CAPACITĂŢILE INOVAŢIONALE ALE REPUBLICII MOLDOVA: POATE CHESTIONARUL INOVAŢIONAL COMUNITAR SĂ CONTRIBUIE LA SUCCESUL UNEI ŢĂRI ÎN CURS DE DEZVOLTARE?

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Republica Moldova este una dintre puţinele ţări rămase în Europa, care nu a aprobat încă chestionarul inovaţional comunitar. Poate acest studiu ajuta Moldova să identifice neajunsurile şi avantajele sistemului său naţional de inovare? Acest articol prevede, că CIC este într-adevăr un instrument util pentru un studiu diagnostic iniţial. Cu toate acestea, într-o economie de tranziţie, în care puţin se ştie despre inovaţie, rezultatele CIC trebuie să fie completate cu chestionare deschise. Se constată că, deşi producţia de inovare este relativ mare în comparaţie cu alte ţări în curs de dezvoltare, Republica Moldova este blocată în modelul inovaţional Rothwell de prima generaţie. Mai mult decât atât, întrucât nu sunt resurse disponibile pentru achiziţionarea de noi tehnologii, guvernul şi companiile private pot lucra pentru încurajarea unei infrastructuri de cunoaştere, care să promoveze inovaţiile organizaţionale şi de management.

***Cuvinte cheie**: chestionar inovaţional, achiziţionare de tehnologii, Moldova.*

MOLDOVA'S CHANCE TO INNOVATION: CAN THE CIS SURVEY HELP A DEVELOPING COUNTRYSUCCEED?

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The Republic of Moldova is one of the few remaining countries in Europe that has not yet taken the Community Innovation Survey (CIS). Can this survey help Moldova identify the drawbacks and advantages of its national innovation system? This article establishes that CIS is indeed a useful tool for an initial diagnostic study. However, in a transitional economy, where little is known about innovation, CIS results must be complemented with open-ended questionnaires. It is found that, even though the innovation output is relatively high compared to other developing countries, Moldova is stuck in Rothwell's first generation model of innovation. Moreover, as resources are not readily available for purchasing new technologies, the government and private companies can work towards encouraging a knowledge infrastructure that promotes organizational and management innovations.

***Keywords:** Innovation surveys, technology acquisition, Moldova.*

JEL Classification: O31, O33, O57

Introduction. As the Republic of Moldova is on its way to adhering to the European Union (EU), innovation would likely be the wisest strategy for companies and the government alike to speed up the development process. A number of studies have shown the positive effect of innovation on growth and have identified a myriad of models, as well as factors that promote innovativeness, but a limited number focused on the context of Moldova.

On the one hand, there are simpler technology-linked innovation models (Rothwell 1994) and more complex models like games of innovation (Floricel 2007) that describe the innovation process. On the other hand, the factors at the base of these models are sometimes proven to have a positive and other times negative effects on innovation. This only suggests that, depending on the ecosystem in which an innovation is promoted, different factors within different stages, activities or games, will affect the process in different ways (Dougherty 2007).

Thus, the current study will not attempt to identify the correlations between factors and the innovation process. Rather, it will analyze the methodology required to construct a comprehensive image of the national innovation system in the Republic of Moldova at multiple levels of the economy.

The basic content

Innovation models and methodologies for data collection

A limited number of researchers have tried to address innovation issues and study the innovation systems in developing countries, but there has not been a dedicated investigation of the private sector in Moldova specifically. Two papers incorporate data on Moldovan enterprises as part of larger investigations of 27 (Gorodnichenko 2008) and 47 developing countries (Ayyagari 2011). Additionally, one paper investigates the data collected via the INNOBarometer in more than 1000 Moldovan companies (Hîrbu 2012).

Gorodnichenko et al. (2008) find that companies in developing countries located further away from the frontier actually suffer as a result of competition, hence are less innovative. Higher foreign competition for Moldovan enterprises should, therefore, promote innovation. Ayyagari et al. (2011) show that foreign competition generally improves innovation. Similarly, the levels of education of managers, access to finance and family ownership all have positive effects on innovation (Ayyagari 2011).

Although these studies have identified important correlations between factors and innovation in the context of the developing world, they aggregate and compare all firms from transitional economies in Eastern Europe and Latin America or Asia. These economies are not necessarily caught in transition for the same reason; thus, the context for innovation may differ. Most of the time Asian and Latin American countries experience the "Dutch disease", or are dependent on their raw material exports (Chang 2003), none of which is the case for Moldova.

