TOWARDS INDUSTRIAL POLICIES TO SUPPORT TECHNOLOGY UPGRADING FOR SUSTAINABLE DEVELOPMENT IN CENTRAL ASIA (SPECA SUBREGION)

Slavo Radosevic[1]

Professor of Industry and Innovation Studies

University College London School of Slavonic and East European Studies

Visiting Professor at National Research University Higher School of Economics St Petersburg

March 2021

Summary

This paper introduces the new industrial policy approach in the context of the Central Asia (SPECA subregion). Following a brief primer on new industrial policy approaches, it outlines relevant principles of new industrial policy in the SPECA subregion. It characterizes techno-economic features of the SPECA economies and outlines the new industrial policy strategic options. It points to industrial and innovation governance as key challenge for new industrial policy implementation. The analysis is framed within the literature on economic catch up, technology upgrading and innovation studies and reflects the state-of-the-art in policy thinking in this area.

[1] With contribution from Dr. Marat Myrzakhmet, Eurasian National University, Innovation Center.

Executive Summary:

SPECA economies` drivers of growth are excessively tied to natural resource-based industries, including agriculture. They are outside of Global Value chains (except in natural resource-based sectors) and have weak innovation systems. Within that context, new industrial policy is an emerging set of policy thinking and practices that may enhance technology upgrading in the SPECA sub-region.

New industrial policies are: pro-active and focused on innovation and technology upgrading in an inter-sectoral context; recognize that the ultimate limits to growth and the relevant solutions are not known ex-ante; market-friendly because they show respect for comparative advantages and export transformation; guided by the perceptions of not only market failure, but also system failure; centred around the private sector and innovation ecosystem actors to enhance their collective action; assume either explicitly or implicitly some elements of experimentalist governance.

A conversion of new industrial policy features into SPECA context generates several implementation principles which should be considered when designing and implementing industrial policy measures. In the SPECA context, the policy is primarily about upscaling the existing or emerging bottom-up initiatives that can potentially increase sustainable growth and technology upgrading. The policy should be created and implemented in coordination and co-production with affected parties. Policy in this perspective is about facilitation and moderation of self-organisation activities. Learning in policy requires experimentation, and thus pilot projects are its essential mechanism. Successful pilots can be reconfigured to scale up, while unsuccessful pilots can be cancelled. The government's role in contributing to and facilitating collective action on innovation remains essential. However, its involvement in the implementation of various policies should match its policy implementation capacities. The policy capacity across SPECA economies varies but on average does not seem to be at the required level for effective industrial policy implementation. This further urges the use of pilot projects where risks and failures are accepted and where technical risks are clearly differentiated from strategic risks and use of "diagnostic monitoring" or early warning system when results do not seem likely.

We identify the following main strategic options for technology upgrading in the SPECA subregion focused on new industrial policy. First, increase R&D, engineering, and innovation capacity in both the private and public sector. Second, build a strategic policy to embed local supply chains into FDI and international supply chains. Third, prioritize structural reforms in sectors which are priorities for strategic FDI policy. Fourth, establish actions on building basic technology upgrading infrastructure services linked to export agenda. Fifth, exploit the potential of the innovation-enhancing public procurement. Sixth, carry out inclusive and pro-poor innovation programs.

Prioritization of specific sectors, technologies or tasks is essential to industrial policy. Priorities should be sought not only in new sectors or in sectoral diversification but equally in intra-sectoral technology upgrading. However, priorities should be used as additional criteria in selecting individual programmes and projects and as the basis for area-specific policy mixes, i.e. set of interventions.

A new industrial policy should be used in conjunction with sector-specific structural reforms and individual infrastructure or modernization projects. Their coordinated implementation will ensure more potent transformative effects. The new industrial policy requires the state to operate effectively as regulatory, developmental and developmental network state. In each of these roles, states aim to

resolve different types of failure (market, coordination, system) or enhance collective action by bridging gaps, facilitating self-organisation, and networking with foreign strategic investors.

However, multiple roles and demanding policy capacities for new industrial policy may surpass state capacities. Hence, it is critical to assess whether in deciding on specific policy measures, governments have assessed their institutional capacities for the implementation and whether they have assessed their technical – operational and political capacities. The absence or presence of coordination capabilities within public or private sectors will determine the appropriateness of specific policy types. Horizontal policies will be more appropriate as compared to vertical when public-private coordination is weak. Also, single agency-based approaches will be preferred when intra-public sector coordination is undeveloped.

In states with weak institutional capabilities, policy overreach is a real possibility. So, the challenge is how to design low-cost policy measures and establish communication with local entrepreneurs and ensure both incentives for technology upgrading and performance requirements.

Final challenge is how to reconcile the experimental nature of innovation policy with requirements for accountability of public policy. The ultimate solution is to rely on pockets of excellence in public administration and entrust them with designing and implementing industrial policy programs. A short-term aim is humble: to accelerate what already exists, starting from pockets of excellence in private and public sectors.

Contents

List of Abbreviations

AFG: Afghanistan

AZE: Azerbaijan

ECA: Europe-Central Asia

EDP: Entrepreneurial Discovery Process

EU: European Union

FDI : Foreign Direct Investment

GDP: Gross Domestic Product

GERD: Gross expenditure on R&D

GVC: Global Value chain

ISO: International Standards Organisation

KAZ: Kazakhstan

KGZ: Kyrgyzstan,

LIC: Low income

MIC: Middle income

NIP: New Industrial Policy

NSE: New Structural Economics

R&D: Research and Development

SPECA

TJK: Tajikistan

TKM: Turkmenistan

UZB: Uzbekistan

WIPO: World Intellectual Property Organization

1. Introduction

The report explores potential of the "new industrial policy" approach to support innovation, in particular through upgrading and enhancing use of technology, as a leading means to discover and build the foundations for sustainable development in the SPECA sub-region (Afghanistan, Azerbaijan, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan). SPECA countries belong to the middle- and low-income groups, which strongly determines the nature of innovation and industrial activities in these economies and has substantial implications for their industrial policies. The challenge of economic and technological transformation has become even more urgent in the light of the impending energy transition and shift towards 'green growth', devastating effects of Covid-19 crisis on global economy, expected impacts of automation and Industry 4.0 on competitive position of these economies.

Industrial activities in SPECA are on a declining path since independence, focussed mainly on mining and manufacturing of commoditised, undifferentiated products for the local or regional markets. The firms use foreign technology to manufacture products whose technology and markets have been tested and proved elsewhere (Kim, 1997)[2]. The focus of firms' activities is on manufacturing capability or capability to produce at the world standards of quality and efficiency much more than on innovation and R&D. Economic structure, levels of productivity and patterns of technology and industrial upgrading in these economies lag significantly behind those in high-income economies. These features, which apply to SPECA economies, call for specific policy approaches to facilitate their technology and industrial upgrading.

However, the appropriate policy approach is never resolved as the global economic and technological environment is continuously changing. Policies that worked in the past do not necessarily work today. Since the 1990s, many catching up economies have strongly focused on structural reforms as the primary policy area (Campos et al., 2017)[3]. However, these policies have limitations as they assume that the right business environment will automatically lead to technology and economic upgrading ignoring the market and system failures in this process. Catching up economies now seek new modes to reconcile the necessity to operate in an open globalized context with the need to promote technology accumulation and structural change by industrial policy activities.

In this context, new industrial policy approaches are a potential alternative that builds on positive and negative experiences of both structural reforms and "old" industrial policies. This report aims to introduce the reader to new industrial policy approaches considering the innovation and policy capacities of the SPECA countries. Our approach is technology upgrading which is defined as 'a shift to higher value-added products and production stages through increasing specialization' (Gereffi (1999: 51-2[4]). This is broad perspective which includes not only innovation and R&D capabilities but also

[2] Kim, Linsu (1997) Imitation to innovation : the dynamics of Korea's technological learning, Boston: Harvard Business School Press,

[3] Campos, Nauro F; De Grauwe, Paul; Ji, Yuemei (2017) : Structural Reforms, Growth and Inequality: An Overview of Theory, Measurement and Evidence, IZA Discussion Papers, No. 11159, Institute of Labor Economics (IZA), Bonn

[4] Gereffi, G. 1999. International trade and industrial upgrading in the apparel commodity chain, Journal of International Economics, 48(1), 37–70.

production capabilities, different dimensions of structural changes and knowledge interaction with global economy (Radosevic and Yoruk, 2016; 2018)[5].

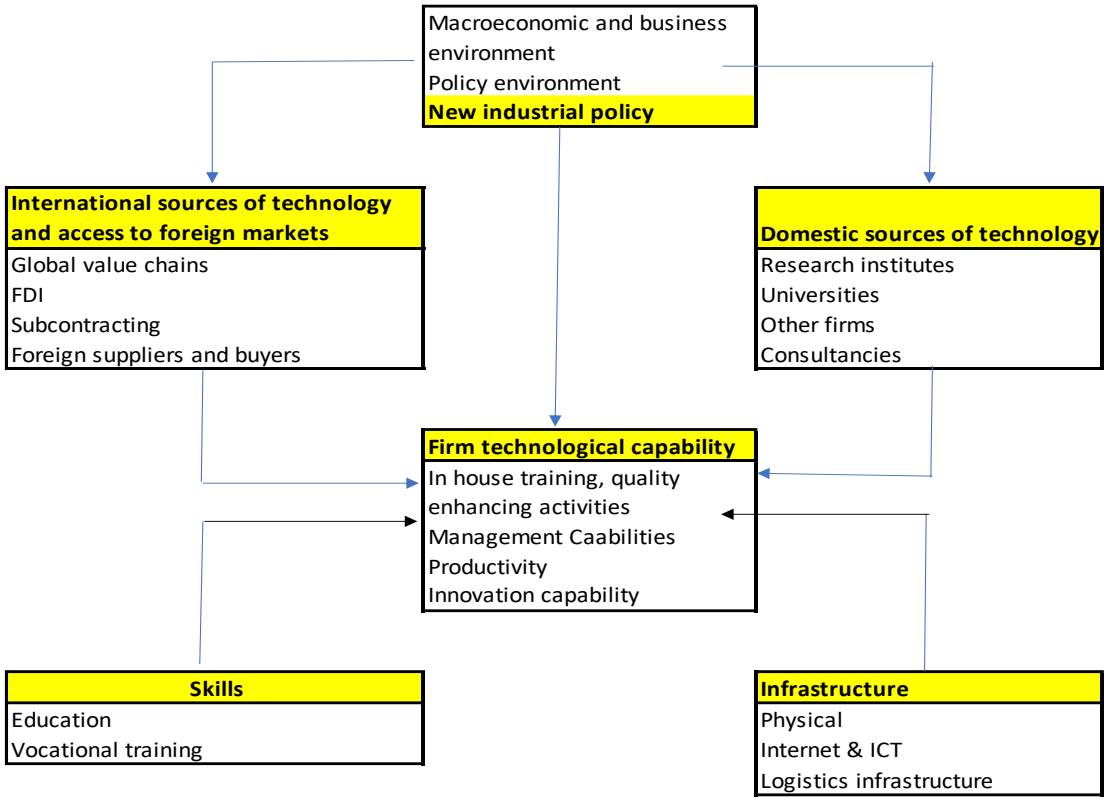
The next section (2) introduces an analytical framework to explore technology upgrading in the SPECA economies. In examining the issue, we use various indicators to understand the context within which we frame and discuss industrial and innovation policy issues in the SPECA subregion (section 3). We aim to propose a new industrial policy approach through technology upgrading, which can be useful when considering industrial policy actions in the SPECA sub-region. Hence, section 4 explains the main new industrial policy approaches and their commonalities and differences. Section 5 elaborates several stylized features of the new industrial policy approach relevant for technology upgrading in SPECA sub-region. The critical challenge for implementation is industrial and innovation governance which we briefly address in section 6. The conclusion contains key findings and messages.

2. Technology upgrading and economic catch-up of SPECA economies: relevant conceptual frameworks

Figure 1 summaries a first conceptual framework that underpins our analysis. It is a framework applicable to transition economies, including SPECA economies. It indicates that the firm's technology capability is the key engine of technology upgrading, but it is also shaped by international technology transfer and domestic extramural sources of knowledge. Also, firms' technology capabilities are shaped by skills and infrastructure inputs. Finally, the macroeconomic and policy environment shapes firms' behaviour and their interactions with foreign and domestic organisations. The key to technology upgrading is the balance and complementarity between the import of technology and local technology efforts.

[5] Radosevic, S., and Yoruk, E. 2016. Why do we need theory and metrics of technology upgrading? Asian J. Tech. Innov. 24 (Sup 1), 8–32. https://doi.org/10.1080/19761597.
2016.1207415. and Radosevic, S., and Yoruk, E. 2018. Technology Upgrading of Middle Income Economies: A New Approach and Result'. Technological Forecasting and Social Change. 129, 56-75.

Figure 1: Sources of technology upgrading in catching up economies



Source: Based on Kim, L., 1997. Imitation to innovation. The dynamics of Korea's technological learning. Boston, MA: Harvard Business School Press.

It is essential to distinguish between two gaps at the firm level: **production capability** and **technology capability gaps** (Bell and Pavitt 1993, 1995[6]; Bell and Figueiredo, 2012[7]). Technology capability enables the creation and implementation of innovations in production to change the forms and configurations of current technologies in use (Bell, 2007[8]). Latecomer firms may catch up with global industry leaders in technologies they use in production. They may use technical and design specifications and performance features at the world frontier, which results in products matching those of global competitors and similar productivity levels. In this respect, firms show developed absorptive or technology use capabilities. However, these firms may be lagging in innovation or technology generation capability, as reflected in their weak capacity to move to higher technology positions in terms of technology functions (see table 1). In this respect, SPECA firms, like many other firms in

[66] Bell, M. and Pavitt, K., 1993. Technological accumulation and industrial growth: contrasts between developed and developing countries. Industrial and corporate change, 2 (2), 157–211.
Bell, M. and Pavitt, K., 1995. The development of technological capabilities. In: I.U. Haque, ed. Trade, technology and international competitiveness. Washington, DC: The World Bank, 157–211.

[7] Martin Bell & Paulo N. Figueiredo (2012) Innovation capability building and learning mechanisms in latecomer firms: recent empirical contributions and implications for research, Canadian Journal of Development Studies/Revue Canadienne D'Etudes du Développement, 33:1, 14-40, DOI: 10.1080/02255189.2012.677168

[8] Martin Bell (2007) Technological Learning and the Development of Production and Innovative Capacities in the Industry and Infrastructure Sectors of the Least Developed Countries: What Roles for ODA?, UNCTAD The Least Developed Countries Report 2007 Background Paper, University of Sussex

catching up economies, face challenges similar to East Asian firms a few decades ago to move from being assemblers to develop their own design or undertake their own process improvements. Increased physical investments alone cannot drive this process if investments are not accompanied by intangible investments in new skills and productivity improvements. So, innovation requires an active process of knowledge acquisition, assimilation, exploration and enhancement. In transition economies, this process often evolves from production to technology capability, including R&D capability (Table 1).

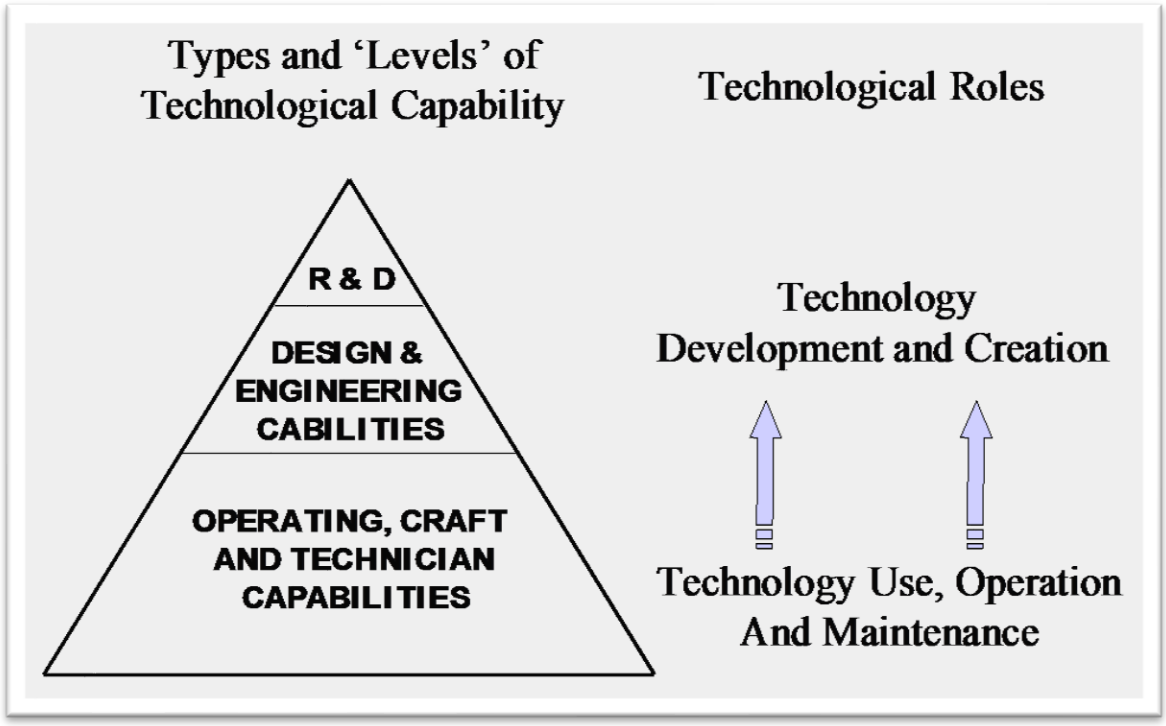
Table 1: Path of technology upgrading from production to innovation capability

Stage	1	2	3	4	5
Technology position	Assembly skills Basic production Mature products	Incremental process changes Reverse engineering	Full production skills Process innovation Product design	R&D Product innovation	Frontier R&D R&D linked to market needs Advanced innovation
Market position	Passive importers pull Cheap labour Distribution by buyers	Active sales to a foreign buyer Quality and cost-based	Advanced production sales International marketing department Markets own design	Product marketing push Own brand product range and sales Own brand push	In-house market research Independent distribution

Source: Based on Hobday, M., 1995. Innovation in East Asia: the challenge to Japan. Aldershot: Edward Elgar

However, R&D is rarely sufficient to generate innovation. Non-R&D activities closely related to either R&D or production are design and engineering capabilities and are very often crucial to the industrial growth of middle-income economies. As argued by Martin Bell (see figure 2) design and engineering capabilities are 'also a necessary basis for building (…) R&D activities in the first place - a 'seed-bed' in which R&D capabilities typically grow' (p.65).

Figure 2: Technological Capabilities and Roles



Source: Bell, Martin (2007)

Design and engineering and operating, craft and technician capabilities are the basis of the technological capability pyramid in catching up economies. Most often, innovation and marketable products do not emerge directly from public R&D labs or by "commercialising" the results of public research. Instead, they appear from the bottom or middle layer of the pyramid in figure 2. Innovation is a complex, market-driven process where R&D represents just one of several factors that lead to innovation (Mason (2014[9]). If anything, the design, and engineering capabilities are crucial innovation activities and the primary driver of demand for R&D once enterprises reach that technological level.

