

# INNOVATION MODELS AND THEIR APPLICATION FOR DEVELOPING COUNTRIES: CASE-STUDIES FROM AGRICULTURAL (CATTLE) DEVELOPMENT IN RURAL KAZAKHSTAN

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# Research problem

A main hypothesis of the thesis is that a well-functioning *industrial and innovative system* critically *depends* on how well *national and regional government of developing countries* can bring together and *coordinate the activities of different actors and stakeholders* for advancing competitiveness in the agricultural sector.

## Specific research questions

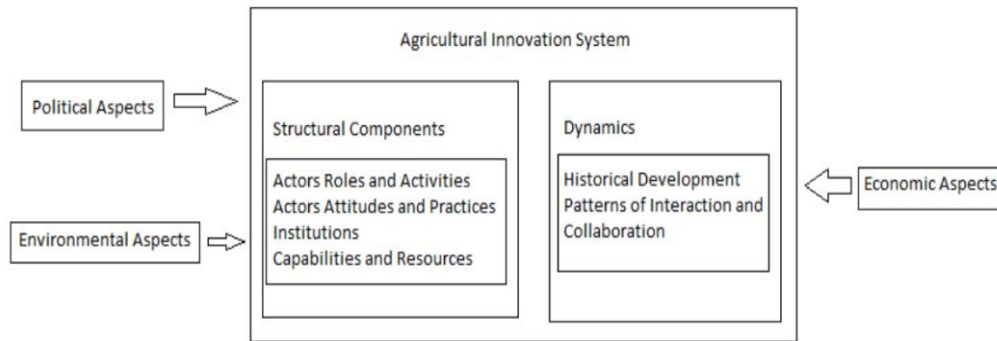
- 1) What is the policy approach for, and the role of the government in agricultural development?
- 2) What are the main courses of inefficiencies in the state support?
- 3) How do extension services support innovation processes and what are their potential contributions to the outcomes of these processes?

# Literature review

- Triple Helix, Quadruple Helix, Quintuple Helix, non-linear & linear innovation modes (Etzkowitz & Leydesdorff 1995, Carayannis et al. 2009, Barth et al. 2012)
- Agrarian vs. rural development (Ellis 2001, Pausewang 1995), rural development models –endogenous, exogenous, neo-endogenous (Ward et al. 2005, Buchenrieder et al. 2007, Shucksmith 2009, Healey 2003)
- Endogenous growth theory (Romer 1986, Lucas 1988), conditional b-convergence (Barro and Sala-i-Martin 1992), meta-governance (Whitehead 2002)

# Research methodology

## 1. Conceptual framework of the Innovation System



Source: Own elaboration- Ranga and Etzkowiz, 2013; Lundvall et al., 2009; Klerkx, et al., 2015; Swaans et al., 2014, p. 2, Hall et al., 2006, p. 28

## 2. Operationalisation of Structural Components and their interactions within the agricultural innovative system

Structural Components	Indicators	Instruments
Stakeholders and their role	A diverse set of organizations from the private to public sector engaged in the agriculture sector	Interviews with stakeholder On-site observation
Stakeholders, their attitudes and practices	Attitudes restricting cooperation and collaboration between stakeholders; Emphasis on institutional learning (using and accessing knowledge more effectively) and technological learning; Top-down culture; Transparency; Trust and reciprocity; Ineffective and/or conservative attitude;	Interviews with stakeholder On-site observation
Capabilities and Resources	Financial sources;	Interviews with stakeholder

Source: Own elaboration, based on Schut, Rodenburg et al. 2015

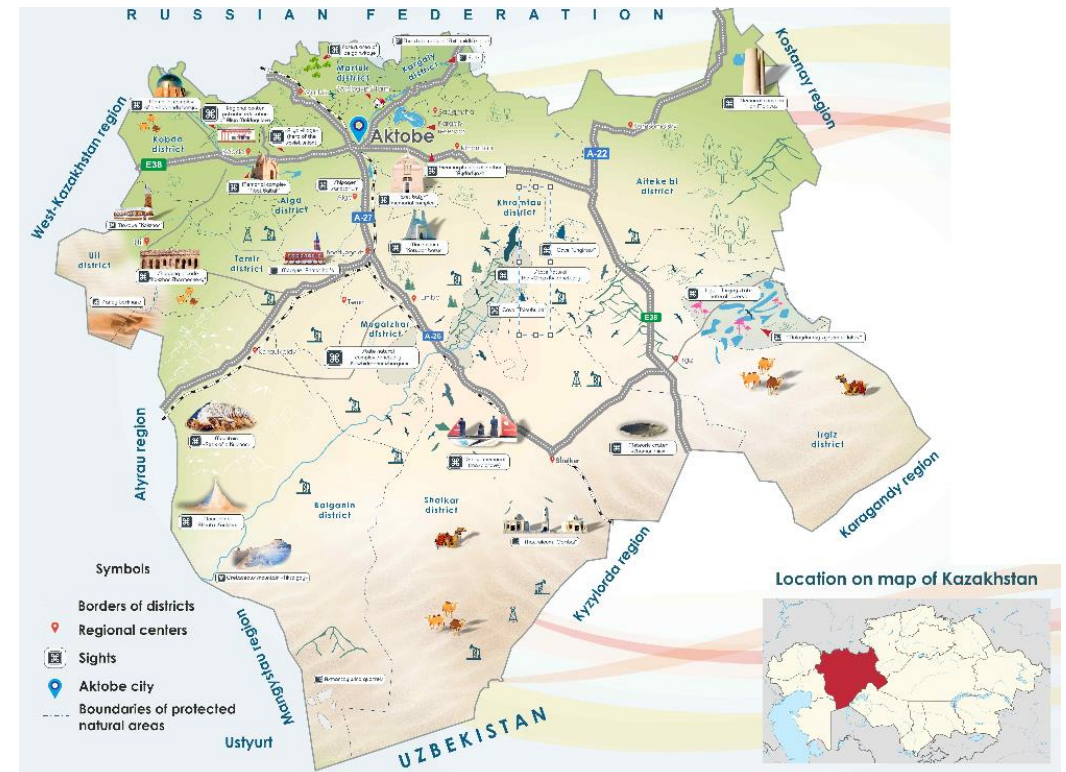
# Research methodology

Map of Kazakhstan



Source: [www.aktobe-kalasy.kz](http://www.aktobe-kalasy.kz)

