## Towards Regionally Engaged Entrepreneurial (REE) University: an analytical framework

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## Abstract

The role of the higher education institutions (HEIs) has changed considerably over time. Recently many scholars are applying the concepts of enterprise and entrepreneurship to the university context but how that works in different context is still a question. The purpose of this review is to present a comprehensive analytical framework to better clarify the changing role of higher education institutions in regional enterprise development. Different conceptual argument on HEIs engagement and how HEIs engage in regional economic development in disparate global societal contexts are reviewed. Identifying institutional contexts shape the role of HEIs, how to collaborate with other regional actors and extracting limitations of existing models were specific questions addressed. All the models discussed lead to different policy conclusions though they are not mutually exclusive. Therefore a more comprehensive analytical framework is developed classifying the roles of HEIs in three major categories as Generative, Intermediary and Collaborative roles. Policies, leadership and facilities are found to be important institutional factors enabling the REE University to exist.

## Introduction

Despite the growing globalization of the world economy, development is context specific (Acs et al. 2014). The ineffectiveness of top-down approaches to regional development has been creating demand for regional actors to shape and influence their regional development trajectories (Salome, 2019). In a given region there are a lot of actors contributing to the economic development of the region. Specifically in the enterprise sector there are private enterprises, different regional government offices, industries and higher education institutions.

Higher education institutions are potentially major economic actors in their respective regions contributing through knowledge generation, transfer and engaging in regional enterprise development projects, which is frequently labeled as the ‘entrepreneurial mission’ (Compagnucci and Spigarell, 2020).

## A region and higher education Institutions

In the literature the term ‘region’ has several understandings. A region can be a sub national territory, a supranational territory or transnational (Kasoet al 2018). Maier et al. (2006) suggests thatfor a region to fulfill homogeneity criteria – the territories within a region should have some similar key performance indicators such as unemployment rate, income level or economic growth. In this research a region is considered at the sub national level. The special scenario in Ethiopia is there is federalist government system composed of regions and unitary higher education system.

The economic development of a region is understood as a process through which a region can improve its economic, political, and social welfare (Baporikar, 2019).Recently, the term ‘region’ is often used in a much broader sense by academics, policy-makers and regional development personnel to indicate the sustained, concerted actions taken by stakeholders to promote the economic well-being and the standard of living of individuals and communities that comprise the region (Saha et al. 2019).

Among economic actors in most regions, HEIs are considered crucial stakeholders given the development potential inherent to the knowledge generation, diffusion and the dissemination capacity of academia (Begg, 2016).Increasingly universities are expected to contribute to the development of their regions, not just through their teaching and research missions, but increasingly through the notion of “entrepreneurial mission” realized through dynamic engagement with external, and other regional partners through diverse engagement mechanisms (Charles, Kitagawa and Uyarra, 2014).

## Regional approach to development

There are a number of sound arguments for a more regional approach to development at a time of growing internationalization of the world economy. Firstly, it is argued that first favorable conditions for development are the result of a highly context specific combination of rules, norms and social relations which encourage and facilitate knowledge diffusion and exploitation mostly on a localized basis (Ascani et al 2012). Secondly, there are those that argue for greater importance to be attributed to bottom-up approaches to economic development emerging from the frequent ineffectiveness of top-down policies employed to regional development (Acs et al., 2014, Salome 2019). This review is consistent with an increasing demand for decentralization approach to development in the belief that regional forces and characteristics are strongly relevant in shaping regional development trajectories in a context of increasing globalization (Schwab et al., 2017 OECD, 2013).Therefore notwithstanding the plethora of arguments for top-down unitary economic development policies and strategies, this paper focuses on the opportunities and challenges to build strong localized economic development

## Higher education and the sustainable development goals (SDGs)

There is an acknowledgement for developments to be aligned with the sustainable development goals (SDGs). The role of HEIs is well acknowledged in the SDGs to prepare lifelong learners for the challenges of the 21st century. Higher education is a fundamental and indispensable for the achievement of most of the SDGs. It will play a pivotal role in ensuring society acquires the knowledge, skills, values, and attitude to attain sustainable development (Inga and Pereira, 2021, UN, 2015). Sustainable Development **Goal 4** calls for “inclusive and equitable quality education and promote lifelong learning opportunities for all” by 2030. Particularly Target 4.4 calls to substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship.