Domestic enterprises are major actors in the innovation process, but they are often heavily reliant on technological knowledge embedded in trade, subcontracting and FDI (figure 1). Trade, subcontracting and FDI are effective channels of technology transfer. Trade and FDI openness are vital preconditions for this process to take place, but its outcomes are by no means guaranteed. What matters is less pure "quantity" of FDI but the 'learning potential' of FDI and trade. It cannot be assumed that knowledge will automatically be transferred without conscious effort to maximise knowledge spillovers that may emerge from trade and FDI linkages.

Finally, firms may have difficulties integrating external knowledge with their own process as they may lack absorptive or organizational capabilities for innovation. Innovation is a systemic and inter-organizational activity. The development of the extramural R&D and knowledge-intensive services, including universities and research – technology organizations (RTO) will strongly impact enterprises' innovation capacities (figure 1). An excellent educational and training system is fundamental for

[9] Brown, R. & Mason, C. (2014) Inside the high-tech black box: A critique of technology entrepreneurship policy. *Technovation*, 34(12), pp. 773-784. (doi:10.1016/j.technovation.2014.07.013)

catching up economies to tap into and absorb the knowledge and technologies from abroad and to enhance creative entrepreneurship.

It is essential to recognize that the channels of interaction between public R&D and business are changing as firms' innovation capabilities evolve (Albuquerque et al., 2015[10]). Initially, universities and public research organisations (PROs) provide human resources, testing, and simple problem solving (e.g., consultancy and technical assistance). Later, universities and PROs become better equipped, and local firms may use their laboratories. Finally, they undertake research activities that substitute and complement research and development (R&D) by firms.

3. Innovation capacity and technology upgrading challenges of SPECA sub-region: a brief overview

In the next section, we highlight and assess by statistical indicators the critical features of the conceptual framework elaborated in section 2 in relation to the SPECA sub-region. We start with outcomes and structural features of the technology upgrading.

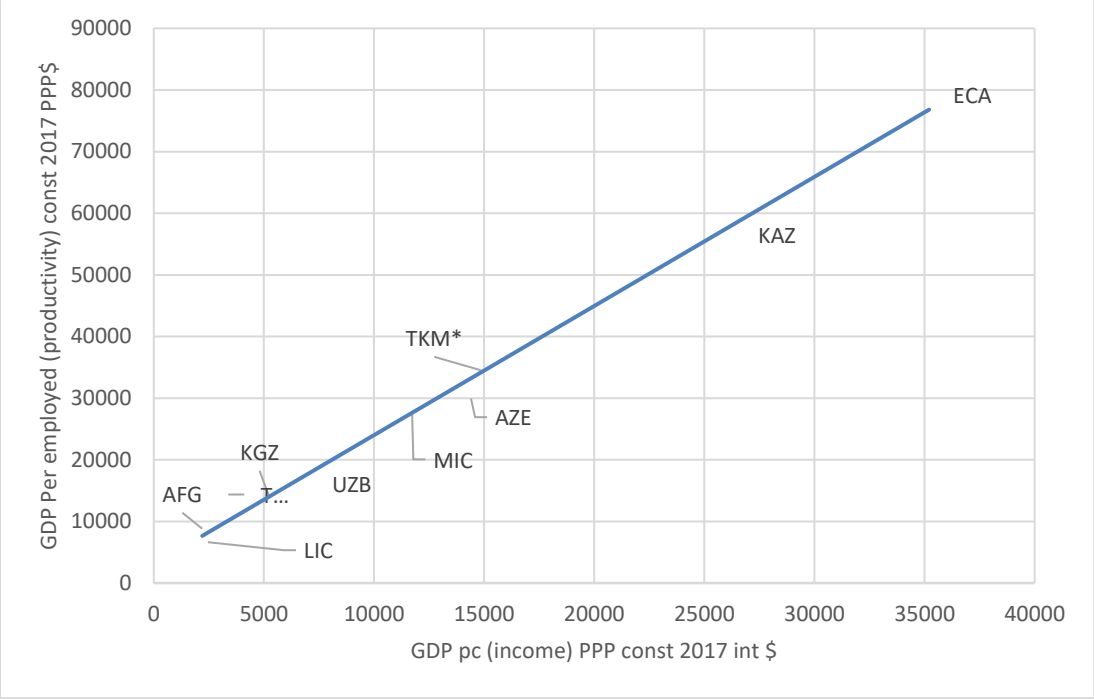
3.1. Economic outcomes and structural features of SPECA economies

Productivity performance is a crucial driver of long-term economic growth and one of the primary drivers of sustainable development. A high correlation between productivity and income levels shows the key role of productivity in driving economic growth. Levels of labour productivity in SPECA countries (expressed as GDP per employee) are somewhat higher than in their respective income groups but still significantly below levels in the Europe Central Asia economies (Figure 3).

The difference between productivity (GDP per employed) and income per capita is significantly higher in middle-income countries than low income. In SPECA sub-region, this is partly due to firms' higher efficiency and partly due to the structure of economies with a higher share of more productive industries.

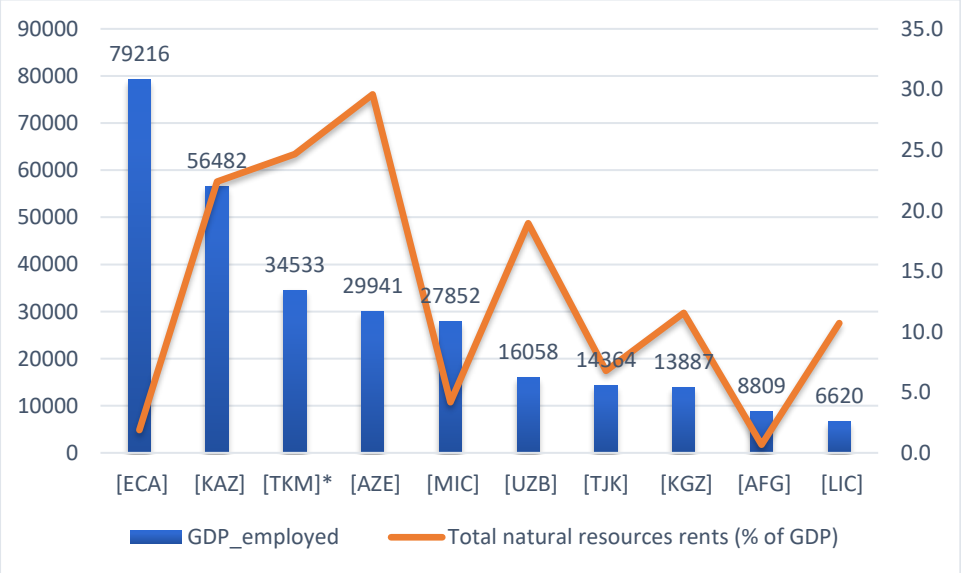
[10] Eduardo Albuquerque, Wilson Suzigan, Glenda Kruss, Keun Lee (eds)(2015) Developing National Systems of Innovation: University–Industry Interactions in the Global South, Edward Elgar, Cheltenham.

Figure 3: Income (GDP) per capita and Productivity (GDP per employed) 2019*



Note: ECA: Europe Central Asia; MIC: Middle-income economies; LIC: Low-income economies; *Turkmenistan 2018
Source: World Development Indicators Database

Figure 4: Productivity (GDP per employed) and total natural resource rents % of GDP) 2019*

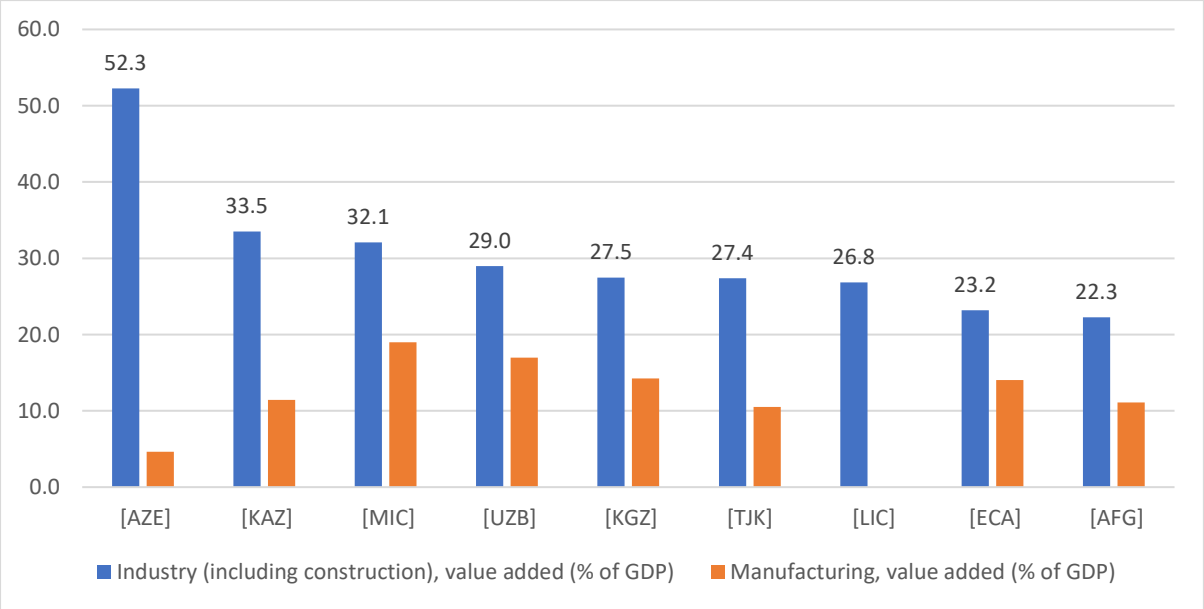


Note: ECA: Europe Central Asia; MIC: Middle-income economies; LIC: Low-income economies; *Turkmenistan 2018
Source: World Development Indicators Database

Kazakhstan, Turkmenistan, Azerbaijan, and Uzbekistan have a high share of natural resources based (NRB) industries in their economic structure where productivity levels are generally significantly higher due to higher capital intensity of these sectors (figure 4). This structural feature is the most pronounced when SPECA countries are compared to the low-income countries of the Europe Central Asia region, which has a significantly higher productivity level but a negligible share of natural resource rents in GDP.

A high share of natural resource-based sectors is discernible in differences between industry shares and its manufacturing part. The difference between these two is due to high natural resources rents located in extractive industries, which makes a massive difference in Azerbaijan and Kazakhstan. All SPECA countries have a share of industry in GDP higher than the average among low-income ECA countries. Compared to the world middle income group of countries, all SPECA countries are not deindustrialised, but the better expression is that they are '*de-manufactured*'. This feature is not unique to SPECA countries but is characteristic of most economies of the former Soviet Union, with Belarus being one notable exception. The average share of manufacturing in GDP for middle-income economies is 19% while for the ECA region, including all SPECA economies, it is below 19%.

Figure 5: Shares of industry and manufacturing in GDP 2018



ECA: Europe Central Asia; MIC: Middle-income economies; LIC: Low-income economies
Note: *Turkmenistan 2018
Source: World Development Indicators Database

Within industry, the largest group are low-tech (labour intensive) industries. The share of medium and high-tech industries in manufacturing value-added is the highest in Uzbekistan (20%) and lowest in Tajikistan (only 3%) (Table 2). Within the SPECA subregion, there is a significant difference between shares of the middle-income group (Uzbekistan, Azerbaijan, and Kazakhstan) compared to its low-income group (Afghanistan, Kyrgyzstan and Tajikistan).

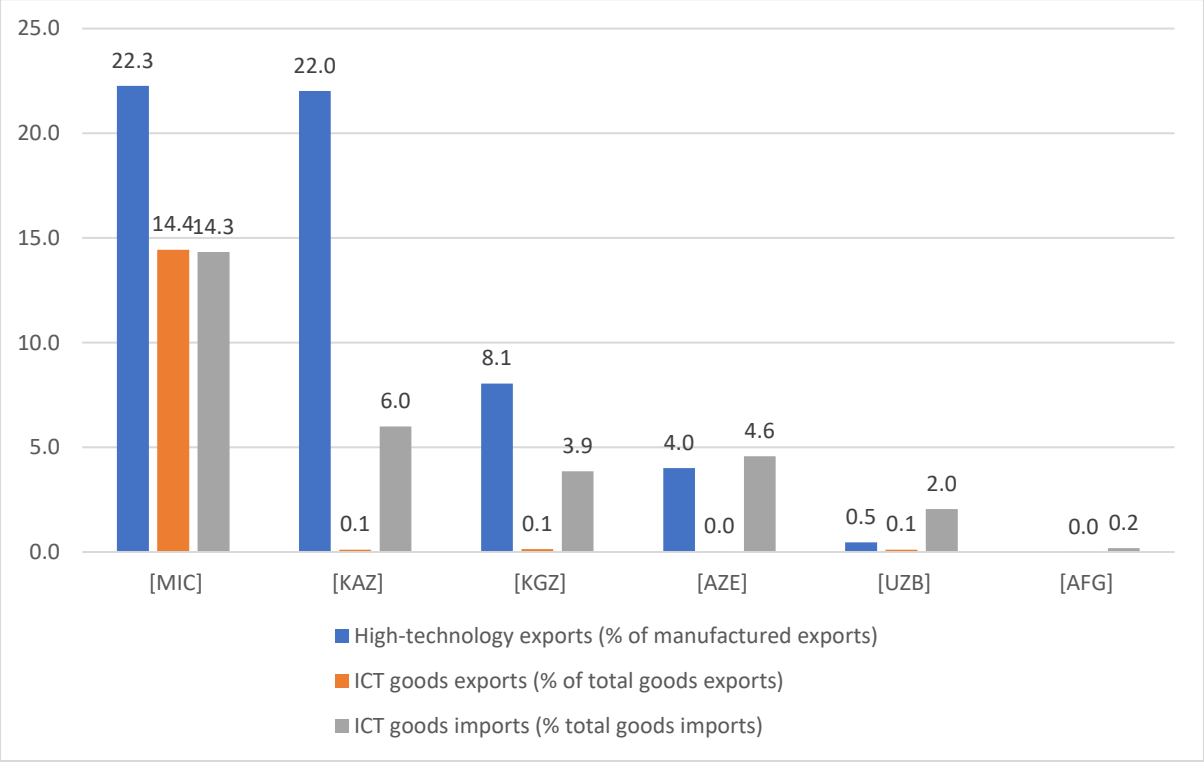
Table 2: Share of medium and high-tech industry (% manufacturing value-added) 2018

UZB	AZE	KAZ	AFG	KGZ	TJK
19.86	15.59	14.51	9.51	2.80	2.80

Source: World Development Indicators Database
Note: No data for Turkmenistan

A low share of medium and high-tech industries is reflected in the low share of high-tech exports where, of the SPECA countries, only Kazakhstan has a percentage similar to middle-income economies. In contrast, the shares in the other SPECA countries are marginal (figure 6). The export of ICT goods is almost non-existent in the subregion. In that respect, the SPECA subregion is outside of international production networks in electronics and telecommunications. However, of particular concern is the low share of ICT imports, which is significantly lower than the average for middle-income economies (figure 6). ICT is an essential factor in modernization and technology upgrading of all sectors and a fundamental mechanism for building a "knowledge society". A low share of ICT imports indicates significant weaknesses in the diffusion and adoption of new technologies in the economy and society.

Figure 6: High tech-export and ICT trade in SPECA and middle-income countries, 2018

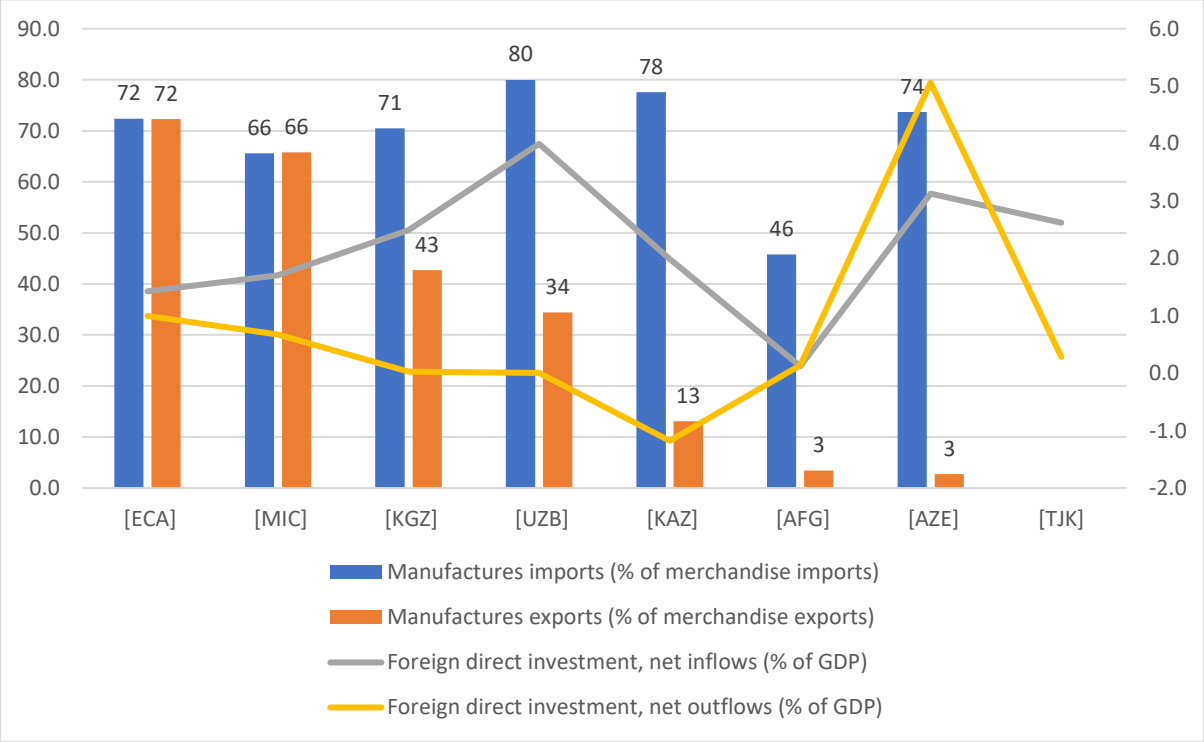


Source: World Development Indicators Database
Note: No data available for Tajikistan and Turkmenistan

Trade intensity expressed as a share of exports and imports in GDP is for most SPECA countries above average for their peer income level. The average for middle-income countries is 51% while it is well above that level in Azerbaijan (92%), Kyrgyzstan (99%), Kazakhstan (64%) and Uzbekistan (66%) (figure

7). Also, SPECA countries are open to FDI to a similar extent as middle income or low-income countries in the ECA region. However, trade in manufactures is heavily unbalanced. A share of manufactures imports is at or slightly above average for middle-income economies (66%). However, the percentage of export is well below the average share in countries of their income levels. The marginal role of manufacturers in export is a significant structural feature of the SPECA subregion, making their economies fragile and dependent on highly cyclical natural resource prices. This is a challenge from both a trade balance as well as a technology and industrial upgrading perspective. Growth of the manufacturing sector based on their comparative advantages (potential and existing) is the critical challenge for industrial and innovation policy.