Location of Aktobe region in Kazakhstan and its districts



Source: [www.aktobe-kalasy.kz](http://www.aktobe-kalasy.kz)

# Research methodology

- 69 agricultural entities were interviewed about financial and value chain constraints during the May, June and July 2016
- 1<sup>st</sup> Case-study. The conceptual framework of Bourcher et al. (2009) was used to distinguish the credit rationing outcomes.
- 2<sup>nd</sup> Case-study. The questionnaire developed by Birner (2009) were used to assess the extension activities provided by the DAMU Business Development Fund

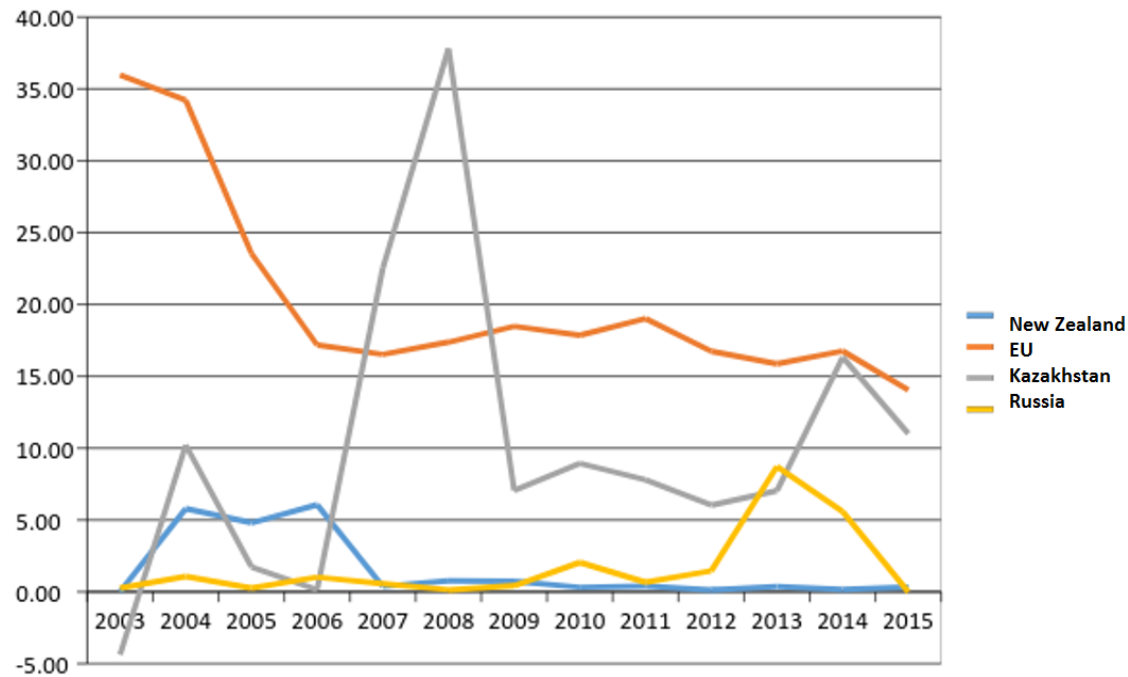
Operational scale of different farm types in the survey data

	Householder s	Individual farms	Agricultural enterprises	Branches of agro holdings
Number of farms, survey sample	34	24	7	5
Utilised agricultural area (ha)	0.02 (0.01;0,05)	73 (19;138)	11,200 (3,856;16,643)	22,000 (8,567-28,600)
Farms with cattle (%)	19	16	6	3
Among which: size of cattle herd	2 (1-4)	35 (0-73)	280 (73-390)	-

Source: Databases of Aktobe Regional State University named after K.Zhubanov and Municipality of Aktobe region

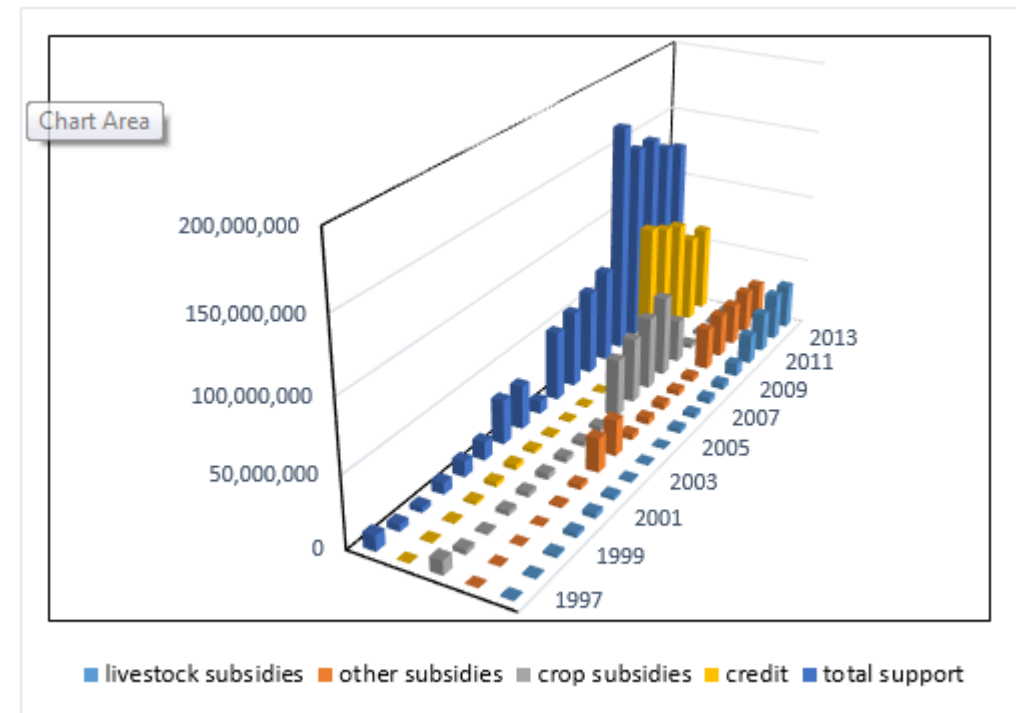
# Key Results

Development of Producer Support Estimate (% PSE)  
for selected OECD countries (in %)