**Goal 8** of the SDGs sets out to promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, technological upgrading and encourage growth of micro-, small- and medium-sized enterprises to reduce youth unemployment (targets 8.2, 8.3 and 8.6).

Additionally **Goal 9** of the SDGs also calls for increase the access of small-scale enterprises, enhance scientific research, upgrade the technological capabilities of industrial sectors and Support domestic technology development, research and innovation particularly in developing countries (targets 9.3, 9.4, 9.5, 9.5B).

Digitalization and globalization has rendered the world is more interconnected than ever and demands for highly skilled people. Universities work with companies, other education providers and local stakeholders in this regard, often supporting business creation through start-ups (Korapin et al. 2021). Finally, **Goal 17 of the SDGs** particularly target 17.17 promote effective public-private and civil society partnerships. HEIs can provide the international links needed to nourish local innovation ecosystems and achieve sustainable growth. SDGs 17 also contains a call for developed countries to play a transformative role in supporting capacity-building in developing countries, improving access to science, technology and innovation on mutually agreed terms(Angel Calderon  2021).

Many of the investments to achieve in the sustainable development goals (SDGs) will take place at the sub national level and will be led by local authorities. 65% of the indicators of the SDG are relevant to local authorities and its effective implementation depends on the local ownership and involvement of various stakeholders at local level (UN LED 2016).

Understanding the role of universities in regional economic development is difficult because the key linkages between universities and economic growth are complex, hard to quantify, and subject to change over time (Ndaruhutse and Thompson 2016). Research on the relationship between universities and regional enterprise development has steadily increased (Harrison and Turok, 2017). It is also evidenced that there is a gap between discourse and practice in regional development programs (Kroll, 2017), particularly evident in less-developed regions.

## Potential roles of HEIs in regional economic development

The literature on universities’ contributions to regional development is broad and diverse. Precise understanding of how regions can potentially draw advantages from various university activities is still missing (Trippl, 2015). Higher education institutions are expected to fulfill their traditional missions (teaching and research) and in addition they have to undertake new roles that reflect economic contribution to the region. However, there is still a lack of clarification on the exact roles universities are performing, and a tendency to conflate and homogenize these roles across institutions, contexts and timeframes (Fonseca and Neith, 2020). The potential roles can be classified broadly as generative roles which mainly production, intermediary roles and collaborative roles.

**A. Generative roles (outputs related)**

1. Knowledge production

The first approach views the universities as a primary factor, along with various other factors, to explain the concentration of high technology activities. Spatial dependence is typically specified in this approach to capture the spillover effects from universities. This approach focuses on the aggregate economic growth resulting from the knowledge production of universities.(Yang 2014).New knowledge is recognized as the key elements of creativity and innovation, which are acknowledged to be a principal means by which regions foster economic growth and competitiveness. For small firms, such as community enterprises and local SMEs, new knowledge can be obtained when the firm actively taps into knowledge sources, such as universities and entrepreneurial networks. Firms able to employ this strategy are known as knowledge-based entrepreneurs (Puangpronpitag, 2019). The dynamics of knowledge production are also changing, as is the way in which societies are regarding expectations and values. Investment on basic research, promoting indigenous potentials and number of publications are all relevant in measuring knowledge production (Trencher et al., 2014; Hadidi and Kirby, 2016; Rubens et al., 2017)

1. Human capital development

Human capital is the most critical agent especially for small and medium enterprise (SME) performance and become a critical index of competition in the world of business to the extent that the development of such capacities through training has become top priority in designing the strategic plan of business organizations (Thaddeus 2010).

HEIs are expected to produce human capital in the form of higher skilled workers and with entrepreneurial mindset. In theoretical literature, the most studied mechanism linking higher education institutions to economic growth is perhaps the production externality of human capital (Osim, 2013). Shoubaki et (2019) presented human capital as crucial factor for the growth of small and medium sized enterprises. Producing what the market demands, skill development and creating an entrepreneurial mindset among graduates of HEIs are found to be crucial (Hubb2019)

1. Innovations /new products

Institutions of higher education participate in the process of technological innovations in a region as producers of basic research (Osim, 2013). According to Asheim et al., (2011) Regional Innovation System approach conceptualizes universities as having a fundamental role in interactive innovation processes.