Figure 7: Trade in manufactures (2018) and foreign direct investments (2019)

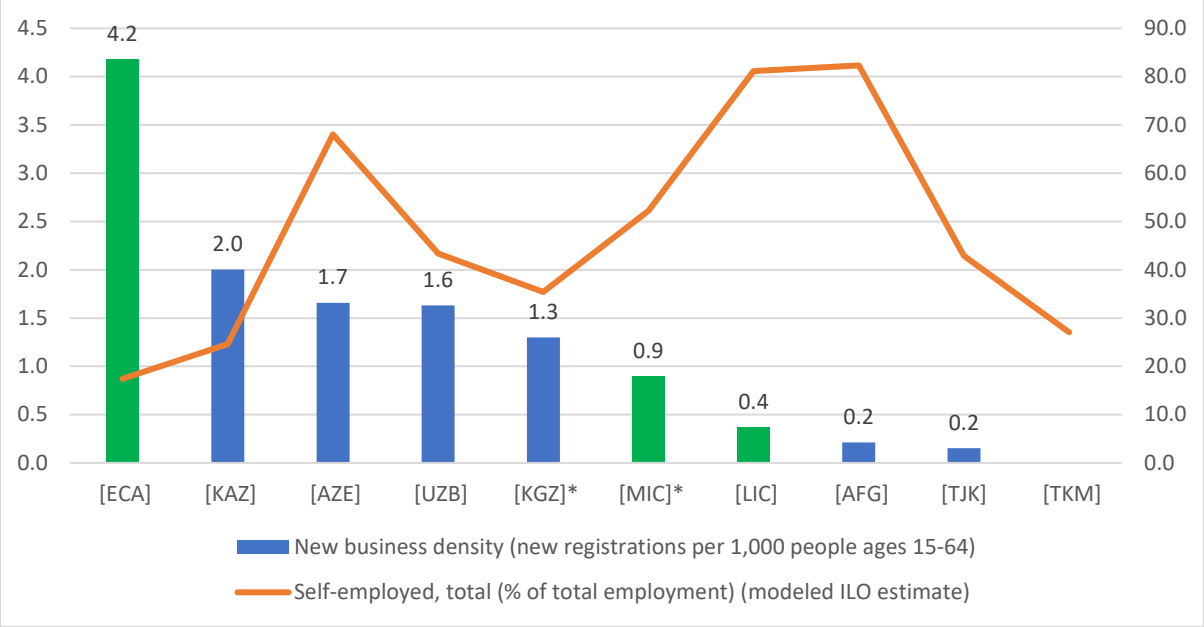


Source: World Development Indicators Database
Note: No data for Turkmenistan

3.2. Entrepreneurship and firms' investments in learning

The previous section has shown that productivity levels per employee in SPECA economies are comparable to countries at similar income levels, and that the main drivers behind productivity are reliance on natural resources-based industries. Despite being FDI and trade intensive economies, they have fragile manufacturing sectors, mainly involved in labour-intensive sectors. They do not have any ICT goods exports but also import a low share of ICT goods. In this section, we try to shed some light on the key engine of technology and industrial upgrading – the enterprise. Understanding the dynamic process of firm formation and firm learning is essential because technology upgrading ultimately occurs at the firm level.

Figure 8: New business density (2018) and self-employment (2019)

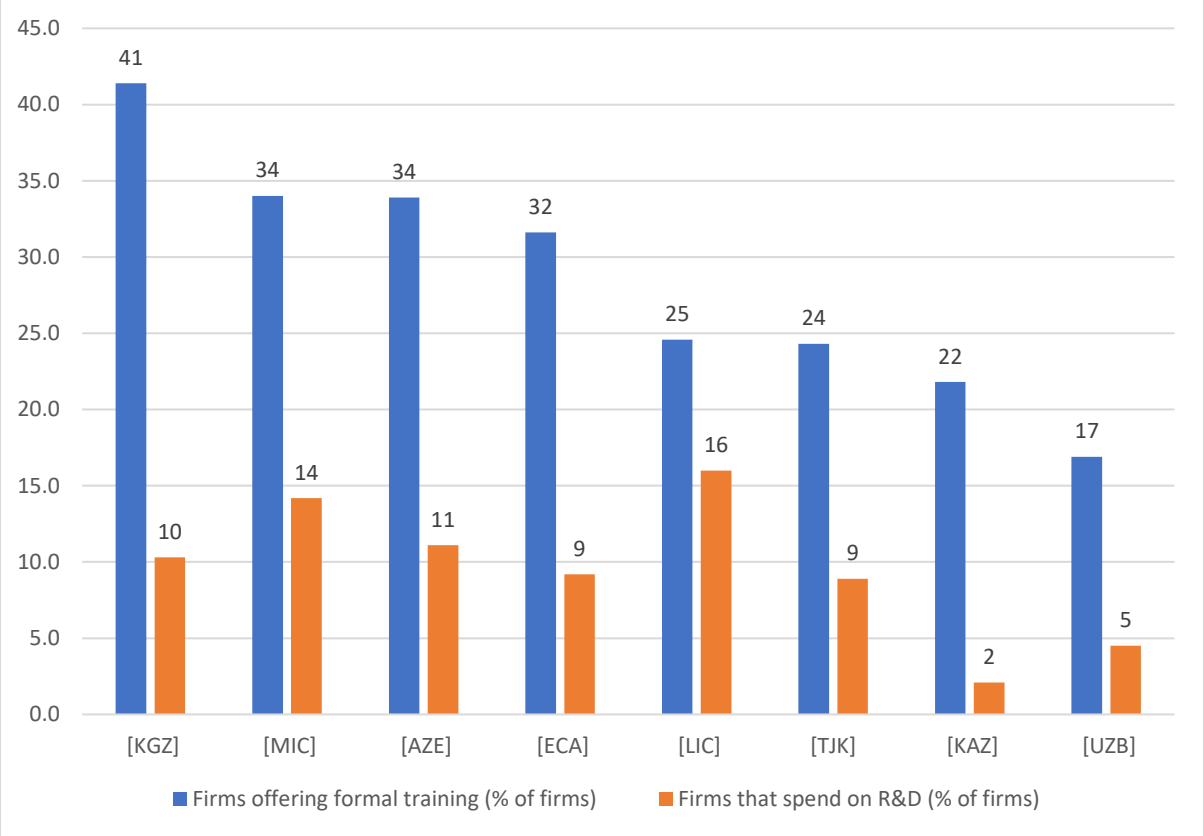


Note: *2016
Source: World Development Indicators Database

The density of new businesses registered is a significant indicator of the entrepreneurial dynamics in an economy. In that respect, SPECA economies are divided into two groups. Kazakhstan, Azerbaijan, Uzbekistan, and Kyrgyzstan have a density above the average intensity of middle-income economies while Afghanistan and Tajikistan are below average for low-income economies. However, even the former group of relatively higher performing SPECA countries is well below the average for ECA countries. So, in overall organised entrepreneurship, as proxied by enterprise density, SPECA countries lag other transition economies of the ECA region. This is especially significant given the high degree of "de-manufacturing" of the economy and probably limited opportunities in services sector alone to drive income generation.

When entrepreneurship through new enterprise formation fails the alternative point of entry into the market is self-employment. Figure 8 shows that there is a substituting relationship between the two. On average, middle, and low-income economies have an inverse share of self-employment compared to new enterprise registration, and there is a similar tendency in the SPECA subregion, although not in the wider ECA region. New enterprise density registration surpasses in many ways self-employment as a more robust type of entrepreneurship. By this measure, the "quality" of entrepreneurship in the SPECA subregion is significantly lower than in the wider ECA region.

Figure 9: Share of firms offering formal training and spending on R&D 2019



Source: World Development Indicators Database
Note: No available data for Afghanistan and Turkmenistan

Individual firms' learning efforts that give rise to their technological capability are central issues in technology upgrading (Kim, 1997). Neither the share of firms that offer formal training or conduct R&D are ideal metrics, but these are the only available direct proxies for these activities (figure 9). The range of these activities in the SPECA countries fall broadly within the ranges seen in the ECA region and their respective income level groups, although levels are lower than would have been expected in Kazakhstan and Uzbekistan, while being higher in Azerbaijan and Kyrgyzstan. These differences may be explained partly by differences in the structure of their manufacturing industries or data representativeness. Overall, these data suggest that firm activities in training and R&D are not a factor of advantage for SPECA economies.

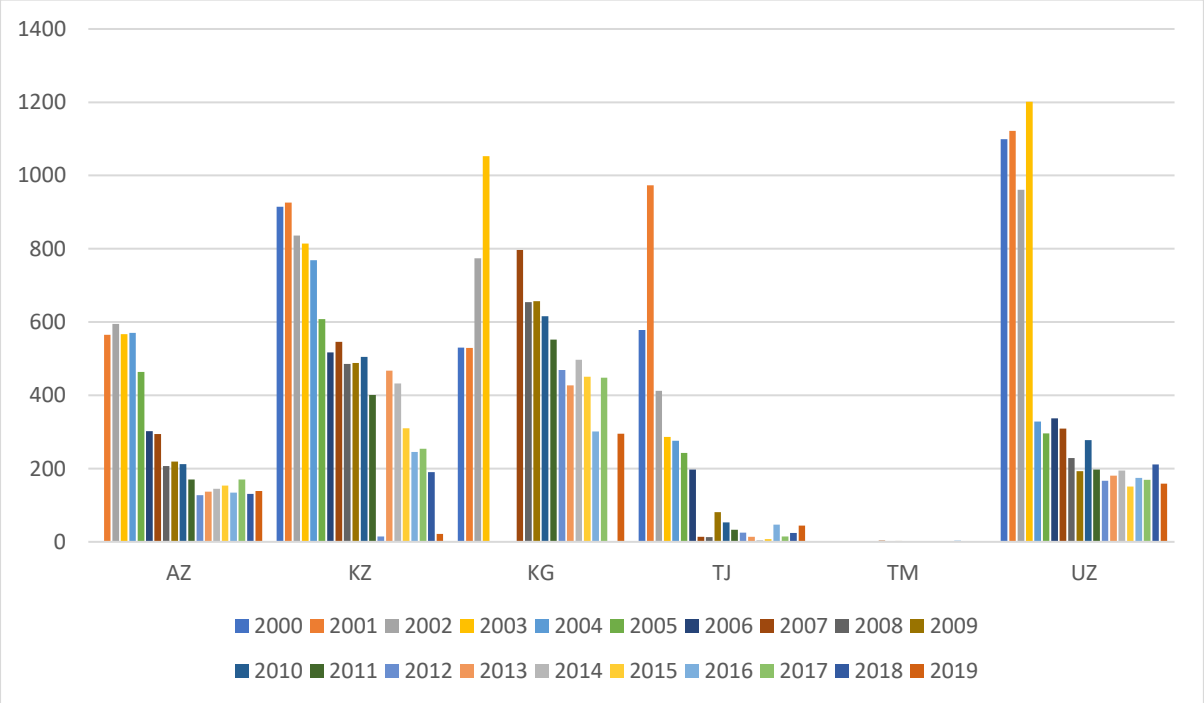
Table 3: Research and development expenditure (% of GDP) 2018

AZE	KAZ	TJK	UZB	MIC	ECA
0.2	0.1	0.1	0.1	1.6	1.98

Note: ECA: Europe Central Asia; MIC: Middle-income economies
Source: World Development Indicators Database; No data available for Afghanistan, Kyrgyzstan, and Turkmenistan.

When we consider the intensity of R&D expressed as a share of GDP, it shows that R&D is a relatively marginal activity (0.1-0.2% GERD/GDP) in SPECA economies and falls significantly behind the middle-income group (1.6%) and the ECA countries (0.81% GERD/GDP), which also include new members of the EU from the CEE. These data also point to a significant difference between SPECA and their middle-income counterparts. While in SPECA countries R&D activities are similarly dispersed the intensity of these activities is radically different. ECA and middle-income countries have a limited core of R&D active companies and a much higher public funding share. In contrast, SPECA economies have weak public R&D and similar share but intermittently and marginally R&D active firms. This is well reflected in countries' inventive activities as demonstrated by residents' patent registrations and the number of trademark applications.

Figure 10: Resident applications per 100 billion USD GDP (2017 PPP) (by origin)



Source: WIPO Database

As may be expected, SPECA countries are not engaged in technology activities at the technology frontier, but they are active innovators and engaged in domestic patenting activities. These are mostly imitative nature activities though part of it are technical novelties but not of international significance. Resident patent applications expressed relative to national GDP is a proxy for the intensity of inventive activity. Figure 10 shows two critical features: the relative intensity of patenting activity is marginal, and it is falling. Given the increasing technological openness of economies and the availability of cheaper and more effective technological solutions abroad, the scale of inventive domestic activity is failing not only in SPECA but in many other emerging economies like Russia, or Ukraine. In larger economies, domestic inventive activity is relatively more extensive due to the domestic market's larger size. For example, Russia and Ukraine resident patents per $100bn GDP are 599 and 226 patents, respectively.

On the other hand, the same indicator in Czechia is similar to Kazakhstan (224 vs 226 in 2019). Still, the scale of inventive activity in SPECA economies is characterised by a very sharp fall in the past 20 years

(figure 10). Also, we should bear in mind that patentors often are not individual firms but individuals, and thus of relatively marginal commercial relevance.

Quality certificates are a proxy for production capabilities and specifically for operations management. They also indicate how the economy is involved in global value chains as quality certificates signal conformity with best practice standards. Data on different industry standards in per capita term are exceptionally small for SPECA economies. Hence, table 4 shows absolute figures which count in tens and thus are very low, even considering the best performing economy – Kazakhstan.

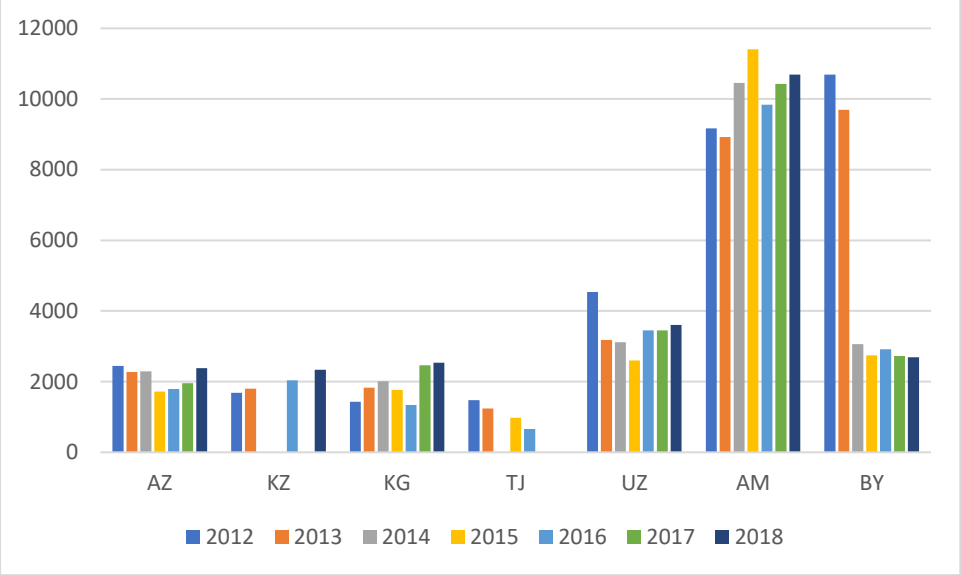
Table 4: Quality certificates in SPECA economies 2019

	AFG	AZE	KAZ	KGZ	TJK	TKM	UZB
ISO 9001:2015 Quality management systems	7	269	452	9	2	0	481
ISO 14001:2015 Environmental management systems	0	72	181		3	7	33
ISO/IEC 27001:2013 IT -- Security techniques -- Information security management systems -- Requirements	0	3	11	0	1	0	0
ISO 50001:2018 Energy management systems -	23	0	42	0	0	0	9

Source: ISO Database

Trademarks are an alternative proxy of technological learning that indicate firms' product differentiation activities and thus reflect how firms are engaged in related innovation activities. A comparison of trademark intensity to country's GDP shows that firms in SPECA economies are very weakly engaged in product differentiation activities (see figure 11). Compared to Armenia and Belarus, their activities are either significantly lower or broadly comparable (Belarus).

Figure 11: Resident trademarks per 100 billion USD GDP (2011 PPP) (by origin)



Source: WIPO Database

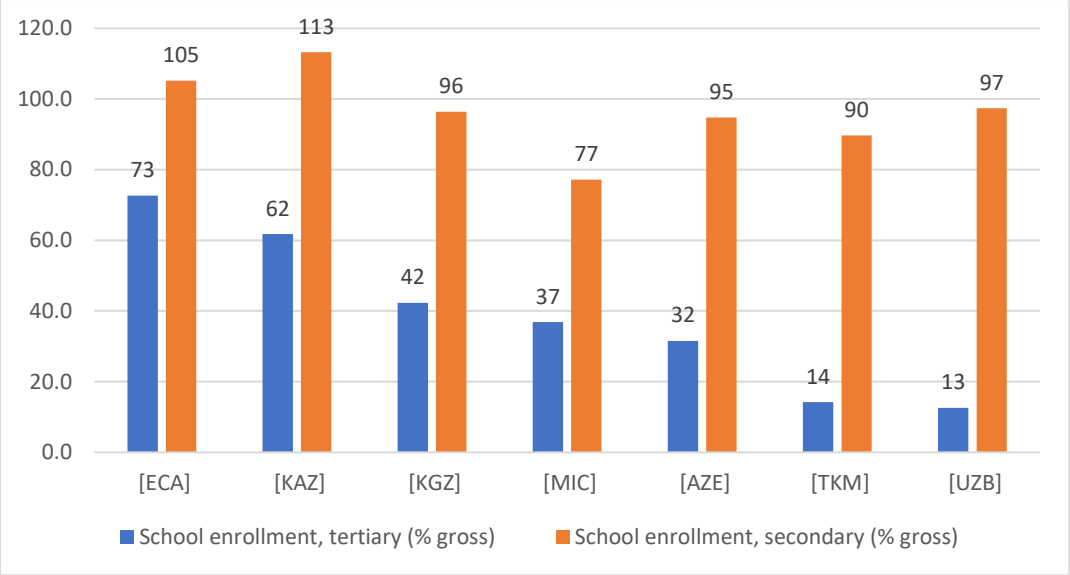
Overall, firm entrepreneurship and their learning and technological activities are limited in the economies of SPECA countries. This can be explained by certain structural features: a greater share of natural resource-based industries, a low percentage of medium and high-tech manufacturing industries, passive innovation strategies, and limited investment in product differentiation. These features may be driven by firm-specific factors (e.g. corporate governance, strategic control of enterprises), or features of the wider business environment discussed in the next section.

3.3. Infrastructure and external institutional environment as drivers of technology upgrading

Firms are the major drivers of innovation and technology upgrading. However, they do not operate alone, and socio-economic and institutional conditions strongly affect firms' involvement in these processes. Firms develop their technological capabilities through in-house efforts but augmented by the quality of human capital and skills learned through the education system. They also interact with domestic and foreign partners and rely on physical, financial, telecoms and logistics infrastructure. Finally, upgrading activities are facilitated or constrained by the environment for entrepreneurship and the economy's overall institutional context (figure 1).