Source: Own elaboration according to OECD database (2016)

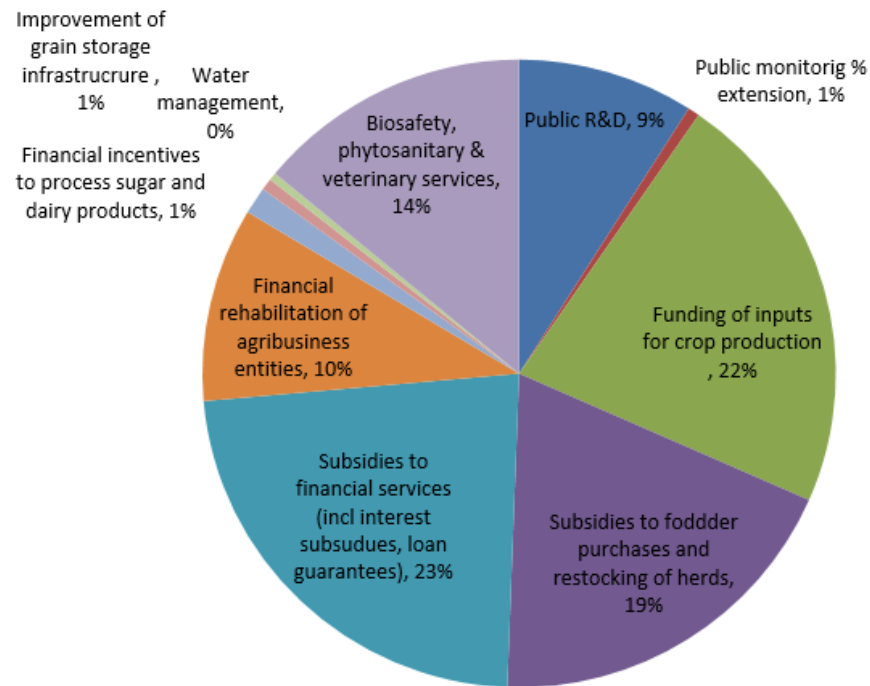
Budget Support for Agriculture (Real prices) in  
Kazakh Tenege (thousands)



Source: Own elaboration according to official website of Ministry of Agriculture RK

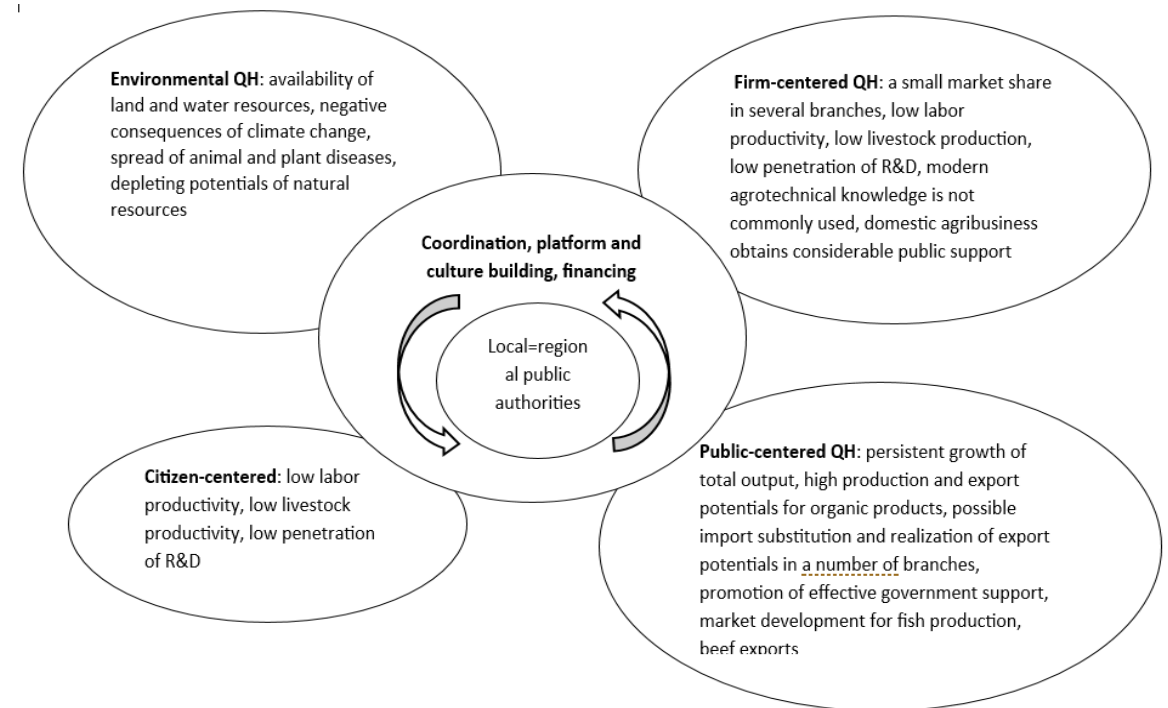
# Key Results

## Budget priorities of the Agribusiness 2020 program



Source: Author's calculations based on Agribusiness 2020 policy document, pp. 77-96

## QH models for Kazakhstan



Source: Own elaboration with an inspiration of Amkilet et al. (2013) (see chapter 1.3.1) and SWOT analysis of "Agribusiness 2020" for Kazakhstan