The popular Community Innovation Survey (CIS) or adaptations of it have been conducted already in over 50 countries mostly in Europe, some in Latin American, Asia and Africa. Bulgaria, Czech Republic, Latvia, Estonia, Lithuania, Hungary, Poland, Slovenia, Slovakia,

Romania, Russia, Croatia, Turkey and Ukraine have all endeavored into company-specific innovation surveys to diagnose their output, expenditure, sources of innovation and its hampering factors (Bogliacino 2010).

More specialized innovation surveys have been conducted for individual research studies in moderately developed countries of the EU like Romania and Slovenia. One such study found that technological opportunities, firm age and the country have a great deal of impact on the level of technological innovativeness (Antoncic, et al. 2007).

Moldovan enterprises have been part of larger data collections, such as the World Banks' enterprise survey (WBES), completed with the assistance of the European Bank for Reconstruction and Development (EBRD). This database contains a limited number of questions focused on innovation. An attempt to a dedicated innovation survey has been made in 2011, when data was collected for the INNOBarometer-2010 with assistance from the Agency for Innovation and Technological Transfer (AITT), the National Statistics Bureau, the Academy of Science and the Academy of Economics of Moldova (AITT 2011).

A dedicated innovation survey would allow a detailed analysis of the resources available to Moldovan enterprises and their capacities to absorb and use them for innovative purposes. It would also provide a better understanding of the innovation tendencies that exist among entrepreneurs and managers here. A short study using the INNOBarometer 2010 data has found that companies in the capital city are the most innovative, contributing to the total of 30% innovation within the country (Hîrbu 2012). Additionally, the INNOBarometer focuses on R&D spending, finding the highest costs for R&D associated with state-owned enterprises (92% of total spending). The article doesn't show any correlations between R&D and higher innovation levels or company performance and there are no clear policy implications from such analysis.

The CIS is also known for its limitations on policy-oriented indicators (Arundel, Innovation Survey Indicators: Any Progress since 1996-2006) and development-specific questions (Sutz 2012, Marins 2008). Sutz (2012) suggests including questions about human resources, asking about the field not only the level of study, adding more innovative activities pertinent to the developing context, and enhancing technology-related sections focusing specifically on the demand. Marins (2008) proposes a whole new structure of the family of indicators for emerging economies that would focus on 4 categories – entrepreneurship, structure, coordination and value – as opposed to the usual inputs, outputs and innovation activities.

Arundel (2006) challenges the usefulness of the CIS for policy-makers. Although he acknowledges the quality of the data for comparative reasons, he argues that the general perceptions differ from country to country, and the survey analysis lacks indicators relevant for policy analysts. He suggests the use of complex indicators, like the share of companies that introduce new to market innovations and are active on the international market, or active knowledge diffusion, or characteristics of innovative firms.

In a related paper, Arundel and Hollanders (2006) suggest combining the source of innovation with the outcome to proxy for the successful adoption of innovations. Among other missing indicators, they mention the rate of internal entrepreneurship, volume of spin-offs, venture capital available for innovative activities, availability of qualified innovation managers that can guide the process through to implementation, the percentage of employees affected by innovation, and the demand for innovation (Arundel and Hollanders, Searching the Forest for the Trees: "Missing" Indicators of Innovation 2006, Arundel, Innovation Survey Indicators: Any Progress since 1996-2006).

More comprehensive studies follow companies longitudinally or conduct open-ended interviews with the managers to understand the internal organization as well as the perception of innovation among employees of all ranks. Case in point serves the longitudinal study conducted by Christensen on two large Danish manufacturing companies (Christensen 2002). He finds a number of techniques that worked in each of the two companies and he manages to determine the areas with greater or smaller capacities that would allow for continuous technological innovation. Christensen is only able to construct the capacity argument because of his long-term understanding for the companies' dynamics, business model, mission and culture (Christensen 2002).

Longitudinal studies and open-ended interviews to some extent will, thus, provide a better understanding of the firm dynamics and strategy or decision-making biases. In this paper, it will be argued that such studies are critical for a transitional economy as innovation does not only depend on the available resources, but also the capacity and willingness of firms to employ these for innovative activities.

On the macroeconomic level, the National Bureau of Statistics of Moldova also collects data regarding aspects of the innovation infrastructure, which were fed into the Global Innovation Index prepared by INSEAD along with other data from WBES. All these sources, complemented by the CIS and an open-ended interview conducted with the managers of a few enterprises can contribute to conceiving a comprehensive image of the Moldovan innovation infrastructure.