The structure and quality of formal education affect the accumulation of firms' technological capabilities (Kim, 1997). We have imperfect indicators and poor understanding of these issues, although data on school enrolment provide some insights. The economies of SPECA countries (except Afghanistan) have secondary enrolment rates above average levels in middle-income economies and somewhat below the ECA region average. However, only certain SPECA countries (e.g. Kazakhstan) perform well according to tertiary enrolment ratios (figure 12). These data suggest that almost all SPECA countries enjoy a strong pool of mid-level educated population, but that the picture for the university-educated labour force is mixed. Fostering new technologies and technology upgrading would require a much more strategic approach to university education and training, and it seems that in some SPECA countries the supply of such skills is relatively low. This may also reflect insufficient demand and an insufficiently strategic approach to the training of both the labour force and population in general.

Figure 12: School enrolment ratios: 2019



Source: World Development Indicators Database

Middle-income economies frequently suffer from electricity outages, affecting on average 57% of firms – a figure rising to 73% of firms in low-income countries (table 5). This external constraint seems relatively less pressing in SPECA countries, although still affecting 30 to 40% of firms.

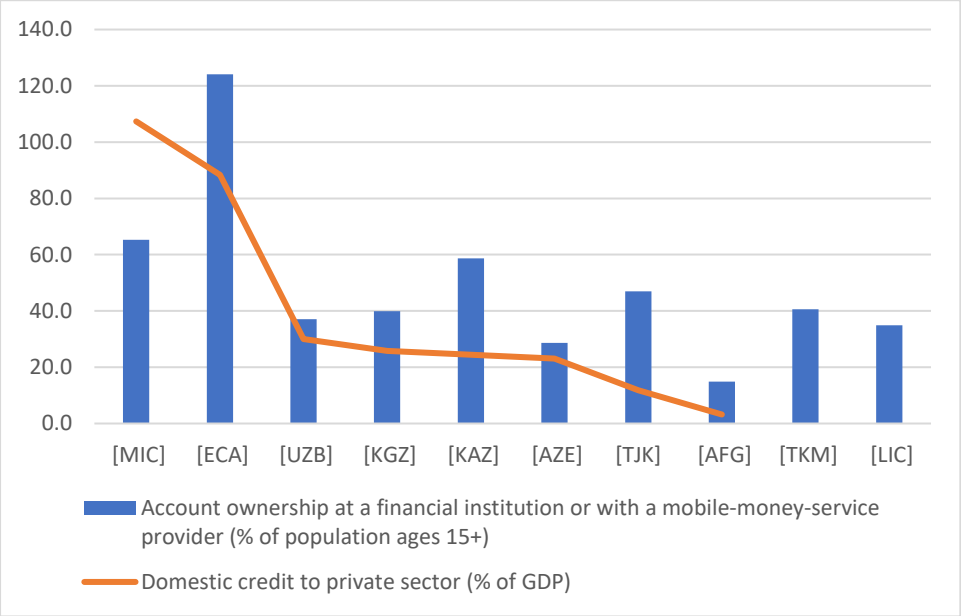
Table 5: Firms experiencing electricity outages (% of firms) 2019

LIC	MIC	KGZ	UZB	ECA	TJK	AZE	KAZ	AFG
73.4	57.4	43.1	35.8	32.8	32.2	27.6	17.1	-

Source: World Development Indicators Database

Financial infrastructure is an essential ingredient for firm entrepreneurship, with two relevant indicators being domestic credit supply to the private sector and access to bank accounts. On both measures, SPECA countries lag well behind when compared to middle-income economies, and the ECA region in particular (figure 13). In terms of access to bank accounts, only Kazakhstan approaches the average for middle-income countries, while the share of domestic credit to the private sector in SPECA countries is, on average, five times lower than in the middle-income group.

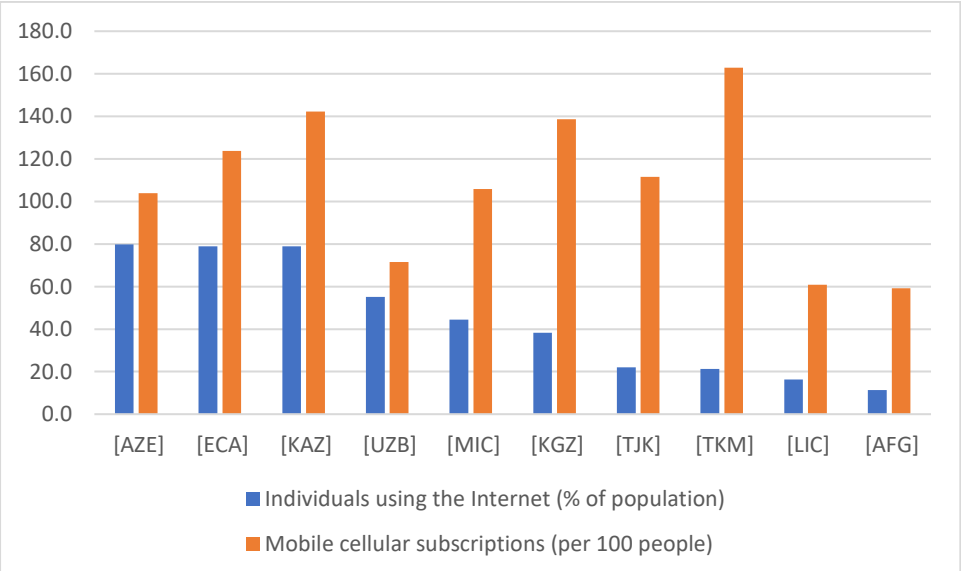
Figure 13: Financial infrastructure in SPECA economies: account ownership (2017) and the supply of domestic credit (2019)



Source: World Development Indicators Database

Access to the internet and mobile communications are indispensable infrastructure tools for any entrepreneurial activity, including self-employment. There are significant differences among SPECA countries regarding internet access that closely track differences in income levels (figure 14). This also appears to be the case for mobile communications, although various country-specific factors may explain these differences.

Figure 14: Access to the internet and mobile communications 2018



Source: World Development Indicators Database

Access to a secure internet server is essential for firm entrepreneurship and, in that respect, only Kazakhstan approaches the ECA average (table 6), with all other SPECA countries having lower shares relative to their respective income groups. A lack of secure internet servers hinders firm entrepreneurship and confines it on self-employed entrepreneurs who usually do not need this level of internet access. Internet infrastructure is as essential as electricity for the modern economy and should be considered a strategic priority.

Table 6: Secure Internet servers (per one million people) 2018

ECA	KAZ	*MIC*	UZB	AZE	KGZ	TJK	AFG	TKM	*LIC*
26678	2359	*1237*	453	369	288	71	28	20	*11*

Source: World Development Indicators Database

Entrepreneurship is inconceivable without a sound logistic infrastructure including, among other factors, a quality trade and transport-related infrastructure, efficient customs clearance processes, competent and quality logistics services, the ability to track and trace consignments and ease of arranging competitively priced shipments. The logistics performance index syntheses all these factors into an index that shows only Kazakhstan ranking above the average for middle-income economies, with other SPECA countries behind their respective income level groups (table 7).

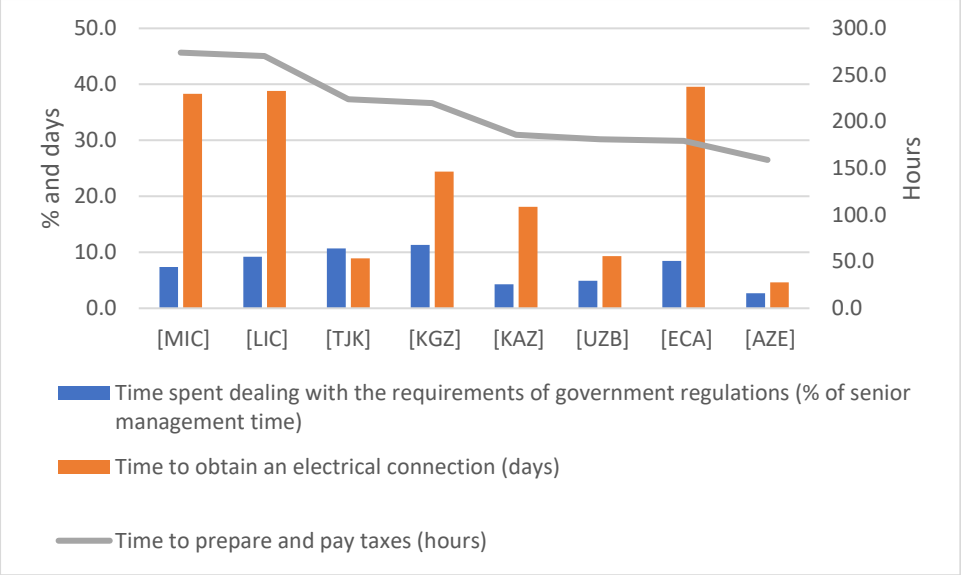
Table 7: Logistics performance index: Overall (1=low to 5=high)

ECA	KAZ	*MIC*	UZB	KGZ	TKM	TJK	*LIC*	AFG
3.2	2.8	*2.6*	2.6	2.6	2.4	2.3	*2.3*	2.0

Source: World Development Indicators Database

Finally, the market and institutional environment affect to a significant extent the behaviour of a firm, suppliers, and customers and interactions among them. However, these interactions are crucially dependent on the transparency of business and market environment and the ease of doing business. Unlike other factors, this factor of technology upgrading is well recognised and accepted as relevant by policymakers. Here, we show three simple indicators offering some insight into the quality of the business environment in SPECA countries (figure 15).

Figure 15: Selected business environment indicators in SPECA countries



Source: World Development Indicators Database

These three indicators provide some evidence of a business environment in the SPECA countries that is broadly similar or somewhat better compared to the middle-income average. This situation is encouraging but far from satisfactory. The business and market environment is multidimensional, and these comparisons should be considered tentative but still indicative.

3.4. Innovation capacity and technology upgrading in SPECA countries: common features

Innovation capacity and technology upgrading in the economies of SPECA countries share the following common features:

1) **SPECA economies are "prematurely deindustrialized" with a very low share of manufacturing in GDP and exports**. Compared to their respective income groups, the SPECA countries comprise a relatively industrialized but very much 'de-manufactured' subregion, with the major exporting sectors being mainly natural resource-based (table 8). This profile explains the very low R&D intensity driven by a low share of manufacturing (not industry).

Table 8: The leading exporting sectors and their shares in SPECA subregion 2018

Economy	The leading export sector share in 2018
Turkmenistan	Petroleum gases (78%)
Azerbaijan	Crude petroleum oils (67%)
Kazakhstan	Crude petroleum oils and gases (48%)
Uzbekistan	Gold and petroleum gases (46%).
Tajikistan	Gold, zinc and lead (33%)

Kyrgyzstan	Gold (28%)
Afghanistan	Grapes, coal, gold and lac (lakh) (37%)

Source: Based on Xin Jamie Wang, Pedro Chaves Venzon, Jelena Duza, Yasmin Baldi (2020) Harnessing "New" Industrial Policy in Central Asia: Towards the Achievement of the Sustainable Development Goals. A Capstone Project in collaboration with United Nations Economic Commission for Europe (UNECE)

2) Manufacturing in the SPECA countries is characterized by a meagre share of medium- and high-tech industries and a high share of low-tech industries of low R&D intensity - structural features that further explain the limited knowledge intensity and fragile business and public sector R&D. SPECA economies have a similar share of firms with active R&D to their respective income groups but are intermittently and marginally active.

3) SPECA economies are outside of global value chains, with the notable exception of resource-based activities: a feature explaining why industries and firms have relatively low production sophistication and management quality. A low number of quality certificates signifies isolation from global value chains and indicates the enormous scope for improvement towards best practice in managing production capabilities.[11] In addition, manufacturing firms in SPECA countries are characterized by a very low degree of product differentiation relative to peers such as Armenia or Belarus.

4) The contribution of R&D is primarily to facilitate foreign knowledge absorption, often supported by research contracted by firms from university or academic institutes in a range of downstream services like consulting, metrology, testing and problem-solving. Business linkages with higher education are informal but relatively frequent to compensate for a weak market for local knowledge-intensive services.

5) Logistical and ICT infrastructure in SPECA countries (except Kazakhstan) falls below the average level for their respective income levels.

Overall, the drivers of growth in SPECA countries are excessively tied to natural resource-based industries, including agriculture. They are largely outside of GVCs (except in natural resource-based sectors) and have weak innovation systems. Their past dynamic growth driven by the export of commodities and mineral resources is fragile. These economic features of the SPECA countries are reflected in their innovation and industrial policies which (with some exceptions) do not yet seem to be driving structural change and technology upgrading, although a full and systematic picture of these policies is not yet available for the whole SPECA sub-region (Dobrinsky, 2020[12]). Previous UNECE Innovation for Sustainable Development Reviews[13] of Kazakhstan, Kyrgyzstan and Tajikistan found policies to be focused on pockets of R&D driven growth through new technology-based firms while

[11] For example, the food industry in Tajikistan has growth potential but no Tajik company has been certified for ISO 22000 food safety certificate in the last few years. ISO data show that there were only two Tajik companies in 2008 and 2009 that were sites covered by ISO 22000 certificates.

[12] Rumen Dobrinsky (2020) Science, Technology and Innovation (STI) Gap Assessment of the SPECA Countries Analytical study prepared in the context of the project "Strengthening innovation policies for SPECA countries in support of the 2030 Agenda for Sustainable Development" conducted by UNECE in partnership with ESCAP under the 12th tranche of the UN Development Account

[13] See https://unece.org/innovation-sustainable-development-reviews

often ignoring local non-R&D sources of productivity improvements. Policies often focus on commercialising publicly funded R&D but not on innovation and productivity-enhancing activities in the business enterprise sector, including export promotion. Overall, there is a strong rationale to rethink the existing innovation and industrial policy mix and how they can promote structural change and technology upgrading. New industrial policy provides a new perspective on these issues. The next section aims to set the scene and the context of new industrial policy, and to draw implications for SPECA subregion.

4. A new industrial policy approach: a primer

4.1. A new industrial policy, structural reforms, and "big push" modernisation (infrastructure) projects

Within the broader policy landscape, "new industrial policy" is a new approach in addition to conventional structural reforms and 'big push' modernisation (infrastructure) projects with scope to drive structural change. Broadly speaking, policy options for the SPECA countries should be sought within three streams of policy thinking.

The first stream is '*thinking conventional'*. It is about structural reforms agenda and the improvements in business and regulatory environment where SPECA countries have taken some steps forward as reflected in various international benchmarks, e.g., World Bank Doing Business, index of legal rights etc.

The second stream of policy is '*thinking big*' about strategic modernization projects and actions in critical areas like electricity supply, education and skills or building basic industry extension services. A good example would be Kazakhstan's Bolashak programme that is directed towards the internationalisation of education systems and significant investments in upgrading young generation skills.

The third policy line is '*thinking new'* along the lines of new industrial policy. A core of new industrial policy should be the *exports as a springboard agenda*. It should explore new areas of potential growth and non-traditional exports as entry points to the global economy (World Bank, 2010). This requires creating basic institutional infrastructure and a few potential "islands of growth" that may be enlarged through clustering and international networking.

Although considered as three isolated streams of policy thinking, the above can also be approached as complementary components of a diverse policy mix. A new industrial policy portfolio may involve all three areas to fully exploit complementarities**.** In this way, we can think of industrial policy as building on existing approaches rather than replacing one with the other. For example, structural reform priorities should be in sectors that prioritise modernization or enhance exports. Also, "big push" projects like creating the basic infrastructure for industry services can be linked to areas of strong interest for foreign investors.

Technology upgrading and catch up are too complex to be driven by only one policy approach, and reviews of innovation policies worldwide indicate both the successes and limitations of industrial policies. As Rodrik (2014[14]) points out, it is essential not to exaggerate what can be accomplished by industrial policy. On the other hand, successful catching up cases like China, Vietnam, or in past Korea and Japan show the significant role of industrial policy. The next section describes the new industrial

[14] Rodrik, Dani (2014) Industrial policy and the EU, Presentation at Institute of Advanced Studies

policy approach's intellectual and broader ramifications within this eclectic policy perspective, pointing to elements relevant to SPECA economies.

4.2. Industrial policy: legacies and rationale

Before considering the conceptual approach to industrial policy for technology upgrading in the SPECA sub-region, it is necessary to clarify the new industrial policy landscape and justify the new industrial policy approach.

Industrial policy is a much-politicized term and has been often reduced to the infant industry motivation for protection from foreign trade. Since the 1990s and until recently, the policy consensus both internationally and in middle-income economies were not supportive of conventionally defined industrial policy as infant industry promotion. However, in the last 30-40 years, industrial policy has also changed nature and is now considered a legitimate area for policy attention due to several ongoing structural factors and trends.

Firstly, industrial policy has been widely implemented through FDI, innovation and regional policy, even when it was normatively rejected[15]. Second, the area of application of industrial policy moved from foreign trade and protection to domestic regulatory and support system but in a relatively open trade and FDI context. This structural shift came as an inevitable outcome of spreading of GVC (Baldwin, 2012[16]). Third, as innovation became more critical as a driver of economic growth, the boundary between innovation and industrial policy has blurred to the point that they are no longer distinguishable. Fourth, a revival of industrial policy accelerated after the 2008 Global Financial Crisis (GFC) which shook the firmly held belief of policymakers in developed economies in the "free market" as the sole governance mechanism. Fourth, China's rise and its impact on the deindustrialization of many emerging economies and regions in developed economies has led to a reconsideration of previous policies. Fifth, climate change has shown that *laissez faire*, technology-led trajectories do not guarantee the emergence of technologies to mitigate climate change. Finally, the COVID19 pandemic is the latest push towards industrial policy. It has forced governments to take a much more proactive role in buffering the crisis's harmful effects.

These processes are of different significance and duration. Still, they have all led to significant changes in policy philosophies and various new policy approaches that fall within the broadly defined notion of the "new industrial policy". Hence, it is crucial to clarify why these policies are considered "new" and how they differ from "old" industrial policies.

A notion of "old" industrial policies is associated with the import substitution policies of the 1950s-1970s that were practised in many developing economies (Radosevic,1999[17]; Ramos, 2000[18]; Crespi et

[15] For argument about 'implicit' industrial policies implemented through FDI see Rodrik (2007) One Economics, Many Recipes: Globalization, Institutions, and Economic Growth, Princeton UP

[16] Richard Baldwin (2012) Global Supply Chains: Why They Emerged, Why They Matter, and Where They are Going, Centre for Economic Policy Research Discussion Paper No. 9103, CEPR, London

[17] Radosevic S (1999) International Technology Transfer and 'Catch Up' in Economic Development, Edward Elgar, Cheltenham.

[18] Ramos, J., 2000. Policy directions for the New Economic Model in Latin America. World Dev. 28 (9), 1703–1717

al., 2014[19]) and the notion of "national champion" based industrial policies practised in the majority of developed economies. Former centrally planned socialist economies had extreme import substitution regimes, and implicitly promoted industrial policy on a large scale (Popov, 2020)[20]. However, the globalisation of the 1990s-2010s and the advent of the Washington Consensus led to a radical shift towards a more significant role for markets and the state's limited role (Williamson, 1990[21]). The Washington Consensus framework-based policies have been vigorously practised in many emerging economies, particularly in the so-called economies in transition.