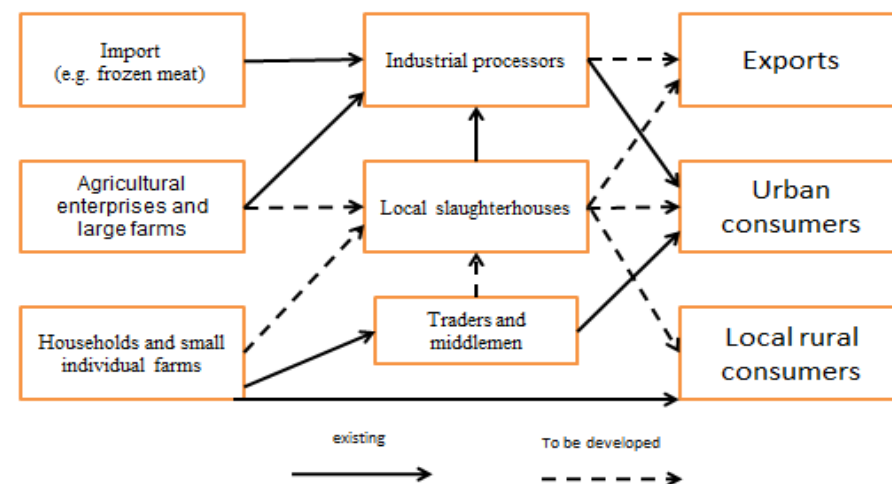
# Key Results

Borrowing behavior

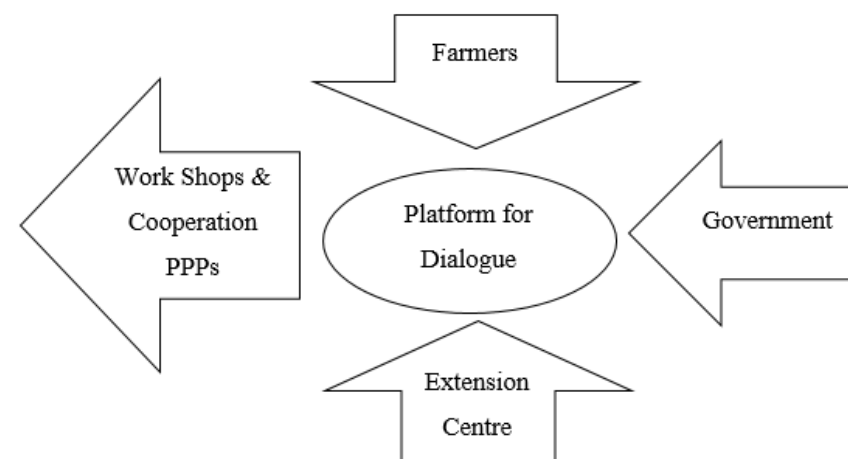
	Households	Individual Farms	Agric. enterprises	Agro-holdings
Took loans in 2015	3	3	6	5
Price rationed borrowers	3	2	4	3
Quantity rationed borrowers	0	1	2	2
No new loan in 2015	31	21	1	0
Price rationed no borrowers	29	19	1	0
Quantity rationed no borrowers	1	2	0	0
Risk rationed no borrower	23	16	0	0
Transaction cost rat. no borrowers	26	15	0	0

Source: Author's findings

Value chain of beef production in Aktobe region



Triple Helix Collaboration for Aktobe region



# Conclusions and implications for further research

## ➤ Brief answers to the research questions:

- 1) What is the policy approach for, and the role of the government in agricultural development?
  - Commitment towards improving the competitiveness of the economy
  - Coordinate and monitor the modernization process of agribusiness
- 2) What are the main courses of inefficiencies in the state support?
  - Knowledge and incentive problems
  - Farmers requires more or something else than just access to cheap inputs
  - Small and medium sized enterprises
- 3) How do extension services support innovation processes and what are their potential contributions to the outcomes of these processes
  - The know-how of individual farmers

## ➤ Implications for policy and practice

- Shift towards demand driven and pluralistic system approaches
- Performance evaluation
- Necessary competences, transparency of budget allocation

Thank you for your attention

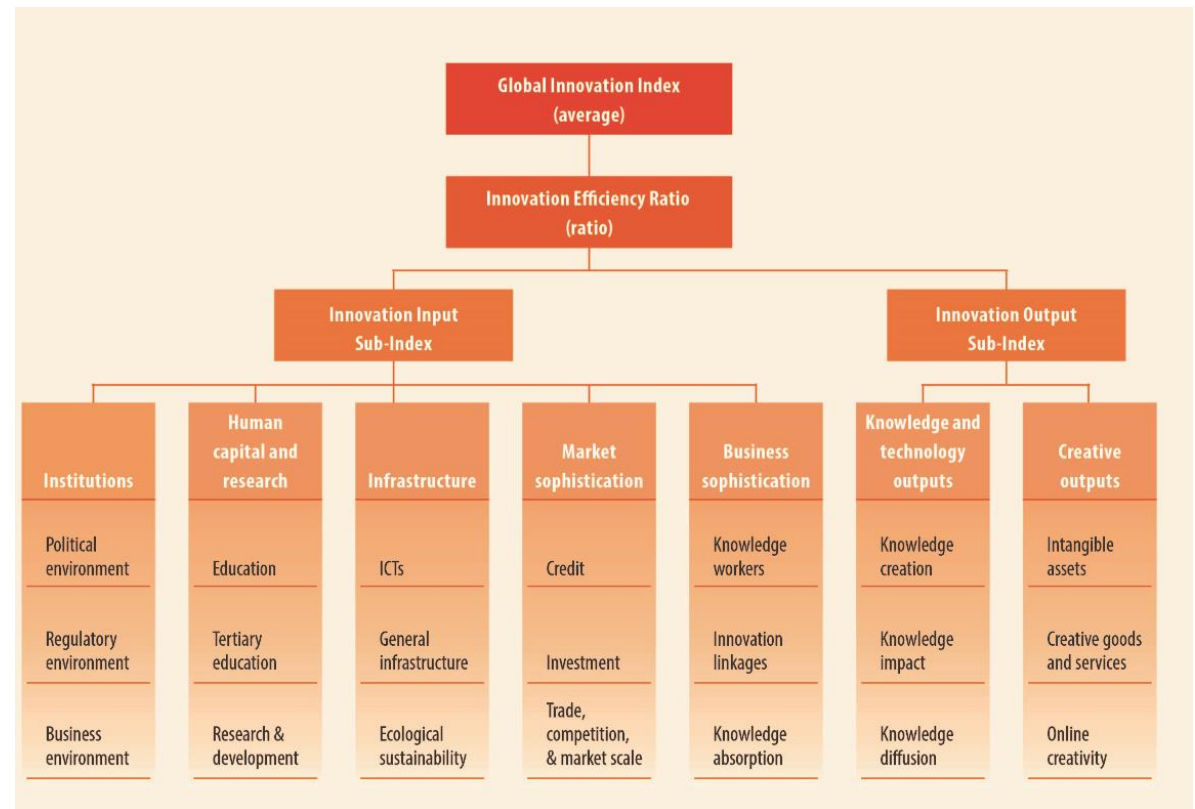
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doc. Ing. Eva Cudlínová, CSc., question 1: „Byla bych ráda, kdyby autorka mohla stručně charakterizovat globální inovační index, který je zmíněn v první větě úvodu práce, ale pak již se mu autorka nevěnuje.“