The importance in the asymmetric economic development of regions throughout the industrialized world in recent decades seems to be the capacity to innovate and to disseminate new technologies (Brekke 2020).Innovation and technology policy, aimed at promoting innovation and technology transfer, have become increasingly important in promoting regional competitiveness. Traditionally, technology policy used to be aimed at promoting R&D at large firms competing on international high-tech markets. A broad range of policy instruments may be used to complement each other in an integrated technology policy. There are traditional policy instruments such as institutional support, education and technological infrastructure, and financial support (Kramer, 1990)

Berne et al 2019 has put the challenge of innovation in micro and small businesses as they have limited investment capacity and skill which might be possible in effective collaboration with higher education institutions.

1. Technology transfer

Technology transfer is used to describe the process of moving the commercial outputs of a research project out of a higher education institute and into a company.The emphasis in research on university technology transfer has been on highlighting the value of licensing intellectual property (IP) to technology commercialization agendas (Algieri et al., 2013; Vinig and Lips, 2015).Since the mid-1980s, it has been focused more on technology transfer for the dissemination of new productive technologies and on eliminating bottlenecks of innovation, especially for small and medium-sized enterprises (Shane, 2014; Morcolonggo, 2017).

**B. Intermediary roles(Business development related)**

1. Promoting Entrepreneurship

Creating a business environment conducive to entrepreneurship and enterprise creation in which innovative young firms have scope to expand rapidly once they have established themselves requires a broad range of mutually reinforcing and supportive policies( OECD 2014). Culture is increasingly acknowledged as a factor which can contribute to building an entrepreneurial society and training in entrepreneurship is used as instruments for encouraging entrepreneurial behavior in societies, and have an impact on entrepreneurial activity and enterprise performance

Possible factors that influence entrepreneurship are diverse and connected with the local conditions. Some of them are: research and development activities with innovative results and socio-demographic changes, dissolution of market entry barriers, easier access to local resources and easier access to capital**.** The Global Entrepreneurship Monitor Report (2017) reveals that the regional culture can influence the perception of entrepreneurship. Thus people can perceive entrepreneurship as a good career choice, give a high status to successful entrepreneurs and give a high media attention to successful stories. And nevertheless the local demand creates entrepreneurial conditions and stimulates in a positive way the evaluation and perspectives for business success.

The World Bank economic forum proposed five ways to promote entrepreneurship in Africa; strengthen the skills base, improving the regulatory environment, Attract investments, efficient use of the business incubator and providing sources of investment, transferring skills and know-how (WB 2014).Different strategies might need to generate motivation and attitudes for entrepreneurship and the skills and competencies needed to successfully start-up and grow a business, and the provision of start-up support (LEED 2010).

1. Shared Resources/ expertise, facilities , finance)

Developing entrepreneurs is often focused on the provision of opportunities and facilities rather than the inspiration and motivation that is necessary for individuals to move from ideas to action. Business incubation is an important tool that can be used by universities to support new startups and spin-offs, as well as building links to industry. Incubators often provide free or subsidized premises, access to laboratories, research facilities and IT services, coaching, mentoring, training and access to financing (OCED 2012).

According to Melendez et al. (2020) having expertise with required level of skills and experience, funds available to support all entrepreneurship programs are important aspects to contribute to regional enterprise development

1. Business development service

Business development services refer to activities of business advisers, consultants, mentors, training programs and incubation services. It mainly includes services and products offered to entrepreneurs at various stages of their business needs. These services are primarily aimed at skills transfer or business advice. The field of business support has been growing alongside the SME development process internationally (BEE 2010, ILO 2019)

Being the most important implementer of local development policies such as education, business development services, and infrastructure and employment, the universities are very important socioeconomic institutions of the society having increasing popularity in local economic development activities. Good educational institutes need to take the responsibility of shaping the future of Business and Society (Gonda, 2014).

