Agricultural Business is its professional staff. And, recognizing that faculty and graduate students alone were not in the best position to deliver the educational programs and research demanded by industry was one of the most important decisions made at CAB’s founding. Given CAB is self-funding, the institution’s willingness to allow program fees to flow directly to the Center has been essential in providing the funds needed to hire and retain a top-quality professional staff.

In the case of GTAP, the flow of revenue from consortium fees and data base sales to the Center has been critical to its financial viability, and to the motivation of its outstanding staff to deliver these services. GTAP also supports graduate students in the Department – often as many as a half-dozen at any point in time -- who develop highly marketable skills and experience. Many of these graduates go on to work for consortium member agencies, thereby strengthening the ties between GTAP and its members. For its part, the Department uses GTAP as a recruiting device for graduate students and faculty, as well as a vehicle for enhancing the competitiveness of research grant proposals.

A viable revenue model – Resources for launch are one thing, but how will the entity sustain itself over time? Many, many Centers last only as long as their initial resource allocation – because they have not given thought to how they will fund their activities on an on-going basis. Expecting institutions to continue to invest may work, but in most cases, institutions provide seed funding to such entities, then move on to the next big idea. If thought has gone into the specific goals of the Center and what resources are essential to achieving those goals, then the question of how those resources will be obtained over time can be addressed. There are many, many possibilities here: federal research grants, philanthropic support, institutional recurring allocations, fee for service, state support, consortia arrangements, and industry support, among others.

Institutions and Center leadership should give thought to what revenue model is needed to support the launch of the Center, and how that revenue model may need to evolve over time. Perhaps administrative overhead is reduced/waived in the launch phase. Perhaps then some revenue sharing arrangement is appropriate as the Center begins to grow. How financial risk will be managed is important as well: if the Center experiences a period of reduced external funding, how will the short-run downturn be addressed and by whom? Long-term viability means thinking about the funding model, the risks associated with the model, and how those risks will be best managed over time. Ideally, the solution permits some actual science to be done instead of spending all available time looking for resources.

When the Center for Food and Agricultural Business was founded in 1986, the Dean's directive was clear: CAB can serve food and agribusiness educational and research stakeholders as long as it can generate the revenue needed to cover the cost of the activity. So, from inception, a business model that collected revenue from industry clients, then paid all operating costs of the Center has been in place. These revenues come from educational program fees, tuition, consortia funding, research project funding, and some (limited) philanthropic support. Once the Center became better established, the institution began collecting an overhead charge from the Center. This revenue model allows the Center to control its own destiny and not rely on institutional decisions about resources, while covering the full cost of the activity.

Like CAB, GTAP is also a 'not for loss' activity. Revenue streams come from consortium membership fees, data base sales, GTAP-U course tuition, as well as research projects. The diversification of revenue across these sources, as well as the geographic diversification, has provided funding resilience. US government agencies account for only a handful of the consortium members. Data base sales are a global phenomenon, course participants come from many different countries, and research projects are also geographically diversified. The latter often come in the

form of direct requests for research from GTAP Consortium members. Since the Center is at the cutting edge of data base and model development, it often faces an excess demand for its services.

Flexibility and adaptability – Launching a new Center is a challenge, but ensuring its viability and continued performance over time is another issue altogether. Far too many such efforts fade quickly in the face of Center leadership turnover, when the central convening issue loses some of its luster, Center members don't realize the specific professional benefits they thought they would, university administration changes bring different campus priorities, etc. Successful Centers continually revisit their answers to the fundamental questions asked when they were organized and adjust their activities accordingly. Perhaps a new research thread has emerged that is more promising than the original, perhaps resource needs have changed as the Center has grown, perhaps the entity needs to appeal to a new group of scientists to continue to make progress on its organizing question, etc. Key here is an on-going and rigorous review (internal or external) of Center activities and the willingness to heed the insights from such a review.

A different reason that flexibility and adaptability are so important is the tendency for institutions to pull back support on current initiatives to invest in the new and the different. Any Center interested in long-term viability must continually remind its stakeholders why it is important, why continued engagement creates benefits, and why ongoing investment is important. Institutional leadership turnover can present a special challenge here, and may demand repeating many of the steps involved in launching the Center to build support with the new leaders (especially understanding their priorities and ambitions). Science and the need for science-based knowledge are dynamic and any Center pursuing scale and scope economies must be equally dynamic if it is to remain relevant to the stakeholders it engages and its sponsoring institution(s).

The Center for Food and Agricultural Business is a client-focused entity. As such, it must stay flexible and adaptable to client needs if it is to survive. Topics of interest for industry educational programming can evolve quickly and clients have little patience for yesterday's ideas. With technology advancements, program modality has evolved as well, with on-line and hybrid programming becoming much more prevalent. Client inquiries about an on-line degree program ultimately led to the development and launch of the MS-MBA in Food and Agricultural Business graduate program in 1999. More broadly, personnel changes inside client organizations, mergers and acquisitions, and other dynamics with the Center's clientele demand continuous engagement to stay relevant. Such flexibility and adaptability have their foundation in deep and on-going relationships with clients that keep CAB current with changing industry demands. These relationships and this continuous due diligence pay real dividends for the broader institution. Faculty engagement with industry helps ensure that undergraduate and graduate coursework is current and relevant, as well as providing insights into important research problems that industry faces. For students, these relationships mean the institution is viewed more favorably as an employer. The indirect benefits from industry connections are an important way CAB creates value for Purdue.