**The GII project** was launched in 2007 with aims to determine how to find metrics and approaches that better *capture the richness of innovation in society* and *go beyond traditional measures of innovation*.



Source: <https://www.globalinnovationindex.org/>

## Global Innovation Index for Kazakhstan since 2007 (out of 128)

	2008	2009	2010	2011	2012
<b>Technological readiness</b>	<b>75</b>	<b>69</b>	<b>82</b>	<b>87</b>	<b>55</b>
Availability of latest technologies	93	101	97	103	90
Firms-level technology absorption	85	85	105	113	91
FDI and technology transfer	114	113	108	100	85
Individuals using Internet, %	90	82	69	77	62
Broadband Internet subscription/100 pop	91	64	69	77	62
Int’l Internet bandwidth, kb/s per user	-	-	69	74	53
<b>Innovation potential</b>	<b>62</b>	<b>78</b>	<b>102</b>	<b>116</b>	<b>103</b>
Capacity for innovation	50	50	75	101	92
Quality of scientific research institutions	58	80	112	121	108
Company spending on R&D	62	60	84	107	94
University-industry collaboration in R&D	64	77	111	119	90
Gov’t procurement of advanced tech products	59	62	83	93	71
Availability of scientist and engineers	83	74	91	106	104
PCT patents, applications/million pop	72	85	81	81	65

Source: GII Report (2008, 2009, 2010, 2011, 2012, 2013)

Indicators	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
<b>Global Innovation Index</b>	<b>61</b>	<b>72</b>	<b>63</b>	<b>84</b>	<b>83</b>	<b>84</b>	<b>79</b>	<b>82</b>	<b>75</b>	<b>78</b>
<i>Innovation Output Sub-Index</i>	-	67	62	103	105	106	101	107	90	93
<i>Innovation Input Sub-Index</i>	-	81	68	64	67	69	69	75	65	64
<i>Innovation Efficiency Index</i>	-	-	77	112	131	126	118	124	108	116
Institutions		85	91	68	52	64	67	67	54	55
Human capital & research		60	66	74	85	64	63	66	66	71
Infrastructure		82	59	60	58	52	44	54	54	60
Market sophistication		84	54	75	92	89	98	96	92	80
Business sophistication		76	78	60	62	90	106	110	96	87
Knowledge & technology outputs		77	65	81	85	92	82	96	83	88
Creative output		-	63	113	119	116	106	117	99	95

Source: GII Report (2008, 2009, 2010, 2011, 2012, 2013)

	2013	2014	2015	2016	2017
<b>Innovation linkage</b>	124	136	128	114	114
<b>Knowledge absorption</b>	82	105	115	98	98
<b>Knowledge impact</b>	76	79	70	61	61
<b>Knowledge diffusion</b>	115	81	109	96	96

Source: GII Report (2013, 2014, 2015, 2016, 2017, 2018)

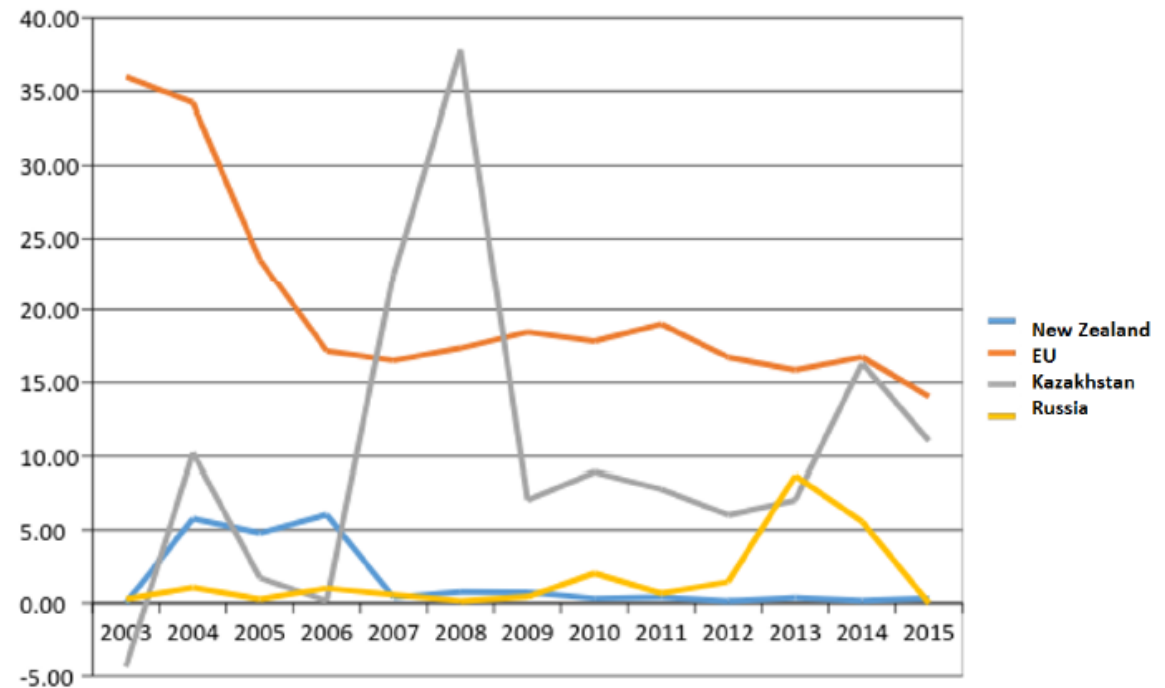
doc. Ing. Eva Cudlínová, CSc., question 2: “Autorka uvádí, že rodinné farmy jsou důležitou formou podnikání z hlediska udržitelného rozvoje. S tímto tvrzením souhlasím, ale domnívám se, že by bylo vhodné je podložit nějakou podrobnější argumentací.”