The assessment is that Washington Consensus-based policies in their original form failed to deliver what was promised (World Bank 2005[22]). These policies focused on privatisation, market-oriented incentives, macroeconomic stability, and an outward orientation that should normally be considered positive shifts. However, these were considered objectives in themselves, since it was assumed that the growth would automatically re-emerge once the "right incentives and institutions" were in place. This policy philosophy ignored accumulated production, organisational and innovation capabilities that were considered irrelevant in the open economy context or assumed that they could be speedily rebuilt once the private entrepreneurs were exposed to "right incentives" and once the state got "out of the way". A fact that growth of firm is sector-specific and dependent on various external private and public knowledge sources have been ignored. The only legitimate policies to stimulate growth were those seeking to correct "market failures" and not discriminating between sectors, firms or technologies. Thus "horizontal" policies like improving the general business environment, technology neutral innovation policies, or policies that attract FDI generally were considered acceptable.

The extent to which such policies were followed varied widely among economies in transition, as for example could be seen from the metrics of the EBRD transition indicators during this period. SPECA economies were part of the monitoring of the 'progress in transition' conducted by the EBRD until 2014. This metrics was subsequently changed into a broader framework that includes sectoral reforms. Transition impact is now more broadly defined and includes explicit measurement of 'the institutional preconditions for development, legitimacy and resilience of market supporting institutions'. This significant change is a recognition that the 'development of state institutions complements market development, in contrast to what was sometimes suggested 20 years ago' (Besley et al, 2010). Also, it has been recognised that 'the endpoint of transition is much less clearly defined now than it was then: there are multiple versions of capitalism, and the historical and institutional contexts of individual countries necessarily affect their destinations'. It is crucial to recognize that 'transition is at best an intermediate goal and that it is important to remain focused on the ultimate ends towards which transition is oriented' (Besley et al., 2010)[23]

[19] Crespi, G., Fernandez Arias, G., Stein, E., 2014. Rethinking Productive Development: Sound Policies and Institutions for Economic Transformation. Inter-American Development Bank and Palgrave Macmillan, New York, NY

[20] Popov, Vladimir, 2020. "A myth of soft budget constraints in socialist economies," MPRA Paper 99769, University Library of Munich, Germany

[21] Williamson, J., 1990. What Washington means by policy reform. In: Williamson, J. (Ed.), Latin American Adjustment: How Much has Happened?. Institute for International Economics, Washington DC

[22] World Bank, 2005. Economic Growth in the 1990s: Learning From a Decade of Reform. World Bank, Washington, DC

[23] Timothy Besley, Mathias Dewatripont, Sergei Guriev (2010) Transition and transition impact. Review of the concept and implications for the EBRD. Report for the EBRD's Office of the Chief Economist

The growth and recovery of 'transition economies' cannot be explained only by the variables of the 'progress in transition' framework but reflect a much broader set of resource-based, technological and institutional factors. The bottom line is that 'progress in transition' did not correspond to expected outcomes (World Bank 2005).

For the SPECA countries, policy thinking is also strongly influenced by the Asian experience of policy reform. Their growth shows that catching up depends on efficient markets and effective government operating as complements, not as substitutes. The Asian experience also suggests that openness without a coherent industrial policy driven by effective government is insufficient (Nayar, 2019[24]). Also, the extent to which countries rely on foreign technology through FDI, GVC and licensing and how they rely on domestic technology accumulation differs widely between stages of the development process. The state's roles in these processes also differ widely depending on the nature of the state, which in turn is shaped by politics and historical contingencies and context.

4.3. Roles of the State in Industrial Policy

As discussed above, the state is constitutive to markets, but the issue is in which ways. The taxonomy below aims to capture the dominant rationales for the state's role (table 9). This taxonomy builds on the seminal contribution of Peter Evans (1995[25]), on recent work on the developmental network state by (Block,2008)[26], Block et al. (2020[27]) as well as on (Mazzucato, 2013) and (Radosevic (2017[28]).

Table 9: Three roles of the state in industrial policy and their rationales

Role	Rationale
Regulatory state	Market failure
Developmental state	Capability failure
Developmental network state	Network (system) failure

Source: Author

1. Regulatory state

The regulatory state is a 'custodian' (guardian) type of state (Evans, 1995) or 'fixing market state' (Mazzucato, 2013[29]). This role corresponds to the conventional view of industrial policy about correcting market failures in R&D and innovation through taxation or subsidies. Market failure is the

[24] Nayyar, Deepak (2019) Resurgent Asia: Diversity in Development, Oxford University Press
[25] Evans, Peter (1995) Embedded Autonomy, States and Industrial Transformation. Princeton, NJ: Princeton University Press.
[26] Block, F. (2008), 'Swimming Against the Current: The Rise of a Hidden Developmental State in the United States', Politics & Society, 36 (2), pp. 169–206.
[27] Fred Block & Matthew R. Keller & Marian Negoita (2020) Network Failure and the Evolution of the US Innovation System, *Journal of Industry, Competition and Trade*, 20:235–247 https://doi.org/10.1007/s10842-019-00324-1
[28] Radosevic S (2017) 'Assessing EU Smart Specialization Policy in a Comparative Perspective' (Chapter 1) In Radosevic, Slavo, Adrian Curaj, Radu Gheorghiu, Liviu Andreescu and Imogen Wade (eds) Advances in the Theory and Practice of Smart Specialization, Academic Press, Elsevier Science Publishers.
[29] Mazzucato, M., 2013. The Entrepreneurial State: Debunking the Public Vs. Private Myth in Risk and Innovation. Anthem Press, London

primary justification for government activism and (direct) state intervention, while state regulation is a solution to market failure. The state is characterised as 'minimalist' because it is primarily concerned by 'neutral' regulatory framework and focused on horizontal R&D and innovation policy instruments that do not discriminate among sectors or firms.

2. Developmental state

The rationale for the developmental state is a situation where the domestic private sector cannot enter new industries or connect with foreign firms. A classic case was the establishment of the state steel producer POSCO in Korea in 1972 as domestic capital and foreign capital were unwilling or unable to enter this industry, in which the government considered self-sufficiency and the construction of an integrated steelworks as essential to economic development[30]. Among the SPECA countries, Uzbekistan (Popov and Chowdhury, 2016[31]; Lombardozzi, 2020), and to some degree Kazakhstan (see Box 1), provide examples of this type of state role. The justification for this role of the state is the domestic private sector's capability failure, which makes the state intermediary role ineffective.

A challenge is the potential failure of state-owned enterprises to play a transformative role, and the risks of persistent subsidy and weak or politicised corporate governance.

Box 1. Industrial policy in SPECA economies: the case of Kazakhstan

At independence, Kazakhstan considered three models of industrial policy development: export-oriented, import-substituting, and innovative[32]. In the following two decades (1990 - 2008), policy largely followed the first two models: an export-oriented industrial policy followed by an import substitution programme with specific, targeted elements of state influence.

In 2003, the Strategy for industrial and innovative development for 2003–2015 was adopted[33]. The first version of the Strategy was developed based on best international practices in market economies. Then, in 2008, the Strategy was significantly redesigned to adapt it to the realities of the command economy principles still in place in the country[34]. This approach to the industrialization of the country was recorded in the "State programme of accelerated industrial-innovative development of Kazakhstan for 2010-2014" (SPAIID 2010-2014).

These approaches to industrial policy have been the subject of strong debate by experts. Critics argue that the country has numerous state support programmes to industry administered through "command" or state-directed methods of development of business competitiveness[35].

[30] https://en.wikipedia.org/wiki/POSCO

[31] Vladimir Popov, Anis Chowdhurya (2016) What can Uzbekistan tell us about industrial policy that we did not already know? DESA Working Paper No. 147 ST/ESA/2016/DWP/147 UNITED NATIONS Department of Economic and Social Affairs

[32] Abishev A.A. Innovative guidelines for industrial policy in Kazakhstan. Economy of the region N3/2010 - pp. 43-48

[33] Strategy of industrial and innovative development of the Republic of Kazakhstan for 2003-2015 (Version 2003). http://adilet.zan.kz/rus/archive/docs/U030001096_/17.05.2003

[34] Strategy of industrial and innovative development of the Republic of Kazakhstan for 2003-2015 (Version 2008). http://adilet.zan.kz/rus/archive/docs/U030001096_/02.07.2008

[35] Murat Temirkhanov. Industrial policy of Kazakhstan: what went wrong? Forbes Kazakhstan. 20 December 2020. https:// forbes . kz / process / expertise / promyishlennaya_politika_kazahstana_chto_poshlo_ne_tak/

Subsequent industrialization programmes "State programme of industrial-innovative development of Kazakhstan for 2015-2019" (SPIIR 2015-2019)[36] and the "State programme of industrial-innovative development of Kazakhstan for 2020-2025" (SPIIR 2020-2025) draw on the approach developed in the first programme of industrial development and are its logical continuation.

In November 2020, a draft law "On industrial policy"[37] was presented by the Government and is now under discussion by the Parliament. The table in the Annex 1 provides a brief analysis of this document, which gives an overview of the current situation in the area of industrial development, including the objectives, implementing entities and policy instruments.

Author: : Marat Myrzakhmet, Eurasian National University, Innovation Center

3. Developmental networked state

The developmental networked state (DNS) refers to the recent conceptualisation of the state's role in developed countries, especially in the US (Block, 2008, 2020) and the EU. However, we consider the DNS concept as also very relevant for the emerging and catching up economies. The notion rests on the crucial importance of network or system (not market) failure. The network failure is about difficulties in achieving collective action, which is especially relevant for innovation. Innovation is not the activity of a sole inventor but collaborative activity *par excellence*.

The network failure approach implicitly assumes that firms already have strong incentives to innovate that are stymied by endemic coordination failures among firms and between firms and public organisations. Overcoming these failures situation requires public sector officials to work closely with firms to identify sector or technology-specific challenges which can be addressed only through collective action with the state emerging as a facilitator or broker to overcome barriers to cooperation.

In emerging economies, the DNS idea is the most relevant for attracting and embedding FDI and supply chains into the local economy and supporting local clustering. It has been practised in different forms and degrees of vigour, ranging from the Irish software industry to China's imposition of joint-venture requirements in specific industries or inducing foreign firms to integrate into the local economy as demonstrated by CzechInvest activities.

The taxonomy (Table 9) serves as the analytical framework to understand the emergence of new industrial policy. The developmental networked state is the most compatible with the new industrial policy approach. However, this type of state involvement requires developed state capability and the private sector's capabilities and organisation. Hence, the right form of state action can be determined only on a case-by-case basis rather than based on general principles that disregard the country context. In this respect, new industrial policy does not follow 'best practice' solutions but 'best matches' solutions, those compatible with the state and private sector capabilities and coordination conditions. Thus, three roles of state (figure 9) should be understood as very rough stylizations which rarely can be found in their neat form. Instead, we recognise that:

[36] State program of industrial and innovative development of the Republic of Kazakhstan for 2015 - 2019, approved by the Decree of the President of the Republic of Kazakhstan No.
957 dated 19 .0 3 .201 0 . http://adilet.zan.kz/rus/docs/U1400000874
[37] http://www.parlam.kz/ru/mazhilis/itreceived

First, **the roles of the states are not mutually exclusive.** Different states have different propensities towards one of their roles. Still, states can have different roles in various sectors and combine different roles in the same sectors. The state can be entrepreneurial in all three roles (regulatory, developmental and networked) but in different ways.

Second, **boundaries between state roles may be quite fuzzy**. A state can be entrepreneurial as steersman in a regulatory role or be involved in funding mission-oriented R&D or shape new markets. These roles can all be justified by market failure but also by system failure or capability failures.

Third, **the role of the state evolves.** Once the function has been effectively executed, this leads to a new market and industry situation that requires a new and often qualitatively different state role. For example, the Korean state was very successful in its role of developmental state at the catching up stage but it is experiencing several institutional challenges in promoting technology upgrading using the same model in post-catch-up stage (Choung, 2021).

4.4. Contemporary new industrial policy methodologies

A coherent and clearly defined approach to new industrial policy does not yet exist. Instead, we find various methodological approaches and practices based on explicit or implicit assumptions that differ from the 'old' type of industrial policies and structural reform type policies[38].

In this section, we identify six methodologies that are used or have been used in policy practices of different countries or international organizations.

a) **New structural economics** (NSE) is methodology and theory developed by Justin Jifu Lin, ex-chief economist of the World Bank, which, to a large extent, reflects the Chinese economic experience. This approach's idea is that catching up countries should specialize in industries where countries that are ahead of them in income levels are losing comparative advantages. The "sunset" industries in leading countries will become the latent comparative advantage of the latecomers. Achieving this aim requires a sector-targeted industrial policy which should target sectors that are the country's latent comparative advantages (Yifu Lin, 2015). For that purpose, Lin has developed *The Growth Identification and Facilitation Framework*, based on New Structural Economics, to target industries with latent comparative advantage and support their growth. This approach assumes the state's active and facilitating role, which varies by the type of comparative advantage in question.

There is a sharp contrast in industrial policy between NSE and the approach in transition economics. NSE rationalizes a gradualist approach to trade liberalization and temporary protection to industries that have latent comparative advantages. Contrary to this, transition economics did not see value in maintaining and subsidizing currently inefficient industries. NSE holds that governments need to support industry-specific infrastructures consistent with current or potential (latent) comparative advantages, and that broad horizontal policies alone are insufficient. Transition economics is thus generally sceptical of vertical policies. NSE advises a "dual-track" approach and the "second-best" policy

[38] This section draws partly on chapter in Radosevic et al (2017)

options of which transition economics is generally doubtful. Finally, NSE recognizes the role of pioneer firms in the process of industrial upgrading and firm heterogeneity (Bergloff et al., 2015)[39].

b) Smart specialization is a methodological approach deployed in the EU that sees the role of regional and national governments as active moderators in the process of "entrepreneurial discovery" potential areas of future technological advantages. Smart Specialisation Strategies (S3) is the EU version of the new industrial policy (see Foray et al., 2009)[40].

The S3 aims to reconcile two logics: vertical (not horizontal) prioritization with dynamism, entry and competition, and entrepreneurship. Central to this approach is policy design and a so-called entrepreneurial discovery process (EDP) or finding suitable niches that match regions' latent comparative advantages. Neither sectors nor individual firms are prioritised, but rather new activities (domains). The process aims to generate structural change through the inclusive process of stakeholder involvement in EDP. The focus is on collective "discovery" of new technological opportunities, focusing on priority areas and a portfolio of programmes oriented towards specific technology priority areas (Foray 2015[41], Radosevic et al., 2017).

c) Mission-oriented research and innovation policy is the approach developed originally by Mazzucato. It has been subsequently in full or partial form deployed internationally and, in the EU, in addition to smart specialization. It aims to direct innovation policy towards grand societal challenges (social, ecological, and technological). Missions are both a means of setting the direction of economic growth and a vehicle to achieve the goals. Examples include carbon-neutral cities, plastic-free oceans or decreasing the burden of dementia. While positively received in developed countries, this approach has yet to be fully tested in the case of small catching up economies whose technology upgrading is inevitably linked to the use and import of foreign knowledge and technologies.

d) Binding constraints to growth is an approach deployed in growth diagnostics of some international organizations. It assumes that some constraints to growth should have priority as their resolution has much larger returns than others (Haussmann, Rodrik and Velasco, 2005[42]). A long list of generic constraints that apply to the whole economy is replaced by carefully identified key constraints with significant economic impact. Like other new industrial policy approaches, the "binding constraints" approach departs from the same assumption that ultimate constraints need to be discovered, i.e. they are not known in advance. The need for selectivity arises due to limited technical, operational, and political capabilities of the state. This limitation calls for a selective approach that targets the "binding constraints" or those areas where the most significant growth returns are (Hausmann, Rodrik and Velasco, 2005).

e) Schumpeterian approach is a market-friendly approach, which like other new industrial policy approaches aims to 'discover' areas of specialization. However, specialization choices are not obvious,

[39] Erik Berglof, Justin Yifu Lin and Slavo Radosevic (2015) 'Transition economics meet new structural economics', Journal of Economic Policy Reform, Volume 18, Issue 2

[40] Dominique Foray, Paul A. David, Bronwyn Hall Smart Specialisation – The Concept Knowledge Economists Policy Brief n° 9, June 2009 , http://ec.europa.eu/invest-in-research/pdf/download_en/kfg_policy_brief_no9.pdf

[41] Foray, D (2015) Smart Specialisation: Opportunities and Challenges for Regional Innovation Policy, Routledge

[42] Hausmann, R., Rodrik, D., Velasco, A., 2005. Growth Diagnostics, The John F. Kennedy School of Government, Harvard University. Available from: http://citeseerx.ist.psu.edu/viewdoc/downloa d?doi=10.1.1.446.2212&rep=rep1&type=pdf.

but they are historically contingent on 'windows of opportunity' or periods and areas of rapid technical change where incumbents have not accumulated significant technological advantages. For catching up economies which are approaching the technology frontier, the Korean experience serves as a good model in this regard and its analysis (along with the Taiwanese one) by Keun Lee (2013[43]) could be instructive.

However, countries cannot catch up by directly emulating or replicating the practices of the forerunning economies, as catch-up comes by taking a different path. This approach is opposite to the product space method (see below). It shows that technologies in which Korea and Taiwan specialized were those in which barriers to entry were low so that incumbents could not accumulate knowledge and build barriers to entrants. By specializing in areas where technological change is fast, and knowledge has not yet been accumulated ('short cycles' technologies), latecomer firms could build competitive advantage and become global players. Like the product space method, this approach is much more articulate regarding the issue of where to specialize (what) rather than on how to organize this process (how).

f) Product space method is the methodological approach developed by MIT authors and increasingly used internationally as the basis for the selection of priorities. The method is based on the stylized fact that countries tend to have productive structures similar to that of their more affluent neighbours. Accordingly, neighbouring firms in the existing sectors have knowledge that helps their successful upgrading and diversification to adjacent industries in the product space.

The assumption is that countries can more easily specialize in technological areas related to those in which they already have some comparative advantages. The basis for selecting priority areas is similarities in export products based on the matrices of other countries' export products. Hidalgo and Hausmann (2009[44]) proposed a new measure of export sophistication or complexity. Products are more complex when fewer countries competitively export them, and these countries have dense export baskets, with a great number of products. Felipe et al. (2012[45]) use Hidalgo and Hausmann 's (2009) methodology and computed product and country complexity measures for 124 countries showing that export shares of the most complex products increase with income while exports of the less complex products decrease with income. This method suggests that there are no short cuts in technology upgrading and that path dependency is inevitable. Unlike the Lee approach, which suggests jumping into new and unrelated technology areas, this approach suggests specialization in related product areas. Also, similar products may have quite different underlying capabilities or skills levels reflected in the quality. For example, Dulleck et al. (2005[46]) show that quality upgrading (within the same product groups) is a critical dividing line in successful technology upgrading between Central and East European economies.