The ultimate goal of this study, thus, is to devise the most efficient method to gather enough quantitative and qualitative data around the innovation process of the private sector in Moldova in order to build a base for policy-making and assist companies with implementing new techniques for innovation.

Methodology. The methodology in this study will be discussed in terms of the data sources, data collection and analysis.

Data sources. This paper employs 4 different data sources with an ultimate goal of defining the indicators that would help construct the building blocks of the national innovation system and find the proximate hurdles to innovating effectively. The WBES is used as a first source of information on innovative activities in Moldovan enterprises (Enterprise Analysis Unit – World Bank Group 2009). The survey covers 363 small, medium and large companies in Moldova.

Amongst its 262 indicators, it carries questions related to the new or improved products or services, access to finance, acquired technology, investments in R&D, uneducated workforce as an obstacle, competition and customers' role in developing new products, access to computers and internet.

The INNOBarometer 2010 data is used as a second source of information more specifically linked to innovation and resources for innovation (AITT 2011). Among the main indicators are human resources and the level of education, availability of public finance, R&D and non-R&D spending for innovation, public-private collaborative activities, product and process innovations, marketing and organizational innovations and the selling and exporting of such innovations. A dedicated innovation questionnaire adapted from the CIS and translated into Romanian was used as a third source of innovation data. This questionnaire addressed both the inputs and outputs of innovation on a firm level to understand the limitations and the use of resources for innovative purposes. The questionnaire followed the structure of the UK CIS 2006-2008, however, the period was extended to 4 years and the markets were modified to include the former Soviet block.

Lastly, a selected number of managers were given the opportunity to express their opinions and perception of innovation and innovative activities via an open-ended questionnaire in the local language. This exercise was conducted in order to gather a better understanding of the preponderant local awareness of innovation, the types and uses as well as the techniques used to include it in business models or within the company strategies.

Data collection and analysis. The CIS questionnaire covers the period of 2009 to 2012 and was carried out in 40 enterprises all headquartered in the capital city. The sample was randomly selected to include large and small companies, with more and less known brands, private, public and state-owned, young, as well as more established companies. Table 1 below is a summary of the sample distribution by sector. All companies were assured anonymity to increase the number of responses, as well as decrease any reporting biases.

The questionnaire results were analyzed in the context of the data available from the World Bank enterprise survey and the INNOBarometer, considering the latter two cover data only up to 2010. Also, comparative analysis with similar indicators in the EU was carried out.

A selected number of companies that responded to the CIS survey were further questioned on their perception on innovation. The findings from this evaluation were juxtaposed with the data available from the large-scale enterprise and CIS surveys to illustrate the limits of measuring innovation. This analysis allows to determine the missing indicators from the three surveys and to suggest an additional set of questions that would allow a CIS survey in Moldova to identify the major areas that need policy intervention.

Findings. The findings in this study will be discussed in terms of the survey approach, which will include the data from the three surveys and the consultant's approach, which will expand on the open-ended questionnaire.

The survey approach. All three large-scale data sources confirm a relatively high level of innovative companies in Moldova compared to other developing countries and in some cases even developed. According the WBES, between 2007 and 2009, 53% of the companies reviewed have implemented a new product or service on the market and 64% improved existing ones (Enterprise Analysis Unit – World Bank Group 2009). The INNOBarometer finds that slightly more than 30% of the surveyed enterprises have implemented a new or significantly improved product for the firm in 2009-2010. Out of the 40 firms that were tested for the CIS survey, 64% have implemented a service, product or process innovation over the past 4 years.

These figures signal the fact that innovation within Moldovan companies is high. In the majority of cases, however, the innovation implemented is new only for the firm and rarely for the market or for the industry. Only 19% of more than 1,000 companies interviewed for the INNOBarometer have launched products and services new to their market. This figure aligns with countries like Romania, Bulgaria, Latvia, Slovakia and Serbia (AITT 2011). In other words, Moldovan enterprises are acting more as imitators, than as original innovators, hence can succeed mostly on local markets and less so on the international ones.

In terms of inputs, innovative enterprises in Moldova allocate their financial resources to R&D activities. World Bank enterprise data shows that 72% of companies invest in internal R&D, while 16% acquire or adapt technologies from other companies. The INNOBarometer finds that 23% of the firms have invested in internal R&D, most of which are located in the municipality of Chisinau and the southern region. However, the total figure of R&D spending lies at 0.037% of total GDP, which is below the 3% target set by the Lisbon Treaty (AITT 2011).