- 45 % of general population of Kazakhstan lives in rural areas. When a such great number of families derive their livelihoods from agriculture, sustainability of agriculture cannot be discussed or even defined in isolation from the issue of livelihood.
- Livelihood is defined as adequate stock and flow of food and cash with an individual or a family to meet its basic needs (Acharya 2006): production-based livelihood, labour-based livelihood, exchange- or market- based livelihood, transfer-based entitlements.
- Improving living standards through reforms and policies, combined with practical support in terms of infrastructure, capacity, tools, technologies and basic services should be a priority for international and national efforts for sustainable development.

doc. Ing. Eva Cudlínová, CSc., question 3: “Zajímá mě důvod zařazení Nového Zélandu u Fig. 13 na str. 64 mezi vybrané země OECD, s nimiž je Kazachstán porovnáván, pokud jde o zemědělskou dotační politiku. Zéland odstranil dotace a je zemědělsky kompetitivní, ale má specifické podmínky a postavení na trhu.”

The reason for including New Zealand into the comparison analysis is the change of the paradigm in the concept and approach to agriculture (producers versus entrepreneurs in the agricultural sector).

Figure 13. Development of Producer Support Estimate (% PSE) for selected OECD countries  
(in %)



Source: Own elaboration according to OECD database (2016)

Prof. PhDr. Michal Lošták, Ph.D, question 1: “What is the role of university start-ups or spin-offs in Kazakhstan?”

- Data on research commercialization are scarce.
- According to the National Institute of Intellectual Property of Kazakhstan (2015), the total number of resident patent licensing agreements in Kazakhstan grew from 2 agreements in 2012 to 14 in 2013 and 17 in 2014. According to OECD (2016b) roughly around 50 technology based spin-offs have been established annually.
- There is still limited research capability in public and private organizations as in the lack of business awareness and interest in innovation (OECD 2017).
- The Science Fund carried out survey of 1 627 projects funded by government grants and found only 3 % of relevance to identified industry needs (OECD, 2016c)
- Therefore, I didn't pay major attention to this issue in the research

Table: Global Innovation Index (2010-2017)

	2010-11		2016-17	
	Kazakhstan ranking			
	Global	Central Asia	Global	Central Asia
Capacity for innovation	75	1	73	2
University-industry collaboration in R&D	111	2	66	2

Source: World Economic Forum (2016), Global Competitiveness Report 2016-2017; World Economic Forum (2011), Global Competitiveness Report 2011-2012

Prof. PhDr. Michal Lošták, Ph.D, question 2: “Small-scale farmers often do not have a chance to get government support, but nevertheless their dynamics in the market shows their ability to accept new market conditions and trends. Can you explain it?”

- **Small-scale farmers** are usually associated with the production of very labor-intensive agricultural products (livestock, potato, vegetables and fruits) and use old machineries and technologies;
- Many analysts used to be convinced that **individual family farms represented the more flexible and also more equitable mode of production** (Binswanger et al 1995 and Tomich et al. 1995).
- A key argument has been that family farms are productive because labour shirking is mitigated by **family ties**.
- Lerman (2010) shows that Kazakh regions with more individual farms also display a higher land productivity, which he attributes to a general **superiority of individual farms**.

Prof. PhDr. Michal Lošták, Ph.D, question 3: “They believe that investment in agriculture cannot deliver sustainable and sufficient revenue that could service repayment rates. Only a small number of respondents think that there is a lack of access to source of finance that prevents them from borrowing. Can an author confront the statement with some of existing theories?”

Farmers perception about subsidies is very sensitive, and therefore believe that will not be able to continue their production without them, i.e. they do not believe that their investments would be long-term sustainable without subsidy. On the other hand they do not experience major problem to claim for subsidies or preferential loans. Economists call this situation as **subvention trap** (Šumpíková, Ochrana, Pavel, a kol., 2005; Frankel, 2014). There are some cases in the world, when the farmers shared similar view, but after a radical reform to change farmers' perception (see New Zealand 80ies, Roger Douglas) they stopped thinking as producers, and started to think as entrepreneurs.

Prof. PhDr. Michal Lošták, Ph.D, question 4: “In terms of agricultural enterprises, there are some rich Kazakh people buy the land as large investors in farming. Is it really a new development in Kazakhstan?”

- According to the National Plan of RK "100 Steps" (step 60 and 61), to attract/invite strategic investors for the production and processing of meat, milk and dairy.
- Kazakhstan aims to create a cooperative model, following the example of the Danish company "Arla", where farmers are co-founders of the cooperative

Who finances the construction of the plants for cooperatives?