**C. Collaborative roles**

1. Outreach service/ engagements

Outreach services should answer the question how should academic staff engage in outreach with communities outside of the university (Johnsen et al.,2019).Conceptualization of outreach; funding; recognition and management of workload; nurturing relationships with internal and external partners; capacity-building; commercial interests, payment and responsibility; pedagogical style and content; integration of outreach into curricula, and evaluation of programs (Harrison and Waller 2017; Harris and Ridealgh 2016; Johnson 2016)

HEIs role is providing education to those who have limited access and design specific programs that meets the human resource needs of the local industry (Westnes et al., 2009). It also includes the provision of regionally focused programs, formal integration of regional needs in university priorities and Coordination of regional networks and policy advice (Gunasekara, 2012).

1. Problem solving Joint research

In the increasingly competitive and globalizing world of higher education, the future of universities relies on how successfully they interact with research partners, including industry (Tijssen, 2012). Winning large research grants from the business sector, and partnering in research and development agreements and strategic alliances with technology-based companies, is one way of coping with economic and competitive pressures (Bjerregaard, 2010).

Through their expertise universities can engage in contract research and joint research to solve existing challenges of MSMEs in the region and also to have alternative source of funds(Darwish, 2014, Pabollet 2021).

1. Collaborate with regional government

Tackling existing social challenges demands more ties between institutions working in respective regions among higher education government collaboration are found to be very important. The various mechanisms HEIs can be consulting and involving in regional policy design and development (Trippl, 2015), and actively supporting regional institutional capacity building (Kitawi, 2014).

## Regional context

Universities play an important role as an actor within the entrepreneurial ecosystems on both national and regional level (Spiegel & Harrison, 2018). The knowledge ecosystem that emerges around universities as anchor tenants are termed in the entrepreneurship literature as entrepreneurial university ecosystems(Graham, 2014; Hayter, 2016; Siegel and Wright, 2015).An entrepreneurial ecosystem is also a combination of social, political, economic, and cultural elements within a region that support the development and growth of innovative start-ups and encourage nascent entrepreneurs and other actors to take the risks of starting, funding, and otherwise assisting high-risk ventures, (Spigel, 2017). Well-functioning and growing entrepreneurial ecosystem is beyond any doubt an important issue for local governments, both public and private institutions that focus to foster entrepreneurship, as well as for the entrepreneurs themselves. The creation of functional entrepreneurship ecosystems is believed to foster innovation and growth of new enterprises, and to create agile collaboration between institutions and entrepreneurs (Daniel, 2019).

These ecosystems have cultural (supportive culture, histories of entrepreneurship), social (worker talent, investment capital, networks, mentors and role models), and material attributes (policy and governance, universities, support services, physical infrastructure, open markets), based on how their benefits are created and governed (Spigel, 2017).

The connection between entrepreneurial university ecosystems and business ecosystems has recently attracted the attention of scholars and more research has been called for in this area (Clarysse et al., 2014). Literature supports that differences in effectiveness between ecosystems are due to the context in which the university is embedded (Carayannis et al., 2016). The context is understood as the combination of technology/ industrial, organizational, institutional, and social characteristics, overlaid by the spatial and temporal characteristics of the area where the university is located (Autio et al., 2014). Furthermore, Siegel and Wright, (2015) argued that analysis of entrepreneurial universities located in new contexts that are not explored in literature is needed in order to contribute to this debate.

## Institutional context

The role of the university has changed considerably over time (Fuller et al., 2019). The notion of the ‘entrepreneurial university’ has also evolved, with scholars applying the concepts of enterprise and entrepreneurship to the university context (Patton 2020). A number of contributors utilized the resourcebased view and the theoretical framework of institutional economics (Guerrero and Urbano, (2010); Kirby et al., 2011) to model the development of entrepreneurial universities. Institutional economic theory (North, 2005) considers how institutions and the institutional context affect economic and social development. Despite the difference in economic condition, entrepreneurial universities are engines of socio economic development in their regions (Salamazadehet al*.,* 2014). However the question remains- how these engines are working?