[43] Lee, K., 2013. Schumpeterian Analysis of Economic Catch-Up: Knowledge: Path-Creation and the Middle Income Trap. Cambridge University Press, New York.
[44] Hidalgo, C.A., Hausmann, R., 2009. The building blocks of economic complexity. Proc. Natl. Acad. Sci. USA 106 (26), 10570–10575.
[45] Felipe, J., Kumar, U., Abdon, A., Bacate, M., 2012. Product complexity and economic development. Struct. Change Econ. Dyn. 23, 36–68.
[46] Dulleck, U., Foster, N., Stehrer, R., Woerz, J., 2005. Dimensions of quality upgrading. Econ. Transit. 13 (1), 51–76.

These approaches differ with respect to their emphasis on either choice of specialization (what?) versus the process by which prioritization and implementation take place (how?). For example, EU S3 is focused on methodology but also the process (EDP).

The process view of industrial policy is based on the notion of *experimental governance*. Unlike conventional policy governance experimentalist governance *is* deliberately provisional and revise its objectives in the light of outcomes (Sabel and Zeitlin, 2011[47]). Its features are*:* i) policy goals are established in interaction with the affected stakeholders; ii) stakeholders have a significant degree of autonomy in pursuing different programmes or projects (ideally through a portfolio of projects or programmes); iii) the performance of programmes and projects is monitored through the system of "diagnostic monitoring" which discovers unforeseen events in the portfolio of projects and tries to correct them or use them as new opportunities; iv) the goals, metrics, and decision-making procedures are reviewed in the light of new problems and possibilities (Sabel and Zeitlin, 2011[48]).

The experimentalist governance is best implemented by autonomous innovation, FDI or industry promotion agencies. The most known examples of agencies that broadly followed these principles are Fundación Chile, DARPA of USA, Irish Development Agency and Enterprise Ireland (see Kuznetsov, 2021[49]; Breznitz and Ornston, 2013)[50]

Aghion et al. approach to industrial policy argue that in countries behind the technology frontier, growth is driven by technological imitation, and their policy design should be different from that of countries operating at the technology frontier (Aghion et al, 2011)[51]. For example, the importance of openness, property rights, the nature of the financial system, or level of education differs between technology leaders and followers (Aghion et al, 2011b)[52]. The governments need to focus public investments on a small number of growth-enhancing areas and sectors. However, this requires that sectoral governance of specific public sectors or structural reforms to be compatible with growth. Innovation policy measures alone are insufficient, and they usually need to be accompanied by structural reforms. The uniqueness of the Schumpeterian approach is that it considers the issue of technology innovation in the broader institutional context of other economic policies. For example, subsidies for IT adoption alone will not suffice unless there are complementary measures that can facilitate its adoption, such as improving skills and reregulating labor and product markets. Innovation policy measures alone do not suffice unless accompanied by tax reform to encourage entrepreneurship or supply of skilled labor.

[47] Sabel, Charles and Zeitlin, Jonathan (2011), 'Experimentalist Governance', GREEN Working Paper, No.9 www.greenfp7.eu/papers/workingpapers

[48] Sabel, C.F., Zeitlin, J., 2011. Experimentalist governance. In: Levi-Faur, D. (Ed.), The Oxford Handbook of Governance. Oxford University Press, Oxford.

[49]Yevgeny Kuznetsov (2021) Experimentalist Governance for Technology Upgrading: New Industrial Policy Process, In Keun Lee, Jong Dong Lee, Dirk Meissner, Slavo Radosevic and Nick Vonortas (eds) Technology Upgrading and Economic Catch-up, Oxford University Press

[50] Breznitz, D. and Ornston, D. (2013), 'The Revolutionary Power of Peripheral Agencies: Explaining Radical Policy Innovation in Finland and Israel', Comparative Political Studies, 46 (10) 1219-1245.

[51] Aghion, P., Boulanger, J., Cohen, E., 2011. Rethinking Industrial Policy, Breugel Policy Brief, June, Issue 04. Available from: http://bruegel.org/2011/06/rethinking-industrial-policy/.

[52] Aghion, P., Harmgart, H., Weisshaar, N., 2011b. Fostering growth in CEE countries: a country tailored approach to growth policy. In: Radosevic, S., Kaderabkova, A. (Eds.), Challenges for European Innovation Policy: Cohesion and Excellence From a Schumpeterian Perspective. Edward Elgar Publishers, Cheltenham.

Within this perspective, a trade-off between the need for sector-specific technology upgrading and need for sectoral regulatory reforms is a false dilemma. To increase the impact of regulatory reforms, they should be inextricably linked to potential areas and sources of growth. Possible areas of medium-term and long-term growth should be precisely those areas where regulatory reforms should be prioritized.

Elsewhere (see Radosevic, 2017), we systematically compare these approaches for both (what and how) dimensions. However, for this Report, it is of more significant interest to draw commonalities between these different approaches and practices. Hence, in the next section we seek to develop a conceptual framework of new industrial policy as a common philosophy underlying these various policy approaches.

4.5. Stylized features of new industrial policy approaches

We use the term "stylized feature" intentionally as not all features listed below may be present in all cases, methodologies, or practices. However, when taken together, they form a much more coherent set of ideas than explicitly addressing each approach.

In stylized form new industrial policies have the following features:[53]

- *They are pro-active and focused on innovation and technology upgrading in an inter-sectoral context. Industry boundaries are not defined through products, but rather 'sectors' and where 'activities' correspond to 'capabilities'*.

The selectivity of the new industrial policies is based not on industries defined through NACE classification and their products, but on applications of new technologies in any "sector" or in a cross-sectoral settings (e.g. drones in agriculture).

- *They are 'smart' because they recognize that the ultimate limits to growth and the relevant solutions are not known ex-ante; the new industrial policies open freedom to experiment.*

New industrial policies assume that the 'ultimate' constraints to growth are unknown *ex-ante*, and these constraints need to be 'discovered' through the process prompting an understanding of these constraints (Crespi et al., 2014). Unlike the old-style industrial policies, new industrial policies recognize that the government does not possess the necessary information for the right decision. Equally, firms do not have perfect foresight about the opportunities and constraints they face in the long-term. All views are partial, and not one actor possesses a panoramic view of an industry. In that respect, all new industrial policy approaches are smart as they recognise the inability of policy and market actors to have perfect foresight. Cooperative public and private sector efforts to work jointly on technology upgrading of individual sectors and firms are more important than which sectors are chosen as priorities (Wilson and Furtado, 2006[54]; Kuznetsov and Sabel, 2017[55]).

- *They are 'market-friendly' because they show respect for comparative advantages and export transformation.*

[53] Parts of this section draw on Radosevic (2017), *op cit*

[54] Wilson, S., Furtado, J., 2006. Industrial Policy and Development. CEPAL Review, 89.

[55] Yevgeny Kuznetsov and Charles Sabel (2017) Managing Self-Discovery: Diagnostic Monitoring of a Portfolio of Projects and Programs, In Radosevic et al (2017) op cit

New industrial policies are designed to work with the market rather than against the market. Reliance on the market as an allocation mechanism at any stage of development and recognising a facilitating role of the state in industrial upgrading are central to new industrial policy approaches (Yifu Lin, 2012[56]). Central to this is the idea that policy should enhance latent comparative advantages of the economy and using 'soft' policies to embed FDI and GVC as levers and linkages mechanisms for domestic technology upgrading.

- *They are guided by the perceptions of not only market failure, but also system failure.*

In the context of new industrial policy, the distinction between market and system (coordination) failure is quite important. What may seem like market failure may be coordination or system failures due to lack of knowledge of the potential market and technological opportunities which cannot be easily recognized (Aoki et al., 1997). However, the government's role in such cases is not to replace the market but to enhance private sector coordination by establishing missing intermediary organizations or mechanisms of "non-market articulation of markets". From this "market enhancing" view, the government's role is to facilitate the development of private sector institutions that can overcome these failures rather than solve the coordination problem by itself (Aoki et al., 1997[57]).

- *They are centred around the private sector and innovation ecosystem actors; not resolving coordination failure but enhancing collective action.*

The new industrial policy aims to increase the private sector's capabilities to cooperate in new technological areas, as opposed to some of the "old" industrial policy mechanisms as subsidies to individual enterprises, which ultimately will not induce cooperation between firms and enhance interdependencies, thus preventing the formation of the new microsystems of innovation like clusters or value chains. For example, the aim of the EU S3 'entrepreneurial discovery process' is to enhance collective action capacity of firms. The scope for government action will largely depend on the degree to which the private sector has technological capabilities and the extent to which there are intermediaries that can facilitate collective activities searching for new technologies or new markets.

- *They assume either explicitly or implicitly some elements of experimentalist governance.*

New industrial policies require "coordinated decentralization" as initiatives are left to a variety of actors involved in implementation at national and local levels and across different economic activities. The actors` freedom to experiment with different ways to solve technological problems is at the core of the NIPs. Another central idea of NIP is to forge a "more flexible form of strategic collaboration between public and private sectors, designed to elicit information about objectives, distribute responsibilities for solutions, and evaluate outcomes as they appear" (Rodrik 2004, 18). Based on these approaches, the EU S3's entrepreneurial discovery process is construed as a process of collective discovery that can encourage innovation production

[56] Lin, Justin Yifu(2012)New Structural Economics. A Framework for Rethinking Development and Policy. The World Bank, Washington D.C.,

[57] Masahiko Aoki, Masahiro Okuno-Fujiwara, Hyung-Ki Kim (eds) (1997) The Role of Government in East Asian Economic Development: Comparative Institutional Analysis Oxford: Clarendon Press.

When it comes to policy processes, to be effective new industrial policy requires “rich institutional context” and new forms of government. Thus, an institutionally “rich” system of government-business relations and self-organizing mechanisms within business and industry is required to correct both government and market failures. Since the policy outcomes are inherently unknowable ex-ante, it is crucial to get these policy processes right.

In this section, we summarised the context and key features of new industrial policy approaches selecting the issues that seem to be relevant from the SPECA subregion economies' perspective. In continuation, based on this background, we outline the features of the new industrial policy approach appropriate to the SPECA subregion.

5. The new industrial policy approach to the SPECA sub-region

This section outlines three key constraints for designing a new industrial policy for SPECA subregion. It then spells out key principles of new industrial policy for SPECA subregion which explicitly recognises its weak policy (institutional) capacity. Finally, we outline the main strategic options for a new industrial policy.

5.1. Three key constraints for new industrial policy in the SPECA subregion

Three major specificities of the SPECA subregion determine the range of approaches and policy solutions available to countries’ decision-makers. In summary, these specificities are:

- The technological position of local firms as latecomers, which requires a broad approach to innovation through a technology upgrading perspective rather than focused only on R&D based growth.
- Weak integration into global value chains and a need to use GVC and FDI as levers of domestic technology upgrading.
- Weak institutional implementation capacity and the need to develop new approaches to innovation promotion that go beyond top-down approaches.

First, SPECA economies belong to low- and middle-income economies whose firms by and large operate as technology latecomers and laggards. Accordingly, the nature of these economies’ innovation processes is significantly different compared to those in high-income economies. Innovation processes in SPECA countries have in recent years been focused on the adoption and assimilation of foreign technology. R&D is primarily extramural, i.e. conducted in public R&D organisations and firms face quality and management capability constraints and a lack of highly skilled labour. Firms are concerned with productivity improvements and how to improve manufacturing and services capabilities to meet export markets' requirements. While innovation activities in advanced economies are R&D focused, they are much more focused on downstream activities in low- and middle-income economies. R&D plays a role in isolated segments of the industry and is primarily important to improve firms' absorptive capability. This feature of the economies of SPECA countries has important policy implications and calls for a much more significant role of industrial policy than conventional horizontal and R&D- based innovation policy. In other words, it calls for *technology upgrading approach* going beyond the R&D for sustainable development approach.

Second, SPECA economies are, apart from resource-based sectors, poorly integrated into the global economy and global value chains. Hence, accessing supplier chains and enhancing local firms' technology upgrading is the challenge. Almost all SPECA countries have pockets of excellence in R&D

or ICT services. However, it remains to be seen whether these pockets of excellence can represent sources of future growth of employment and value-added. In macroeconomic (employment and value-added) terms, they are still marginal. Hence, there is a need to broaden the internationalisation approach and explore how other sectors can be involved in global value chains. This means using international supply chains as a mechanism of learning and leverage to local firms and going beyond the traditional organisational and policy boundaries between industrial, innovation, trade, and FDI policies.

Third, new industrial policies recognise the limits of top-down approaches and limited foresight of government to support sector or activities in which country has potential comparative advantages. An additional challenge in SPECA sub-region is deficient policy capability or administrative capacity of the governments to pursue expensive top-down policy programs (Dobrinsky, 2020). Instead, the policy should recognise the simultaneous market and government failure and focus on low-cost policy measures.

In conditions of limited institutional implementation capacities and institutional capabilities, the solution is to be found in the "best matches" approach, i.e. policy solutions that correspond to limited administrative capacities. The challenge lays in designing low-cost policy measures and establishing communication with local entrepreneurs, while ensuring both incentives for technology upgrading and performance requirements. This approach requires developed industrial and innovation governance, and thus the governance dimension of industrial policy is as important as its direction. How to develop governance in conditions of limited institutional implementation capacities is the major challenge we address in the section 6 on industrial policy governance.

5.2. Principles of new industrial policy in SPECA sub-region

The objectives of the new industrial policy approach in the SPECA subregion should be defined as twofold: i) in terms of specific technology priority areas and its supporting instruments, and ii) in terms of *capacity for self-organisation in private and public sectors* in achieving the set policy goals. In this approach, we recognise that the state does not have significant resources, or often possesses minimal resources for publicly funded programs in innovation policy. We also recognise that even when funds are available from external sources, the state does not have the administrative capacity to implement, manage, monitor and evaluate these programs effectively. However, the state is still an indispensable actor, though not the sole coordinator of collective action or activities of actors who aim to solve their problems through coordinated action.

This "networking" or "intermediary" role of the government requires knowledge and intimate understanding of different sectors and organising processes aiming at finding solutions to commonly agreed challenges among stakeholders. The new industrial policy is about identifying and facilitating activities of "network organisers" or organisations with the potential to mobilise many actors. One example of this policy would be voluntary quality or performance standards which enterprises agree are desirable future states and are willing to work individually and collectively to achieve them as they will all benefit from it. Another one is the joint co-funding programs on meeting export certificates.

We recognise that the state's role will depend on its capabilities and capabilities for self-organisation or collective action in the private and public sectors. This will determine whether the state will operate only as a regulator, as a substitute for private activities or as a moderator of the process. However,

given low policy capabilities of the SPECA countries, it may be useful to submit any potential policy proposal to several following principles of new industrial policy of relevance to the SPECA sub-region.

These implementation principles are the following:

1. The policy is primarily about *upscaling the existing or emerging bottom-up initiatives* that can potentially increase sustainable growth and contribute to technology upgrading. The majority of SPECA governments cannot currently lead implementation efforts for industrial upgrading (Dobrinsky, 2020). Thus, other non-profit, industry and donor-supported groups could also take responsibility for spearheading these efforts.

2. The policy is created and implemented in *coordination and co-production with affected parties; it is about co-delivery and co-funding*. The policy is about facilitation and moderation of self-organization activities undertaken or proposed by the government and non-state organizations. Hence, the capacity for policy action is not prerogative only of governments but also of 'commons', i.e., public bodies, coordination bodies, etc. Policy in this perspective is about *facilitation and moderation of self-organisation activities*.

3. The policy is a learning process about what works and what does not. Hence, *'think small' or based on pilot projects is its vital characteristic*. Learning in policy requires experimentation, and thus pilot projects are its essential mechanism. Small-scale pilots that focus on improving policy aspects are likely to yield significant benefits. Small pilots can be developed to specific regional and industrial contexts and can be adapted for other contexts, including at the scale of the sub-region. Successful pilots can be reconfigured to scale up, while unsuccessful pilots can be cancelled.

4. Decisions about specific policy instruments are more successful when based on *a careful assessment of institutional capacities for their design, implementation, monitoring and evaluation*. Thus, selectivity is vital; only those actions with a good match between policy intention and policy implementation capacity should be promoted. Based on the principle of the *'best matches'* (not only 'best practices') new industrial policy will promote *only those actions where there is a good match between policy intention and policy implementation capacity*. The government's role in contributing to and facilitating collective action around different innovation issues remains essential. However, its involvement in the implementation of various policies should match its policy implementation capacities.

5. *Transparency and competitive nature of public policy programmes and benefits* are intrinsic to the developed policy capacity. Despite varying degrees of the policy capacity across SPECA economies, on average this capacity does not seem to be at the required level for effective industrial policy implementation (Dobrinsky, 2020) (except possibly Uzbekistan, see Lombardozzi, 2020; and Popov and Chowdhury, 2016). Whatever the level of policy capacity, it is indispensable to rely on the competitive allocation of state enterprise support, including directed credits, and to ensure high transparency and accountability in the allocation of state support, while providing for the system of controls and penalties for rent-seeking and asset stripping. However, the accountability requirements may be an obstacle to the experimentation, essential to new industrial policy. This further urges the use of pilot projects as a key tool, as pilots accept risks and failures with technical risks being clearly differentiated

from strategic risks, and the use of '*diagnostic monitoring' or early warning system* is widespread to protect against the unlikely results.

5.3. Strategic orientation of the new industrial policy for SPECA sub-region: firm focused and linking domestic and foreign sources of technology

Based on the principles of new industrial policy relevant to SPECA economies in this section, we highlight potential six strategic orientations of the new industrial policy which are focused on improving firms' innovation capacity and on the coupling of foreign sources of knowledge and technology with domestic technology upgrading activities.

Main strategic options for technology upgrading focused on the new industrial policy are:

1. Increase R&D, engineering, and innovation capacity in both the private and public sector;
2. Build a strategic policy to embed local supply chains into FDI and international supply chains;
3. Prioritize structural reforms in sectors which are priorities for strategic FDI policy;
4. Establish actions on building basic technology upgrading infrastructure services linked to export agenda;
5. Exploit the potential of the innovation-enhancing public procurement;
6. Carry out inclusive and pro-poor innovation programs.

5.3.1. Increase R&D investments and facilitate engineering and innovation capabilities

R&D investments in SPECA subregion are very low partly due to the structure of their economies which is dominated by natural resource-based industries and by a minimal share of medium and high-tech industry. However, the level of R&D investment is so low that it inhibits any structural change towards technology upgrading, even within the current economic structure. Therefore:

- SPECA economies should aim to increase GERD to 0.5-1%% GDP and set targets for business sector R&D investments. This will enable them to improve absorptive capacity to adopt and assimilate foreign technologies and knowledge and facilitate R&D system to link up internationally. The enlarged R&D sector will also facilitate absorption of foreign knowledge through contracts of Academies of Science institutes and universities with enterprises in a wide range of downstream services like consulting, metrology, testing, and problem-solving. This cooperation is now informal and often based on individual contacts.

- Public support to local R&D should be extended to engineering and innovation management activities in enterprises including support to quality improvement programs like ISO9001 standards, ISO14000 environment standards and industry-specific international standards.