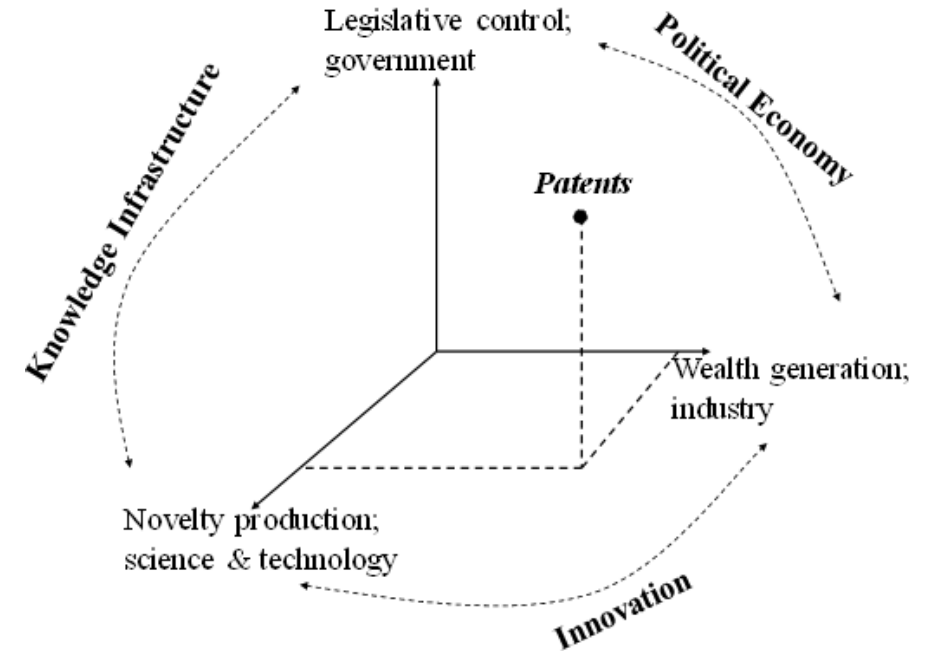
- **Kazakh Bank for the development** and **quasi-public sector** with a help of governmental investment subsidies that are coming from Kazakhstan National Fund (Sovereign Wealth Fund Institute)
- **Strategic investors**, who are also provided with investment subsidies

Prof. PhDr. Michal Lošták, Ph.D, question 5: “Rodina is a sort of Kazakh triple helix model. Is it true such model does not exist in the region the author studies? Can you explain why it exist in the form of Rodina close to Astana and not in region you studied?”

- According to OECD (2011) Kazakhstan was among the world’s ten largest producers and five exporters of wheat. About 80 percent of Kazakhstan’s wheat is produced in the three north-Kazakh provinces Akmola (**Astana, village Rodina**), Kostanay, and North-Kazakhstan.
- In general, crop production has received **more support** than livestock production.
- “Rodina” farm emerged from a former dairy sovhoz (hosted about 2,000 cows). It had severe economic difficulties before the current fifty-year old **director took over the operations**. He is well known in the region for his **entrepreneurial attitude** and his **social engagement for the local community**.
- **Better access to information** and **influential contacts** due to close location to new capital Astana during early 21<sup>st</sup> century, when internet was not widely used by population
- **German-Kazakh international cooperation** for supporting German minorities in Kazakhstan (Kazakh-German university in Almaty, Leibniz Institute of Agricultural Development in Central and Eastern Europe (IAMO) etc.

Prof. PhDr. Michal Lošták, Ph.D, question 6: “Knowledge based economy contributes to political economy (p.19). The concept of political economy is not explained therefore it is difficult for me to understand how knowledge based economy contributes to political economy”

- **Political economy** can be explained in terms of two sub dynamics: **economic exchange relations** (equilibrates between supply and demand) and **political control** (economic exchange relations can be regulated by political institutions)
- In a **knowledge-based economy**, organized knowledge production and control has become a third coordination mechanism
- Since relations and events (e.g. patents) can also circulate among the partners, **three-way interaction** effects can also be expected.
- The knowledge-based economy contributes to the political economy by **endogenizing the social organization of knowledge** as R&D into a three (or more) dimensional system's dynamics (e.g., Dangelico et al., 2010).



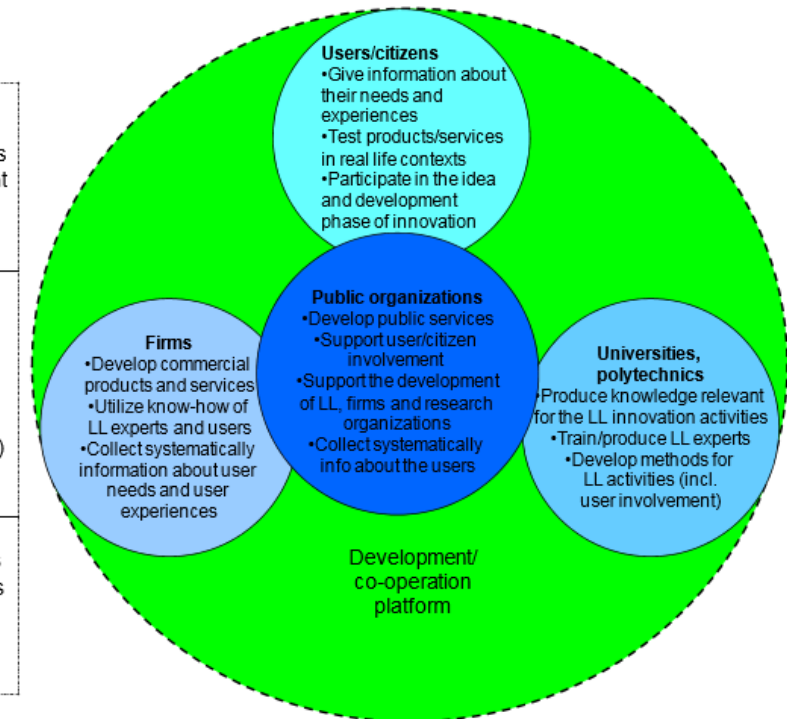
Source: Smith & Leydesdorff (2014)

Prof. PhDr. Michal Lošták, Ph.D, question 7: “How to understand the difference between citizen centered and public centered QH model?”