According to Nelles and Vorley (2010) university Structure, Systems, Leadership, Strategies, and Entrepreneurial Culture were identified as factors which make up an entrepreneurial university. The Organization for Economic Cooperation and Development (OECD, 2012) provided a guiding framework which included seven major factors that characterize an entrepreneurial university: leadership and governance; organizational capacity; people and incentives; entrepreneurship development in teaching and learning; pathways for entrepreneurs, university – business/external relationships for knowledge exchange; internationalization and Measuring the impact. Yadolahi et al (2014) presented formal institutional factors that affect academic entrepreneurship as follows: rules, structure and governance of the university, entrepreneurship and business training programs and educational and research structure of the university.

HEIs should identify their capacities (expertise, fund, facilities) and also needs to orientation and perspective to be externally focused so that they can ensure exploitation by the commercialization of research production in collaboration with government and industry (Rubens et al. 2017). University leadership and management are critical to the long-term success of such initiatives and sustainable partnership between universities and business environment brings benefits to all partners (Powell and Dayson, 2013).

In summary the following table is developed to identify institutional factors that affect the contribution of HEIs in regional enterprise development;

|  |  |
| --- | --- |
| Major category | Proxies |
| Policies | * On knowledge transfer mechanisms * On university-business-government partnership * the creation of spin-offs * Innovation related ( patents, IP) * Incentives designed to promote Entrepreneurship and innovation * Separate autonomous unit |
| * Presence in the mission of the university * Strategy on knowledge transfer * Strategy for university-business/organization partnership * Strategy for financing entrepreneurship programs * Strategies on monitoring and evaluation of impacts |
| Leadership | * orientation of key leaders toward the third mission * Leaders’ formal and informal regional engagement * Decentralized decision-making * Commitment for implementing entrepreneurship strategy |
| Resources | * Human resources / expertise * Funds allocated * Entrepreneurial infrastructure: technology transfer offices (TTOs), incubators, tech parks, business portals Collaboration with local knowledge institutions |
| Entrepreneurship programs | * Promoting entrepreneurship and innovation among students , staffs and in the region * developing entrepreneurial abilities * Integrating entrepreneurship across university major activities * Provides access to business incubation facilities. * Measuring entrepreneurship learning outcomes |
| University- Enterprise- Government linkages | * Ability access to private financing * Mentoring capacities to industry ( enterprises ) * commitment to collaborate and knowledge exchange with industry/Enterprises * providing facilities for industries * engaging with regional government |

## University-Industry- Government collaborations: Theoretical models

Emerging challenges in the economy requires substantial investments in partnerships between the public and the private sector (Maynard, 2015). The collaboration between university-industry-government relations continuously restructures to address complex challenges to exploit opportunities which itself is the result of the commitments of each of the participating unit.Interactions between academia (the university), industry and government, are becoming essential to foster regional economic development, as described in concepts such as the knowledge economy. In the literature Triple helix and regional innovation system models are presented explaining the collaborations between the three helices (university industry and government).

**Triple helix theoretical model**

One of the first regionalized theoretical models of entrepreneurial university, called as ‘Triple Helix’ model, which is coined by Etzkowitz 2003. In this model, each of the three institutions or helices (university-industry/enterprise-government) interact with each other and establish diverse bilateral and trilateral relations to support knowledge generation and transfer to contribute to regional economic development (Motohashi, 2005)

The model is premised on commercialization of academic outputs for high-tech companies. According to Etzkowitz entrepreneurial university should create contiguous ‘hybrid structures’ with state and industry (Schmitz et al., 2017). However the application of this model demands higher absorptive regional capacity and local firms that are capable of commercializing academic research results. Apart from profit oriented activities (i.e. diversified funding base), managerial flexibility, and autonomous decision making calls integrated entrepreneurial culture within the university (Shattok, 2010). In this regard the OECD (2012) points out that regional growth and sustainable development depend on how well universities adapt to unpredictable environments.

Entrepreneurial universities are involved in partnerships, networks and other relationships with public and private organizations. In order to make this happen entrepreneurial university implements several strategies and new institutional configuration to work together with the government and industries to facilitate the generation and exploitation of knowledge and technology (Leydesdorff and Meyer, 2006). In this regard the OECD (2012) points out that regional growth and sustainable development depend on how well universities adapt to unpredictable environments. But still the missing component is “entrepreneurial thinking”. Entrepreneurial mindset has to be integrated into university community and in all its operational structures and parts (Patel, 2017).