The Center for Global Trade Analysis is also client-focused, although these clients are quite diverse geographically as well as in the sectors represented. Front and center is the GTAP Advisory Board, which comprises individual representatives from each of the 33 consortium member organizations. The advisory board meets once a year for two days prior to the Annual GTAP

Conference. In addition to receiving updates on the Center's activities over the past year, thematic panels explore emerging issues and the board members discuss pressing policy questions which they are confronting in their respective institutions. The outcome of this annual meeting is a workplan for the coming year, aiming to develop data bases and analytical tools to address these emerging issues. As a result of this guidance, the focus of GTAP's efforts has evolved from tariff and agricultural policy reforms, to climate change, and more recently to supply chains and sustainable development. Each new initiative is typically supported through special projects commissioned by subsets of the member agencies. Absent this annual guidance, GTAP would likely have followed an academic-driven agenda which would have surely failed to maintain continued policy relevance and stakeholder engagement.

Leadership and governance – The key success factors above must be supported by the right leadership/governance structure. As with any entrepreneurial venture, leadership needs will likely evolve over time. The founder of the Center may well be a highly visible, respected, and charismatic individual who is able to convene the initial members, sell the sponsoring institution on the effort, and secure the needed resources for launch. And, some Centers are by design intended to sunset when the founder steps down. When that is not the case, managing such a Center for the long-term is an entirely different matter. This requires that careful thought be given to what kind of support the founder needs, how growth will impact how the entity is organized, how governance and decision authority plays out. A key question to be answered early on is how leadership transitions will be managed. Who has decision authority when the Center needs a new leader? What role will Center members play in the process? These leadership transitions represent delicate moments for a Center, and timely, thoughtful leadership appointments are required if the Center is to thrive post-transition. In general, the most successful Centers are not top-down ventures, they are communities of professionals who want voice in the direction of the work, the allocation of resources, etc. How this is structured to take full advantage of the power of individual creativity while capturing the benefits of scope and scale economies and collaboration takes deep thought – and again, the answer will evolve over time as the entity evolves.

Careful attention to succession planning has been central to the long-term viability of the Center for Food and Agricultural Business. The original leadership structure involved a faculty Director and Associate Director, with the Associate Director stepping into the Director role when the founding Director stepped away from day-to-day leadership responsibilities. Likewise on the staff side, there has been a conscious effort to promote from within, with less experienced staff members learning the industry, what is involved in delivering first-rate programming, etc., and moving into roles of increasing responsibility over time. Investments in staff professional development - including funding graduate degrees - have been prioritized, providing another important reason for staff to remain with the Center as well as ensuring staff are well-prepared to address client needs. This attention to leadership structure has allowed the Center to work smoothly through multiple personnel changes and ensured passionate, engaged faculty and staff are leading the Center.

GTAP's founding Director is still a faculty member in the Department and serves as an advisor to the Director, assisting with staff hiring and attending monthly meetings. There have been two Directors since the founder stepped down from day-to-day leadership. One was hired as an Associate Director and then moved into the Director role when the founder left for a sabbatical

year. The next Director was an external hire. This individual had been extremely active in the network and had previously represented three different consortium members in the GTAP Network. He brought to the Center an excellent understanding of the inner workings and motivations of these member agencies. This has led to great success in further growing consortium membership and cultivating many new projects. After a decade under his leadership, the Center is currently facing another leadership transition.

Lifecycle management – Institutional leaders must understand that most such entities can and will run their course. The conditions which motivated their launch shift and change, the science moves in a different direction, or they simply don't get the traction they anticipated. Institutions need to be ready to sunset a Center when these outcomes play out and reallocate the resources in another direction. Far too many such entities in academic enterprises continue to exist long after they are no longer serving a useful purpose. That said, institutions should also be sensitive to pulling resources from high performing Centers simply because they are looking for new and different headlines.

While it is important for the supporting institution to assess the need to sunset Centers when they have served their purpose, the general notion of sunsetting activities that are no longer productive or relevant has also been critical to CAB's success over time. Related to the point about flexibility and adaptability, the Center for Food and Agricultural Business has sunset educational programs that have run their course and are no longer generating enough interest to justify the offering. This willingness to walk away from (or restructure) a program that is well designed and high quality, but no longer generates an industry audience has been important to the Center's long-term viability.

GTAP has also terminated activities that were not viable. For example, based on the early success of the GTAP Short Courses, the Center for Global Trade Analysis introduced an 'Advanced Course in Global Trade Analysis'. However, it quickly became apparent that what network members needed was an opportunity to come and present their own work. The advanced course was discontinued, and in its place emerged the highly successful Annual Conference on Global Economic Analysis, which is now in its 27th year and attracts about 250 attendees. Recent conferences have been held in France, Poland, Colombia, West Lafayette, Indiana, as well as transitioning online for three years during the pandemic to continue serving the GTAP research community.

Conclusion

Universities have great potential to contribute to solving the grand challenges facing society today. However, in order to do so, they must exploit the scope and scale economies deriving from multimission, multidisciplinary, multisector centers, institutes, collaboratives, and laboratories designed to engage deeply with private and public sector partners. The idea of economies of scope is important: the most successful centers bridge institutional mission areas and embrace some combination of discovery, learning, and engagement. To deliver on their promise, these entities must provide incentives for partners to remain engaged as well as for members of the Center to contribute their best efforts. Universities must provide creative and steady institutional support, and the Centers must have a viable long term revenue model. Finally, there

is a natural life cycle to such entities and when the mission has run its course, the resources should be released to launch and support other ventures.

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