- The public funding of R&D should also be focused on the adaptation of imported technologies to local conditions. This is obvious in areas like agriculture where local universities already analyse the impact of differences in soils, climates, weather, pests, and tastes on food products. However, this is much less obvious in the industry. For industry, R&D should be focused on differences in raw materials, climates, and local preferences. In addition, climate change issues call for much local adaptive R&D like the promotion of certain crops over others, or investments in agricultural

extension services and R&D for crop varieties more suited to the changing climate (OECD, 2009[58]). For services, R&D needs to understand differences in institutional set up, the legal system, cultural norms, and customs. This orientation towards local relevance of R&D should be built into the R&D funding system through criteria of selection, eligibility, and success.

- The gap in linkages between research institutes and universities on the one hand and enterprises, on the other hand, could be bridged with the introduction of innovation vouchers. Vouchers would be given to enterprises and would allow them to purchase different types of innovation service, including innovation audit, training, new business and service development, knowledge transfer projects and many others.

5.3.2. Build a strategic policy to embed local supply chains into FDI and international supply chains

The weakness of emerging and catching up economies are dual innovation systems. The issue lies in the fact that countries dependent on FDI have enclaves of highly productive foreign plants detached from domestic knowledge organisations and with weak links to domestic SMEs. Countries like SPECA that do not have strong FDI have weak national innovation system and are detached from the knowledge and market access via GVC. What is required for catching up are policies supporting foreign and indigenous firms working in parallel to drive development in various sectors. In the initial stages, SPECA countries should aspire to *focus on foreign and indigenous firms to evolve side by side*.

In any case, SPECA countries should develop a strategic approach to Foreign Direct Investment (FDI) and integration into Global Value Chains (GVCs). They should consider opportunities such as the "One Belt One Road" initiative and integration initiatives in the Eurasian Economic Union. A strategic approach requires that FDI and GVC become integral to industrial upgrading strategy. Specifically, it involves identifying suitable inward investment projects and the active servicing of the strategic needs of foreign-invested firms once they are established.

The promotion of free economic zones is a potential mechanism of acquiring access to foreign knowledge. Zones should be able to provide investors with better quality services and the concentration of skilled labour. However, given past similar but failed attempts to attract investors, these activities should be done on a piecemeal basis to accumulate experience, and learn from other countries' experiences.

In the case of potentially significant FDI investments, countries should try to negotiate with investors based on explicit contracts with their subsidiaries to generate skills that can also be useful for other firms. The aim is to establish cost-sharing partnerships with MNC subsidiaries to expand the scale of their training in technical skills beyond their own requirements in order to increase the pool of skills available to the industry as a whole. This may require initially subsidising MNCs, but it could be a highly effective mechanism to generate needed skills for the economy. MNCs would extend the scale of the training programmes beyond what is required to meet their own needs. This would be an excellent way to speed up the emergence of local industry, which is a limiting factor of growth. Also, the gradual involvement of local education institutions could generate further spillover effects on local vocational

[58] OECD (2009) Integrating Climate Change Adaptation into Development Co-operation. Policy Guidance, OECD, Paris

training. This would require a compact between MNC, local firms and relevant government agency(s) to secure early commitment to mobilize linkages.

FDI support should extend to subcontracting with a dedicated program on incentivizing foreign companies to involve local suppliers in their value chains. The need for pro-active but subtle industrial policy approach is about using MNCs as levers for learning and upgrading productive capabilities. In that respect, SPECA countries could learn from CzechInvest how to work with foreign and domestic firms (Deichmann, 2010[59]; Benacek, 2010[60]). Funding should be given on matching funding basis to assist potential suppliers in bringing them to required international levels of efficiency and productivity. The critical challenge is that the linkage program requires a competent FDI non-state agency that works in the public sector and has a public mission based on commercial project-based principles.

5.3.3. Prioritize structural reforms in sectors which are important for strategic FDI and industrial policy

The new industrial policy does not mean that the policy's scope is only on industry policy *per se*. Rather, the aim should be to advance the process of sectoral structural reforms and improve the business environment but linked to industrial policy agenda. In this regard, a trade-off between the need for technology upgrading or industrial policy and regulatory reforms is a false dilemma. Structural reforms generate market supporting rules and organisations, and in that respect are the key, but not the only, precondition for a market-based economy. As argued in several UNECE reviews on innovation performance (e.g. Ukraine, Tajikistan), in order to increase their impact, regulatory or structural reforms should be inextricably linked to the potential areas and sources of growth, which, in their turn, should be prioritised based on the prospects of medium-term and long-term growth. Sectoral regulatory reforms are not sufficient without sector- or technology-specific innovation policy measures.

In addition to removing general obstacles for doing business and promoting competitive market, the reforms should equally remove sector-specific barriers (that are most often significant in their scope), targeting specific areas with growth potential, such as ICT, food processing or machinery industry. This would require addressing failures in training and investment in human capital in these areas and designing technology-, sector- or area-specific investment promotion packages that would not give unfair advantages to foreign investors. However, sectoral regulatory reforms are not sufficient without sector- or industry-specific technology upgrading policy measures. For example, in addition to property and regulatory issues in agriculture, SPECA economies also need to tackle fundamental problems in this area, like poor infrastructure, inaccessible markets, inferior storage methods, lack of processing facilities, and in some countries the relative lack of fertilizer and seeds.

[59] Deichmann Joel (2010) Foreign Direct Investment in the Czech Republic: The Role of Origin Effects and Government Promotion Abroad, Comparative Economic Studies, 2010, 52, (249–272)

[60] Benacek Vladimir (2010) Is the Czech economy a success story? The case of CzechInvest: the strategic promotion agency in Czech industrial restructuring, Division of International Trade and Integration, ECLAC, Santiago,

The degree of sector or technology specificity of support can vary, and there is no blueprint. However, the bottom line is that regulatory reforms and innovation policy measures should be implemented complementary to each other.

5.3.4. Establish actions on building basic technology upgrading infrastructure services linked to export agenda

Today, offering world quality goods and services is the crucial precondition to be plugged into global or regional value chains. Given unfavourable geographic location of several SPECA economies and high transportation costs, offering quality that will be able to sustain these costs differentials is the optimal solution (SPECA subregion situation is akin to Japan's catching up period in the 1960s).

The quality is not only an individual firm issue but a challenge for the industry and the country more broadly. For SPECA subregion, the strategic priority is building infrastructure services as the basis for the national quality programs. Innovation-related Specialized Service Infrastructure (SSI) like basic investment promotion services, technology extension services, standards and metrology, productivity centres, and information and communication services are still largely underdeveloped. *Technology extension services* would aim to create small but profitable improvements by extending established technology to smaller firms. While the designs of technology extension organizations differ, all have relations with small firms and with sources of technology. Technology extension programs either provide resources that enable firms to identify needs and find appropriate technological solutions or to identify and provide solutions through targeted assistance.

In SPECA countries, there is a potentially great untapped demand by SMEs for technical services, testing services and problem-solving skills. R&D institutes and some universities operate as substitutes for the missing knowledge-based services sector. In addition, some SPECA economies do not have large enterprises, so SMEs need infrastructure in the form of a network of technical institutes. In the SPECA subregion, a number of research institutes are already engaged in collaboration with SMEs and should further profile themselves in a direction similar to German Fraunhofer[61] or Steinbiss foundation[62] institutes**.** The policy could also respond to the demand from SMEs for innovation support from research institutes and the knowledge-intensive business services sector through innovation vouchers.

5.3.5. Exploit the potential of the innovation-enhancing public procurement

Demand for research, technology and development (RTD) is relatively underdeveloped in the SPECA subregion. Stimulating private sector demand for RTD is an arduous and long-term task. However, public procurement is a new opportunity to couple local demand in public sector development with local technological capabilities (Stojcic et al., 2019)[63]. Innovation-enhancing procurement is quite demanding instrument with high risks of failure. For example, who bears the risk if the gap between needs and capabilities is too great, how to resolve situation when tenderers cannot meet ex ante all the technical aspects of the technology to be purchased due to its novelty and when the product has

[61] https://www.fraunhofer.de/en.html
[62] https://www.steinbeis-iec.de/en/steinbeis/
[63] Nebojša Stojcic , Stjepan Srhoj , Alex Coad (2020) Innovation procurement as capability-building: Evaluating innovation policies in eight Central and Eastern European countries, *European Economic Review* 121 (2020) 103330

to accomplish essential new operational needs (Edler et al, 2005[64]). Very often procurers are not sufficiently aware of technical changes and may have had unreasonable expectations, etc. Still, some SPECA economies (e.g. Kazakhstan) should consider innovation-enhancing procurement for small technology-based firms similar to the ones the US SBIR program focused on. This would stimulate technological innovation while providing government agencies with new, cost-effective, technical and scientific solutions to meet their needs. Procurement programmes designed to facilitate the demand for innovation should:

- Specify the goals to be met without pre-judging the technological ways through which these goals could be achieve;
- Be open to both established companies and the new ones;
- Include a grant element and other forms of support for innovative companies to overcome potential problems with raising financing to develop technologies;
- Involve single company contracts with no requirement for collaboration;
- Allow companies to retain the rights to intellectual property developed through the use of public funds, with no royalties owed to the government, which will retain free use for a specified period; and
- Be run through open competition under rules that are suited to the risky nature of innovation projects.

For the time being, policymakers are unaware of the potential of this instrument. A first application could be in the ICT sector, given the demand for improved ICT services linked to e-government reforms. Elements of this could be developed as local content requirements in public procurement contracts with foreign operators.

5.3.6. Carry out inclusive and pro-poor innovation programs

Often, innovation is considered solely as an economic catchup tool. However, given the UN Sustainable Development Growth agenda, innovation is also a mechanism to assist the alleviation of poverty and facilitate social inclusion and indirectly lead to economic catch-up. It has been increasingly recognised that innovation is not just a driver for economic growth but also a poverty reduction tool (Fu, 2020[65]). From this perspective, there is a need to facilitate a range of technology generation and diffusion activities that explicitly address the needs of poor population to reduce social inequalities and enhance demand for local technological knowledge. Pro-poor innovation programs are specific because they need to be affordable, adaptable, and accessible (Bhatti et al., 2018: 66). The major areas for pro-poor innovation are agriculture, renewable energy and financing pro-poor innovations (UNCTAD, 2011)[67] . There is also scope for so called frugal innovation in services (Mason et al, 2016)[68]and manufacturing[69].

[64] Edler, J et al (2005) Innovation and public procurement. Review of issues at stake, Study for the European Commission (No ENTR/03/24) Fraunhofer Institute for Systems and Innovation Research
[65] Fu, X. (2020). Innovation under the Radar: The Nature and Sources of Innovation in Africa. Cambridge: Cambridge University Press.
[66] Bhatti, Y., Ramaswami Basu, R., Barron, D., & Ventresca, M. (2018). Frugal Innovation: Models, Means, Methods. Cambridge: Cambridge University Press
[67] UNCTAD (2011) Pro-poor technology, innovation and entrepreneurship policies, Note by the UNCTAD secretariat, Geneva, https://unctad.org/system/files/official-document/ciimem1d12_en.pdf
[68] Nathaniel Mason, Julian Doczi, Clare Cummings (2016) Innovating for pro-poor services. Why politics matter, ODI Insights, March https://www.odi.org/sites/odi.org.uk/files/resource-documents/10349.pdf
[69] http://www.unesco.org/new/en/media-services/single-view/news/india_pioneering_pro_poor_innovation/

This type of innovations would require a stronger focus on universities and public research centres cooperating with local firms to address the needs of the poor. An example of such area would be energy. Solar panels hold important potential in terms of enhancing energy efficiency and contributing to a more stable and affordable electricity supply in the SPECA subregion. However, they are still costly for the SPECA population and have not yet become economically attractive solutions for businesses and households. The small hydropower stations for isolated communities could be another area of interest directly contributing to increase in the welfare of the poor population segments. Despite a few successful examples of integrated approach to hydropower and physical connection of water supply to social facilities, more impact could be generated by further introduction of innovations. Yet another potential area is the development of and ensuring the accessibility to "m-government services" by the poor populations of the SPECA subregion. In general, the area of pro-poor innovation programs holds a lot in terms of regional cooperation with prospects of generating the critical mass of demand and interest from the international donor organisations.

5.4. Priority areas and new industrial policy for SPECA subregion

In the section above, we have proposed several policy domains of relevance for the realisation of new industrial policy for SPECA subregion. However, the new industrial policy is about selectivity and spillovers (externalities). Priority sectors should be those with competitive advantages and should have strong potential linkages with the rest of the economy and be likely to generate positive macroeconomic impact on the society and the economy as a whole.

From the perspective of the new industrial policy, selectivity can concern specific sectors, technologies or 'tasks' (stages in the value chain) or some combination of all three (Warwick, 2013). However, the main weakness of this type of "area" prioritisation is that it is often used only as an additional criterion in the portfolio of policy instruments that form industrial strategy or policy. A good example of using successfully the "area" prioritisation from the new industrial policy standpoint is the implementation of the EU regional smart specialization strategies (Magro and Wilson, 2019).

Instead, the priority area (PA) should be used as the basis for a set of interventions constituting a policy mix. The policy mix is usually considered at the macro level but not as a portfolio of instruments geared to each PA. This would require a policy-mix design for each priority area that combines tailored instruments addressing PA specific features with neutral instruments for the whole economy with (Magro and Wilson, 2019[70]). These policy mixes would be different for each PA and would reflect a very different market, competitive and technological position of different PA. In this way, we may expect much more effective conversion of policy objectives into implementation outcomes. However, implementation of PA specific policy mixes require higher administrative capacities and developed innovation and industrial policy governance. Yet, avoiding establishing closer links between policy objectives and their implementation through directional (PA oriented) policy mixes will lead to weak or not transformative impacts.

[70] Edurne Magro and James R. Wilson (2019) Policy-mix evaluation: Governance challenges from new place-based innovation policies, Research Policy 48 (2019) 103612

From this perspective, priorities are only part of the industrial policy story and often not the most important. Academic and policy literature gives disproportionate attention to methodologies for identifying priorities (see section 4) than to the implementation and the institutional context of their implementation. In addition, industrial policy priorities can only be "identified and developed based on careful technical analysis through a broad participatory approach, involving all stakeholders: governments, businesses, academia and research institutions in the concerned countries" (Jenish, 2018)[71].

Priority areas for economic diversification of the SPECA countries (based on new industrial policy)

From the industrial policy standpoint, there are four broad areas within which individual SPECA economies should seek specific areas of their diversification[72]:

- *Resource-based industries* oil, gas, gold and other metallic and non-metallic, and *agriculture* as areas of technology upgrading and diversification;
- *Labour-intensive industries* and development of supply chain programs as a bridge to export and GVC;
- *ICT intensive services* including clustering and collective promotion due to low barriers to entry and the essential role of ICT services in domestic technology upgrading;
- Enlarging pockets of excellence in *engineering intensive* and other activities.

These four areas reflect the inherited structure of SPECA economies and areas with distinctly different techno-economic requirements and conditions for technology upgrading. These four areas also represent opportunities for intra-sectoral (value-added driven), inter-sectoral (related diversification) upgrading, and broad (unrelated) diversification.

Hydrocarbon and hard mineral resources are the drivers of growth of several SPECA economies and source of their volatile growth dynamics. However, being rich in mineral resources entails "resource curse"-type political economy with high rent-seeking opportunities and lacking incentives for diversification, including high-income inequalities, corruption and weak market competition (OECD,2018)[73].

Diversification towards manufacturing should be one of the priorities. No country has achieved high-income status without its manufacturing sectors, reaching at least an 18% share of total employment and output over a sustained period (ASB 2013[74]). However, we may not expect that manufacturing can absorb all labour from agriculture and moving into low productivity services may not represent the basis for sustainable growth. In this regard, ICT services could be an important source of knowledge

[71] Nazgul Jenish (2018) ICT-Driven Technological and Industrial Upgrading in Afghanistan, Kyrgyzstan and Tajikistan: Current Realities and Opportunities, Working Paper #47, University of Central Asia, Institute of Public School and Administration, Bishkek

[72] On the issue of industrial policy priorities in the SPECA region see Nazgul Jenish (2018) and Xin Jamie Wang, Pedro Chaves Venzon, Jelena Duza, Yasmin Baldi (2020) Harnessing "New" Industrial Policy in Central Asia: Towards the Achievement of the Sustainable Development Goals. A Capstone Project in collaboration with United Nations Economic Commission for Europe (UNECE)

[73] OECD (2018), "A regional agenda for economic diversification in Central Asia", in Enhancing Competitiveness in Central Asia, OECD Publishing, Paris, https://doi.org/10.1787/9789264288133-4-en.

[74] Asian Development Bank (2013). Asia's Economic Transformation: Where to, How, and How Fast? Key Indicators for Asia and the Pacific 2013: Special Chapter. Manilla

spillovers and higher-value added activities, however, with the shortcoming of being a modest employer.

From this follows that priorities should be sought not only in new sectors or in sectoral diversification but also in **intra-sectoral technology upgrading**. In that respect, all routes should be open to exploration and experimentation. This may include encouraging the downstream diversification in resource-based industries (Morris et al., 2012)[75] and leapfrogging when product categories are considered the unit of analysis (Bam and De Bryne, 2019)[76]. In other words, the **SPECA region should seek specialisation and diversification niches in the existing and new value chains or industries with or without current comparative advantages**.

The ultimate success of industrial policy for a specific area will be not due to the choice of the right area but due to the complex interaction between area`s potential, stakeholders' actions, portfolio of supporting instruments and implementation capacity of government and non-government actors. As we pointed above, any prioritisation must be accompanied by a policy mix in support of priority area. The range of potential policy instruments, even in the context of WTO rules is quite broad. Jenish (2018) provides a long list of possible instruments and policy actions for three SPECA economies (Tajikistan, Kyrgyzstan and Afghanistan). These range from mandatory technology transfer requirements incorporated into the FDI regulations, preferential treatment of FDI going into priority industries, local content requirements related to priority areas, joint ventures of state-owned enterprises with foreign investors, funding of strategic industrial projects by proceeds from extractive industries in a sovereign fund, etc. These should be complemented by horizontal policies related to R&D, education, transport, energy and ICT infrastructure.

6. Industrial and innovation governance: the key challenge for new industrial policy implementation

The industrial policy, unlike macroeconomic policy, requires developed institutional capabilities that go beyond government capacities and require the ability to engage with the private sector, coordinate across several public agencies and ensure continuity of policy whose effects are usually felt beyond the electoral cycle. Some of these capabilities are the outcome of different historically rooted roles of the state and business in national economies and cannot be simply built by a small team of "modernisers" or reformers.

- **Policy coordination capabilities**

Institutional capacities for innovation policy are not confined to the administrative capabilities of governments. The state cannot be useful in industrial policy as an autonomous entity without being enmeshed in rich knowledge networks with the private sector through which it can enter a dialogue about growth challenges (Evans, 1995). Hence, policy coordination capabilities are as crucial as in-house government capacities. **Capacity to coordinate** actions across public sector agencies and **effectively engage in collaboration** with private sector actors is **essential to successful industrial policy**.