The other theoretical model which explains how the absorptive capacity of the region is significant in the university- Enterprise-government collaboration is the regional innovations system model.

**Regional innovation system theoretical model**

Policy makers worldwide are continually looking for effective mechanisms to stimulate their economies (Autio et al., 2014). In this sense, universities have been the focus of several policies to stimulate the production and diffusion of new knowledge (knowledge transfer) and to act as catalysts of innovation across their regions (Nicolaou and Birley, 2003; Wright, 2014).The focus on forces ways that enable knowledge development and sharing between HEIs and regional networks of firms and other organizations continues to be an emerging and developing (Marjolein and Herman,2011)

A key assumption of the regional innovation system (RIS) approach is that the role of HEIs does not only depend on their own strategies, activities and internal organizational characteristics but also absorption capacities of other RIS elements are central for specifying how university outputs are translated into regional development. The RIS university model points to a high degree of context specificity of university contributions to regional innovation and highlights that the role of universities in regional development might vary, depending on RIS structures (Tödtling and Trippl, 2005), prevailing knowledge bases (Martin and Moodysson, 2011) and the dominant regional growth path (Lester, 2005). (Trippl, Sinozic and Smith, 2014)

The RIS approach has been criticized for overemphasizing regional knowledge circulation and underplaying the importance of extra-regional knowledge for the innovation dynamics of regions. Studies that have taken the global dimension into account find support for universities as attractors of talent to the regional economy and enabling firms to access knowledge from global pipelines of international academic research networks with considerable regional impact (Appe et al., 2017)

Additionally it was agreed that universities contribute to innovation, but it is less clear how they contribute to regional innovation. Uyara (2010) argues that the literature provides a fragmented account of HEIs regional engagement and highlights the need for an integrated approach

## Applied models of HEI engagement in regional economic development

In contemporary literature, three different models have been tried to visualize and explain Higher education institutions engagement in regional economic development. The entrepreneurial university (Mode 1) focusing on commercialization of academic outputs, Model 2 which emphasizes on engagement activities and Mode 3 which focuses on collaboration (Trippl, 2015).Such conceptual and theoretical pathways, put increasing pressure on universities to facilitate the direct application and exploitation of its knowledge and capabilities in order to contribute to the social and economic development (Etzkowitz, 2013).

**Mode1: Entrepreneurial University**

An entrepreneurial university (EU) is a university oriented to the society as a regional actor (Etzkowitz, 2017) which in addition from teaching and research, also focused on the support of entrepreneurial activities by researchers and graduates, with strong connections with R&D centres (RDC), firms, science and technological parks, governments, and institutions. Policymakers are increasingly investing in universities to foster the creation of innovative start-ups in the hope of producing areas of economic growth (Autio et al., 2014). This model university engagement is characterized by a more direct role in stimulating local and regional economic growth (Guerrero et al., 2014; Thorp and Goldstein, 2013).

In the entrepreneurial model, universities contribute actively through commercializing their knowledge through spin-offs, patents and licensing (Trippl et al., 2015; Wang et al., 2016) which is generative contributions through knowledge transactions. The goal of an entrepreneurial university is not only to generate technology transfer in terms of start-ups or other businesses, but to lead the creation of “entrepreneurial thinking, actions, institutions” (Audretsch, 2014)

Empirical evidence suggests universities are exhibiting a large heterogeneity both in their degree and form of their entrepreneurial transformation (Huyghe and Knckaert, 2015), some universities show they are more able, proactive and innovative in engaging stakeholders, allowing them to become key actors in shaping communities, regions and societies (Johnstone & Huggins, 2016). But the understanding of softer and broader roles is less well established (Audretsch, 2014; Rose et al. 2012).While there has been increasing interest in the role of university members within the regional context via knowledge exchange (Dada et al., 2015) and less has been said about how members engage with regions through networks and how relevant their ties to the region might be in positioning the ‘Entrepreneurial University’.