### Public sector-centred living lab

- Is focused on the development of public organizations and services
- The owner of the innovation process is a public organization or a group of public organization
- The goal of innovation activity is, above all, to develop public organizations so that they can function better and offer new and better products and services to their clients, to citizens. In other words, users/citizens participate in the development work of public services together with R&D experts

<b>Main goal of innovation activity</b>
•To produce products and services relevant for public authorities and the users of public services
<b>Type of innovation</b>
•Public sector innovations
•Commercially exploitable innovations (technological + social)
•Incremental and radical innovations
<b>Initiators of innovation process</b>
•Public organizations
•Firms
•Universities



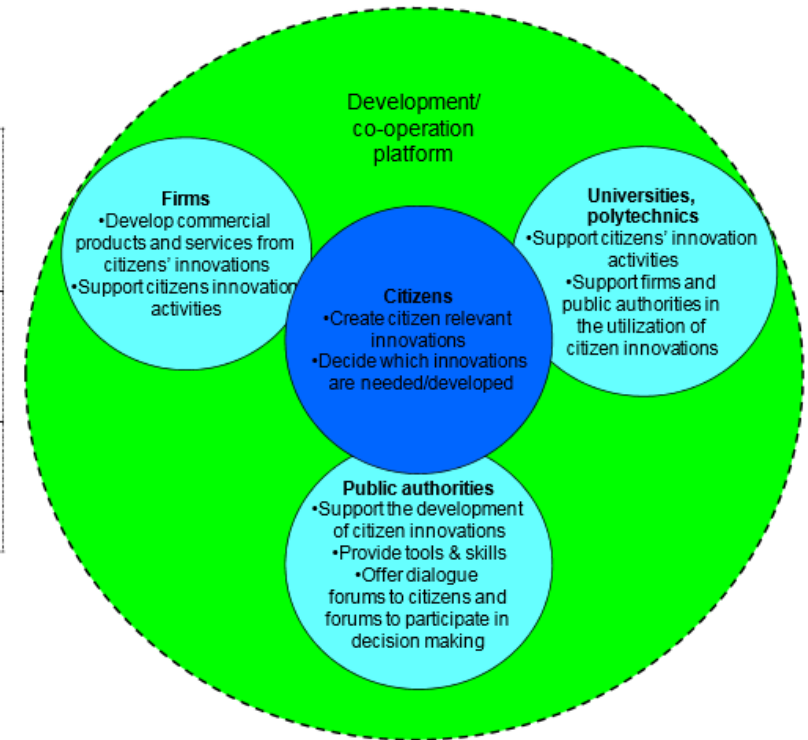
Source: Arnkil et al. 2010

Prof. PhDr. Michal Lošták, Ph.D, question 7: “How to understand the difference between citizen centered and public centered QH model?”

### Citizen-centred QH

- Is focused on the development of innovations relevant for citizens
- The owners of the innovation process are citizens (can be based on the knowledge of citizens, firms, universities and/or public authorities).
- The role of firms, public authorities and universities is, above all, to support citizens in their innovation activities
- Citizens also decide what kinds of innovations are needed and developed.

<b>Main goal of innovation activity</b>
•To produce products and services relevant for citizens
<b>Type of innovation</b>
•Innovations relevant for citizens
<b>Initiators of innovation process</b>
•Citizens



Source: Arnkil et al. 2010

Prof. PhDr. Michal Lošták, Ph.D, question 8: “How to understand the number of farms in Kazakhstan, especially the agricultural enterprises? What does an agricultural enterprise mean in Kazakh context (the text refers to average size of agricultural enterprises 4,378 ha). The text on pages 67-68 is confusing: There were 7,687 registered agricultural enterprises by 2015 in Kazakhstan, with an average land area of 4,378 ha, which shows the decline in land hold by large-scale farms from 1991. There are 4,578 agricultural enterprises operating on an average land area of 43,112 ha.” in one case the agricultural enterprise is characterized by one number (7,687) and latter by another number (4,578). Can an author explain such differences?”

Yes, the text is confusing. It is technical mistake that happened during the proof-reading by professional agency. The original sentence was: “*There were 7,687 registered agricultural enterprises by 2015 in Kazakhstan, with an average land area of 4,378 ha. This represents a substantial decline in land held by large-scale farms from 1991, when a total of 4,578 agricultural enterprises operated with an average land area of 43,112 ha.*”

Prof. PhDr. Michal Lošták, Ph.D, question 9: “Can you explain the difference between government and governance?”

**Governance** is all of the processes of governing, whether undertaken by a **government**, market or network, whether over a family, tribe, formal or informal organization or territory and whether through the laws, norms, power or language of an organized society (UN 2003).

Prof. PhDr. Michal Lošták, Ph.D, question 10: “Kazakh university are still fully finances from the budget of government?”

- Yes, it is true that since 1999, fundamental changes have taken place in the system of financing higher education to the limited budgetary funds for admission of students by higher educational institutions to paid departments.
- Nonetheless, in most of the domestic laws relating to the social sphere, there are numerous budget and tax rules that regulate the requirements for allocating costs and revenues between budgets. In other words, branch legislation provides organizations that implement social services a wide range of rights, benefits and autonomy, and regulates budgetary and tax legislation, minimizes costs and assigns financial responsibility for improper implementation.
- This conglomerate of legal norms, dispersed across many legislative acts of different nature, different branches impede implementation of special social programs and the transfer of part of them into the category of paid ones. In reality, the financing of social sectors is carried out only by budget legislation.

Prof. PhDr. Michal Lošták, Ph.D, question 11: “What about bio-economy?”

- **Bioeconomy** is utilization of biological resources and the knowledge-based production, innovative principles to sustainably provide goods and biological processes as well as services across all economic sectors.
- It merge biomimicry, and utilizes biosciences with already established economic sectors.
- It has been rapidly expanding during the last decade, driven by changed consumer preferences, new technological opportunities, and increased prices of natural resources.

Prof. PhDr. Michal Lošták, Ph.D, question 12: Within the section Human capital development conditions an internship programme is mentioned. Can you evaluate its impact and efficiency of such internship programmes in Kazakhstan

- President Nursultan Nazarbayev in his Program article "Social modernization of Kazakhstan: 20 steps to the Society of General Labor" among the priority directions of the employment strategy of the Republic of Kazakhstan emphasized the importance of organizing an effective system of youth practice, whose goal is to create conditions for obtaining initial experience in the profession, employment and increasing competitiveness in the labor market of young professionals who have just graduated from educational institutions.
- In 2015, the level of youth unemployment in Kazakhstan was 4.6%, and in the first half of 2016 this indicator fell to 4%. At the same time, in recent years the share of graduates employed from the total number of graduates of universities is declining (in 2012 - 75.6%, and in 2015 - only 62%). Thus, despite the decline in the indicator of youth unemployment, the problem of employing graduates remains very relevant.
- In Kazakhstan, mandatory practice during the last year of education in an institution is often considered a formality. Often, graduate students first of all try to get a mark on the passing of practice, rather than real work experience.

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