The bottom line is that the political economy of state – business relationship plays a decisive role in innovation and industrial policy outcomes. Implementation failures are not only technical and

[75] Morris, M., Kaplinsky, R., & Kaplan, D. (2012). "One thing leads to another"—Commodities, linkages and industrial development. Resources Policy, 37, 408–416.
[76] Wouter Bam & Karolien De Bruyne (2019) Improving Industrial Policy Intervention: The Case of Steel in South Africa, The Journal of Development Studies, 55:11, 2460-2475, DOI: 10.1080/00220388.2018.1528354

operational but also political. So, the critical challenge of implementation is how to align the incentives of the stakeholders who have the power to decide with the incentives of society?[77] In essence, this means that thinking about industrial policy in a new way requires understanding the 'politics of policy'.

- Building coalitions for technology upgrading

In natural resources-based economies as are SPECA, this issue is particularly relevant due to great rent-seeking opportunities and unproductive use of rents. The underlying political economy dimension of industrial policy in SPECA subregion is about **building coalitions for technology upgrading**. The issue is an extreme version of the middle-income trap politics where the challenge is about investing in upgrading-related investments that require extensive information, negotiation, monitoring, and short-term costs, but whose benefits would emerge only in the medium or long term (Doner and Schneider, 2016[78]).

Here we can say very little about 'politics of industrial policy' in SPECA subregion as in our analysis we consider it as 'external' factor. However, the politics of industrial policy may alter with changes in the external environment such as, for example, the unfavourable commodity prices which are forcing major stakeholders to seek alternative sources of sustainable growth. In such a condition, the critical policy constraint is the policy capacity or broader institutional capacity of government and non-government actors to promote diversification and experiment to find ways out of protracted crises. The key is that government capacity cannot be built without attempting such policies, i.e. through learning by doing. So, assuming there is a low institutional capacity environment, we outline several key challenges for designing and implementing new industrial policy.

- Institutional capacities for implementation of industrial policy

Assessment of institutional capacities for implementation of industrial policy is indispensable to check whether proposed policy measures can be carried out as intended. The capacities for implementing industrial policy can be grouped into strategy-setting capabilities; policy coordination capabilities, implementation capacities – operational, technical, political; and monitoring & evaluation capacities (see Radosevic, 2020[79]).

The core of institutional capacities for industrial policy is *implementation capacities – operational, technical, political (TOP).*

- Technical capabilities comprise all the knowledge and expertise required to implement industrial policy instruments. Examples of technical capacity are selecting the best business plans, the design of R&D tax incentives, or managing cluster development.
- Operational capabilities include managerial skills, that is, the ability to run an organization with high professional standards, efficiency and results.

[77] 'It is not sufficient to just propose good economic policies; one must propose a way in which they will be endogenously chosen by those with the political power to do so' (Robinson, 2009).

[78] R. F. Doner and B. R. Schneider (2016) The Middle-Income Trap. More Politics than Economics, World Politics 68, no. 4 (October 2016), 608–44

[79] Radosevic Slavo (2020) Benchmarking innovation policy in catching up and emerging economies: methodology for innovation policy index, UCL Centre for Comparative Studies of Emerging Economies Working Papers 2020/1, https://discovery.ucl.ac.uk/id/eprint/10098709

- Political capabilities include securing political support to accomplish the mission and safeguard against political capture (Crespi et al., 2014). The key to political ability is to ensure the continuation of the support of the relevant authorities.

In transition economies, required technical capabilities to implement individual policy measures are much less available than in developed countries. When technical abilities are lacking, agencies or ministries must collaborate with the external public and private organisations that can provide such services.

- Monitoring and evaluation

The quality of industrial policy is significantly determined by how well monitoring and subsequent retrospective evaluation *are organized*. This is the only way to embed experiential learning into the policy (Pritchett, Samji, and Hammer, 2012[80]). In this respect, monitoring and evaluation are essential aspects of industrial policy's institutional setup and implementation capacity. In emerging economies, Monitoring and Evaluation (M&E) is not developed and even when M&E units exist, they are often understaffed, lacking technical capabilities, and having low stature in industrial policy machinery. Very often, M&E is adequately done only when funded as part of international organisations programs.

Ultimately, it is critical to assess whether in deciding on specific policy measures, governments have assessed their institutional implementation capacities and primarily whether they have assessed their TOP capacities. The absence or presence of coordination capabilities within public or private sectors will determine the appropriateness of specific policy types. Horizontal policies will be more appropriate as compared to vertical when public-private coordination is weak. Also, single agency-based approaches will be preferred when intra-public sector coordination is undeveloped.

The government capacity does not include only administrative capacity to design and implement policy but also *coordinate actions across public sector agencies and effectively engage in collaboration with private sector actors*. In states with weak institutional capabilities, policy overreach is a real possibility, therefore the challenge is : i) how to design low-cost policy measures, ii) how to establish communication with local entrepreneurs, and iii) how to ensure both incentives for technology upgrading and performance requirements.

- Resolving experimentation vs accountability trade-off

The final challenge is how to *reconcile the experimental nature of innovation policy with requirements for accountability of public policy* (Kanellou et al,2019)[81]. Experimentation in new industrial policy is about creating various policy solutions that may fit the local context. This approach stands in stark contrast to the idea of the universally relevant policy packages which cite insufficient implementation capacity as the main challenge for the success, disregarding local relevance. There are several distinct

[80] Pritchett, Lant, Salimah Samji, Jeffrey Hammer (2012) It's All About MeE Using Structured Experiential Learning ('e') to Crawl the Design Space, CID Working Paper No. 249, December 2012 Center for International Development at Harvard University

[81] Despina Kanellou, Slavo Radosevic and George Tsekouras (2019) The trade-off between accountability and experimentation in innovation and industrial policy: learning networks as a solution? GROWINPRO Working paper 24/2019
http://www.growinpro.eu/the-trade-off-between-accountability-and-experimentation-in-innovation-and-industrial-policy-learning-networks-as-a-solution/

approaches to experimentation in innovation policy, each with their advantages but also noticeable defects. The underlying issue, however, is a disconnect between the rhetoric which calls for a more experimental public sector (implying acceptance of failures associated with the high risk of innovation activity), and the reality of a public sector compliance culture that is intolerant of mistakes and failure (Morgan, 2016[82]).

In this context, the ultimate solution is to rely on *pockets of excellence* in public administration and entrust them with designing and implementing industrial policy programs (Hickey, 2019)[83]. However, such an approach is difficult to fit into the conventional accountability rules of public policy. Its short-term aim is humble: to accelerate what already exists, starting from pockets of excellence in private and public sectors. The long-term objective is more ambitious with the aim to create a critical mass of capabilities and interactions that can be enlarged to produce a desired macroeconomic effect. However, 'betting' on individual pockets of excellence means also readiness to incur some dramatic losses which may undermine the overall idea, challenging conventional public policy accountability.

This all suggests that there are no easy solutions to effective industrial policy and new industrial policy is not an exception. Still, 'success stories' in industrial policies abound and SPECA economies will willy-nilly have to embark on this learning process. Finally, some success stories in SPECA subregion and failures suggest that countries are already engaged in industrial policy (Lombardozzi, 2020[84])[85]. The issue is whether they can improve and build on past experiences.

7. Conclusions

The report introduces the approach of new industrial policies in the context of the SPECA subregion. The underlying rationale is that catching up of an economy depends on efficient markets and effective industrial policy that can address endemic market and system failures and promote desirable structural change and technology upgrading.

1. SPECA economies` drivers of growth are excessively tied to natural resource-based industries, including agriculture. They are economies with a very low share of manufacturing in GDP and exports. Within manufacturing SPECA economies are characterized by a meagre percentage of medium and high-tech industries and the high share of low-tech industries which are low R&D intensive. They are outside of GVCs (except in natural resource-based sectors) and have weak innovation systems. Their past dynamic growth driven by the export of commodities and mineral resources is fragile. These features of SPECA economies are reflected in the state of their innovation and industrial policies. These policies (with some exceptions) do not (yet) seem to be the driver of the structural change and technology upgrading.

[82] Morgan K (2016) Speaking truth to power: The political dynamics of public sector innovation. In: Kyriakou D, et al. (eds) Governing Smart Specialisation. London: Routledge.
[83] Hickey, S. (2019) The politics of state capacity and development in Africa: Reframing and researching 'pockets of effectiveness'. ESID Working Paper No. 117. Manchester, UK: The University of Manchester. Available at www.effective-states.org
[84] A success story of industrial policy is Uzbekistan's horticulture value chain, where the state, by creating vertical and horizontal linkages shaped the pace and direction of agro-industrial upgrading. See Lombardozzi (2020)
[85] Lorena Lombardozzi (2020): Unpacking state-led upgrading: empirical evidence from Uzbek horticulture value chain governance, Review of International Political Economy, DOI: 10.1080/09692290.2020.1737563

2. Within that context, **new industrial policy is an emerging set of policy thinking and practices** that have some common features and are **distinctively different compared to infant industry-type industrial policies.** New industrial policies are:
    - pro-active and focused on innovation and technology upgrading in an inter-sectoral context;
    - recognize that the ultimate limits to growth and the relevant solutions are not known *ex-ante*;
    - market-friendly because they show respect for comparative advantages and export transformation;
    - guided by the perceptions of not only market failure, but also system failure;
    - centred around the private sector and innovation ecosystem actors to enhance their collective action;
    - assume either explicitly or implicitly some elements of experimentalist governance.
3. **A conversion of new industrial policy features into SPECA context** generates several implementation principles which should be considered when designing and implementing industrial policy measures:
    - In the SPECA context, the policy is primarily about ***upscaling the existing or emerging bottom-up initiatives*** that can potentially increase sustainable growth and technology upgrading.
    - The policy should be created and implemented ***in coordination and co-production with affected parties***. Policy in this perspective is about facilitation and moderation of self-organisation activities.
    - Learning in policy requires experimentation, and thus ***pilot projects are its essential mechanism***. Successful pilots can be reconfigured to scale up, while unsuccessful pilots can be cancelled.
    - The ***government's role in contributing to and facilitating collective action on innovation*** remains essential. However, its involvement in the implementation of various policies should match its policy implementation capacities.
    - ***The policy capacity across SPECA economies*** varies but on average does not seem to be at the required level for effective industrial policy implementation. This further urges the use of pilot projects where risks and failures are accepted and where technical risks are clearly differentiated from strategic risks and use of "diagnostic monitoring" or early warning system when results do not seem likely.
4. We identify the following **main strategic options for technology upgrading** in the SPECA subregion focused on new industrial policy:
    - Increase R&D, engineering, and innovation capacity in both the private and public sector;
    - Build a strategic policy to embed local supply chains into FDI and international supply chains;
    - Prioritize structural reforms in sectors which are priorities for strategic FDI policy;
    - Establish actions on building basic technology upgrading infrastructure services linked to export agenda;
    - Exploit the potential of the innovation-enhancing public procurement;
    - Carry out inclusive and pro-poor innovation programs.

5. Prioritization of specific sectors, technologies or tasks is essential to industrial policy. Priorities should be sought not only in new sectors or in sectoral diversification but equally in intra-sectoral technology upgrading. However, priorities should be used as additional criteria in selecting individual programmes and projects and as the basis for area-specific policy mixes, i.e. set of interventions.
6. A new industrial policy should be used in conjunction with sector-specific structural reforms and individual infrastructure or modernization projects. Their coordinated implementation will ensure more potent transformative effects. The new industrial policy requires the state to operate effectively as regulatory, developmental and developmental network state. In each of these roles, states aim to resolve different types of failure (market, coordination, system) or enhance collective action by bridging gaps, facilitating self-organisation, and networking with foreign strategic investors.

   However, multiple roles and demanding policy capacities for new industrial policy may surpass state capacities. Hence, it is critical to assess whether in deciding on specific policy measures, governments have assessed their institutional capacities for the implementation and whether they have assessed their technical – operational and political capacities. The absence or presence of coordination capabilities within public or private sectors will determine the appropriateness of specific policy types. Horizontal policies will be more appropriate as compared to vertical when public-private coordination is weak. Also, single agency-based approaches will be preferred when intra-public sector coordination is undeveloped.
7. In states with weak institutional capabilities, policy overreach is a real possibility. So, the challenge is how to design low-cost policy measures and establish communication with local entrepreneurs and ensure both incentives for technology upgrading and performance requirements.
8. Final challenge is how to reconcile the experimental nature of innovation policy with requirements for accountability of public policy. The ultimate solution is to rely on pockets of excellence in public administration and entrust them with designing and implementing industrial policy programs. A short-term aim is humble: to accelerate what already exists, starting from pockets of excellence in private and public sectors.

The major limitation of our inquiry are two. First, we do not address the macro dimensions of industrial policy, in particular, the role of exchange rate policy and the overall macroeconomic framework, including the taxation system, as industrial policy factors. Second, as we pointed out, the ultimate constraint to industrial policy are policy capacities and the compatibility of dominant political interests with the agenda of industrial policy. This issue is beyond the scope of this paper.

Finally, the analysis and approach developed in this Report are part of a broader development of new industrial policy approaches (NIP). The overview of NIP in the global economy context is presented in the UNCTAD 2018 *World Investment Report*. Box 2 briefly compare the approach developed in this report with the main features of the NIP as explored and set in the UNCTAD 2018 Report. This comparative perspective shows a high consistency and complementarities between the general approach developed in the UNCTAD 2018 and our application of the NIP thinking in the SPECA sub-region context.

Box 2: SPECA sub-region in the context of the global mainstreaming of new industrial policy (NIP)

The UNCTAD '*World Investment Report 2018: Investment and new industrial policies'* documents the extent to which new industrial policy has become the mainstream activity in all countries, developed and emerging economies. In this box, we point to similarities between our approach and the UNCTAD 2018 approach and specificities of SPECA economies that call for further adjusting it to this sub-region.

First, UNCTAD 2018 and our approach both integrate FDI and GVC policies into new industrial policy. The ambition of NIP is to use FDI and GVC as levers of local technology upgrading, and this should also be one of the strategic orientations of the SPECA economies.

Second, as explored in the UNCTAD 2018, NIP consists of combined individual policy measures ranging from subsidies to sector regulations. Accordingly, our approach follows similar logic and points to integration between structural reforms and strategic FDI and industrial policy in priority sectors. Both approaches agree that the notion of 'sector' can vary from niches and even individual firms to broader industrial categories, including horizontal competitiveness-enhancing policies to develop skills.

Third, UNCTAD 2018 points to the essential role of institutional capacities for designing and implementing NIP. In the SPECA sub-region, we point to this issue as the critical challenge, which relates not only to government capacities and the ability to engage with the private sector but also to coordinate across several public agencies and build coalitions for technology upgrading.

Fourth, SPECA economies belong to 'build-up' and 'catch-up' industrial policy models as defined by UNCTAD 2018. 'Build-up' strategies focus on the improvement of physical infrastructure, roads, ports, airports, power and telecommunication infrastructure as an integral part of industrial policy as well as on the build-up of specific industrial sectors. 'Catch-up' strategies focus on skills development, SME support and promotion of linkages, export promotion, and strategic public procurement as a tool to promote domestic enterprise development. Our analysis of innovation capacities and technology upgrading challenges of SPECA economies shows that their industrial policies' focus should be firmly within 'build-up' and 'catch-up' policy models. Their structural differences in reliance on natural resource-based industries in skills and infrastructure require developing the country-specific approaches but within these two broad policy models.

Fifth, the UNCTAD 2018 highlights several NIP principles that bode very well with our proposed principles for the SPECA sub-region. Two sets of principles highlighted below should be considered complementary. Given the global nature of the UNCTAD 2018 report, its principles are more generic, while for SPECA sub-region they are more specific and thus probably more operational.

Finally, this report's NIP policy approach represents a significant departure from the industrial policies of the 1980s-1990s which were focused on stabilisation, liberalisation, and entirely market-led modernisation. UNCTAD 2018 would qualify the approach presented in this report as one of the 'modern industrial policy' focused on specialisation and increased productivity through coupling between domestic and foreign knowledge. As the impact of the New Industrial Revolution start to take place in the SPECA sub-region, this will require updating of NIP to embrace much more development of modern industrial ecosystems compatible with sustainable development goals.

Table 10: Complementary principles of new industrial policy in UNCTAD 2018 report and the proposal for the SPECA sub-region

UNCTAD 2018	SPECA sub-region
Relative openness to maximise the benefits of attracting external know-how and technology	Upscaling of the existing or emerging bottom-up initiatives
Sustainable development as an imperative for all industrial policy packages	Coordination and co-production of policies with affected parties
Build-up and catch-up industrial policies can no longer ignore the consequences of the New Industrial Revolution	The policy is a learning process: extensive use of pilot projects
Inclusiveness is a criterion to strike a balance between the objectives of upgrading productivity and creating jobs	Assessment of institutional policy capacities is essential for workable and effective NIP
The coherence of industrial policy interventions across several policy areas	Transparency and competitive nature of public policy programmes
Principle of flexibility: a broad strategic direction, with ample room for initiatives at multiple levels	
Effective NIP is about choosing the right policy mix	

Annex 1. State regulation in the field of industrial policy in Kazakhstan

Objectives	Tools	Implementing entity	Article
Development and implementation of industrial policy	Interdepartmental Commission; Unified investment card of goods; Industry information system	Government	Article 7
Planning, monitoring, stimulating and developing industry	State incentives for industry (Article 33); Unified investment card of goods; Unified Industrialization Map; Evaluation of the effectiveness of measures on state promotion of industrial and innovative activities	Authorized body in the field of state incentives for industry	Article 8
Development and promotion of non-resource exports	Rules for partial reimbursement of costs of promoting domestic processed goods and services in foreign markets; List of such goods and services; Rules for subsidizing interest rates on loans and leasing transactions; Export promotion measures	Authorized body in the field of regulation of foreign trade activities	Article 9
Stimulating entities in the field of industrial and innovative activity	Investments in authorized capital; Financial and economic recovery measures	National Development Institute for stimulation of entities in the field of industrial and innovative activities	Article 11
Industry development	Information, analytical and consulting services; Development and updating of a unified investment product map;	National Development Institute for Industrial Development	Article 11

	Measures of state incentives to increase labor productivity; Development of territorial clusters		
Development of in-country value	Information, analytical and consulting services; Database of goods, projects and services and their suppliers; Subcontracting	National Development Institute in the field of development of in-country value	Article 11
Attracting investment	Analytical research; Investor support; Monitoring of projects.	National company in the field of attracting investments	Article 11
Non-commodity export support	Analysis of foreign markets; Information and consulting services; Foreign missions; Financing, export guarantees; Subsidized interest rate	National Institute for Development in the field of development and promotion of non-resource exports	Article 11
Optimization of the control system	Implementation of state programs; Methodical and consulting assistance	National managing holding	Article 11
Attracting investment to the regions	Analytical research; Information support for investors; Monitoring	Regional organizations in the field of attracting investments	Article 11
Recommendations and suggestions: priorities and key indicators; conceptual approaches to implementation; government incentives;	Information request; Creation of expert groups; Hearing of officials; Resolutions on disagreements between government agencies;	Interdepartmental Commission on Industrial Policy	Article 12

industrial infrastructure and climate.	Recommendations for the position of the Government.		
Financial support and incentives, implementation of projects for technological modernization, assistance in attracting investments	Project financing; Lending; Leasing; Engaging experts and consultants for project examination	Industrial Development Fund	Article 13
Collecting information on the state of industries, forecasting their development and state incentives	Automation of collection and processing of information; Analysis and monitoring	Industry Information System Operator	Article 14