The criticisms attributed to the ‘entrepreneurial university’ literature is that it mainly focuses on particular contributions (e.g. spin-offs) thereby ignoring the wider systemic contexts which shape these transactions (Pinheiro et al., 2012). The absorptive capacity of the region (in particular its firms) is a key in how the activities of the entrepreneurial university are received and interacted with: the impact of activities and their ‘use’ will be higher in regions with a greater absorptive capacity (Hayter, 2013).

**Mode 2 University**

Gibbons and colleagues (1994) argued that a new form of knowledge production began emerging in the mid-20th century that was context-driven, problem-focused and trans-disciplinary which they call as “mode 2” knowledge production.

The five key features underpinning mode 2 are knowledge production in the context of application, trans-disciplinarily, heterogeneity, reflexivity, and new types of science governance and quality assessment (Gibbons et al. 1994). Contextual applicability suggests that HEIs are engaged in collaborative research with other organizations. Through these processes they produce knowledge that is relevant and connected to its environment (Trippl 2014).

The mode 2 concept has been criticized for several reasons. According to Godin (1998) Mode 2 is more a political ideology than a descriptive theory. It acknowledges university roles in knowledge production but regards the primary contribution coming via structural improvements to the knowledge exchange environment, organization, and governance and policy frameworks (Cooke et al., 2004). Similarly Carayannis and Campbell (2011) challenged the mode 2 approaches for its neglect of institutions, systems, natural eco-system and environment. Additionally, Mode 2 has been questioned on the basis of the coherence of its key five features (Trippl 2014).

**Mode 3: regionally engaged university**

The ‘engaged university’ is a concept for understanding the adaptation of university functions to regional needs (Boyer, 1990; 1996; Uyarra, 2010). Regionally engaged university model relates to the task of universities in transferring knowledge to small and medium firms and clusters located in the region (Uyarra, 2010). This model is conceptualized on the basis that university regional contributions are produced by “knowledge spillovers” to allow proximate actors to more easily access knowledge-based resources (Ponds et al., 2010).

The ‘engaged university’ is a concept explaining adaptation of university functions to regional needs (Uyarra, 2010). Engaged universities demonstrate a localised developmental as opposed to knowledge-generative role (Gunasekara, 2006). In this case HEIs are perceived to focus its activities towards industry and society and actively shaping regional identity (Breznitz and Feldman, 2012).HEIs may adjust their teaching activities to regional needs through the provision of regionally focused programs, local student recruitment and retaining of graduates, formal integration of regional needs in university priorities, coordination of regional networks and policy advice (Gunasekara, 2006). Furthermore, HEIs may involve themselves directly with local firms, providing assistance and research support (Trippl, 2014).

Despite this all, still some other literature has focused on a rather idealistic ‘one-size-fitsall’ approach to university engagement, though in reality universities have different ways to carry out third stream activities (Mabel 2018). As universities are located in different regions with different development level a particular context shapes the university’s orientation and institutional responses to third-stream activities. Hence context-sensitive studies on universities’ entrepreneurial architectures would be beneficial for exploring further how universities can efficiently contribute to regional development in different environments (Salomaa, 2019).There is also a need for a theoretical orientation that addresses university engagement in a range of settings considering the diverse environmental contexts of universities worldwide. Applying the institutional perspective literature explores how universities are strongly influenced by, as well as active influencers in, their surrounding environment (Lene Foss 2017)

In conclusion, all the three models lead to different policy conclusions though they are not mutually exclusive. The entrepreneurial university (Mode 1) focuses on commercialization activities as third mission outputs, while the knowledge production (Model 2) emphasizes on engagement activities which could take place at different geographical levels (regional, national or international) (Trippl, 2015). Whereas engaged universities (Mode 3) focuses on regional collaborations. Hence as the models are complementary to each other, and with the objective to utilize the advantages in each model a more comprehensive model needs to be developed.

## Proposed Analytical framework

Numerous accounts in the literature tried show an increasing role of universities in regional development (Guerrero, Urbano&Fayolle, 2016; Pinheiro, Benneworth and Jones, 2012).Consequently many models were developed to explain the role of university in regional economy. Among the triple helix model (Etzkowitz and Leydesdorff 1997) sharpened the focus on the role of universities in regional economies, pointing to the anticipation of Hybrid University, industry, government relationships(Hayter 2015) and still other distinguish three broad roles that universities play knowledge production role, entrepreneurial role, and developmental role (Gunasekara, 2006; Uyarra, 2010). Typical activities universities can perform as entrepreneurial institutions are commercialization of research through patents, spin-offs, consultancy, contract and collaborative research (Trippl et al 2015). However, doubts have been raised about the potential of universities’ entrepreneurial activities to catalyze regional growth (O’Reilly & Lupton, 2011; Abreu and Grinevich, 2013).

The process of economic development has also shifted over the last two decades from a top-down government model to a more collaborative model involving state, local, and federal governments, companies, business associations, colleges and universities, and other institutions ( porter 2008). That is, building the competitiveness of a region has become a bottom-up process in which many individuals, companies, and institutions must take responsibility

However, using these models separately does not adequately explain the evolving roles of universities in regional development. Therefore, Comprehensive model that analyses the utility of different standalone models under varied policy contexts has been missing from the analysis of universities role in regional development.

In conclusion, all the three models discussed lead to different policy conclusions though they are not mutually exclusive. The entrepreneurial university (Mode 1) focuses on commercialization activities as third mission outputs, while the Model 2 emphasizes on developmental activities which could take place at different geographical levels (regional, national or international) (Trippl, 2015). Mode 3 focuses on regional collaboration activities. Hence, as the models are complementary to each other, with the objective to utilize the advantages in each model a more comprehensive model is proposed which is referred as ***Regional engaged entrepreneurial university (REE)***

**Comprehensive analytical framework on the role of university in regional enterprise development**

**Regional context**

**Generative role**

* **Knowledge**
* **Innovations/tech**
* **Human capital**

**Intermediary role**

* **BDS Facilities**
* **BD Services**

**Collaborative role**

* **Outreaches**
* **Joint programs**

**Industry / Enterprise**

**REE UNIVERSITY**

**Institutional factors**

**Regional government**

***Proposed framework to be adapted in different institutional and regional contexts***

**Major Roles and measurements**

|  |  |  |
| --- | --- | --- |
| Roles | Main variables | Measurements |
| Generative | Knowledge | Number of basic research conducted relevant for MSEs |
| Number of publication on regional development |
| Indigenous knowledge identified and promoted |
| Innovations/ tech transfers | Level Funds available |
| Commercial Inventions disclosed |
| Patents applied |
| Number of technologies transferred |
| Guidelines facilitating innovation |
| Human capital | Number of Academic programs designed matching the regional demand |
| Number of graduates |
| Graduates attended entrepreneurship programs |
| Intermediary | BD Service facilities | Number of Expertise available involved |
| Amount Funding available |
| facilities developed |
| Business development services | Promoting Entrepreneurship |
| Number of level based trainings, coaching, marketing assistance, |
| technical assistance or improved production technologies |
| Types Incubation services |
| Collaborative | Outreach services: | Need based Enterprise/industry skill development programs, |
| Guidelines, modules and incentives designed |
| Programs for lifelong learners |
| Joint programs | Number of Joint research, /Contract research, |
| Amount of funding raised |
| Number of Enterprise problems solved |
| Level of engagement in regional policy development |
| Capacity development programs designed and delivered |

The model categorizes the different ways of contribution HEIs can make for regional enterprise development. Generative roles are mainly related with production of academic outputs (knowledge, innovations and human power). The second categories are intermediary role where HEIs will have catalytic role in the process of changing different inputs and changing them in to innovations and enterprises. The third category provides collaborative role in which the potential benefits to work with regional enterprises and regional government are explained. All the roles can be played in either of commercial or developmental approach.

**Conclusions**

Clearly defining the changing role of higher education institutions in regional enterprise development specifically will be very important to for enhancing the role Higher education in regional economic development and also to deal with limitations of the existing models. In this article a more comprehensive analytical framework is presented to better understand the changing role of higher education institution. Both institutional context (internal) and regional contexts (external) shape the role of HEIs. Consequently one size fits all approach does not work hence requires further investigations in different contexts to develop working specific to a given institution and region. Therefore it is strongly recommended to examine the model in different contexts as both the higher education sector and the region where they are located demands more than ever.

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