Out of the 31 companies that recorded a figure for R&D costs with the WB, 64% spent up to 300,000 MDL (equivalent of 18,000 EUR) and 15% up to 6 million MDL (equivalent of 370 thousand EUR). CIS data identifies that 80% of a company's spending on R&D goes to the acquisition of software and other tech equipment. The INNOBarometer data, however, shows that between 70 and 80% of R&D spending is for personnel (Hîrbu 2012).

Human resources represent a second input to innovation activities, and more precisely the level of education of the workforce, specialization and the offering of continuous internal trainings. Close to half of the surveyed firms have identified the inadequately educated workforce as major or severe obstacle to performance (Enterprise Analysis Unit – World Bank Group 2009). Only 13.7% of the population between 20 and 24 years of age graduated from a specialized college or university. This figure is at least 50% in 34 other European states, such as Turkey, Iceland and Macedonia. However, there were 0.71% new PhD graduates within the age group of 25 to 34 in 2010.

Table 1

Company sample for the CIS survey against the totals for the Republic

Industry/activity	Sector	CIS Firms	Total nr. of firms*	Relative nr. of employees *	Total revenues, million lei (MDL)*
Totals by activity		**40**	**48541**	**510191**	**207676.8**
A Agriculture, hunting and forestry		0	5.1%	9.9%	4.0%
B Fishing		0	0.2%	0.1%	0.0%
C Mining		0	0.2%	0.5%	0.3%
D Manufacturing		12	10.4%	19.1%	15.0%
	D15 Food and Beverages	3	2.5%	7.2%	7.4%
	D17 Textiles	2	0.3%	0.8%	0.6%
	D19 Leather and shoes	1	0.2%	0.8%	0.2%
	D22 Publishing	3	1.2%	0.8%	0.4%
	D24 Chemical industry	2	0.2%	0.5%	0.6%
	D25 Rubber and plastics	1	0.7%	0.7%	0.6%
E Utilities		3	0.5%	3.6%	9.6%
F Construction		0	5.5%	5.3%	4.4%
		6	40.9%	21.9%	47.0%
G Wholesale and retail, repair of motor vehicles and household goods	G50 Sale, maintenance and repair of motor vehicles	1	3.6%	2.3%	6.7%
	G51 Wholesale	3	15.5%	8.4%	29.8%
	G52 Retail	2	21.8%	11.2%	10.5%
H Hotels and Restaurants		3	3.1%	2.5%	0.8%
I Transport and communication		4	6.8%	11.0%	9.6%
	I64 Post and communications	4	1.0%	2.8%	3.6%
J Financial activities		4	1.8%	0.6%	2.4%
		1	16.5%	10.1%	4.1%
K Real estate, renting and enterprise services	K73 Research and Development	1	0.2%	0.2%	0.1%
M Education		1	0.7%	0.9%	0.2%
N Health and social care		3	1.6%	10.3%	2.0%
O Other activities		4	6.8%	4.0%	0.1%
	O91 Membership organizations	1	4.1%	1.5%	0.0%
	O92 Entertainment and sports	2	1.3%	1.5%	0.5%
	O93 Private services	1	1.2%	0.5%	0.1%

Sursa/Source: * Biroul Național de Statistică al Republicii Moldova, 2012.

This figure is higher than that of European countries like Macedonia, Serbia, Iceland, Turkey, Malta, Luxemburg, Latvia, Bulgaria and Cyprus. These data signal a low capacity of the education system of the country to produce a young and highly skilled labor force, all this not considering the quality of education.

Half of the firms report that less than 10% of their employees have a college or university degree and 90% hardly reach a workforce composed of 50% highly skilled labor (Enterprise Analysis Unit – World Bank Group 2009). The CIS survey confirms the role of personnel qualifications for encouraging innovation, however, it only collects data on the distribution of employees based on their specialty. Hence, an average of only 20% of the workforce has obtained a degree in natural sciences and engineering. This figure is slightly high, due to regional bias in the CIS sample.

In terms of the sources of innovation, the CIS enterprises prefer customers, internal sources, suppliers and competitors. This is also confirmed by the WBES that finds 46-48% of companies believe that customers and competitors are an important source of new products, services and processes. This statistic is relatively odd considering the low level of competition in the country based on world rankings (INSEAD 2012) and the limited availability of internal information sources. This conclusion is backed up by the availability of Internet and computers within firms. Only 53% of the companies have high-speed internet set up and close to 61% of the firms provide computer access to less than 10% of their workforce (Enterprise Analysis Unit – World Bank Group 2009).

According to the CIS survey, new regulations, product quality and increasing the range of products and services are the main facilitators for the decision to innovate in Moldova. Of the non-innovators, 54% claim that the market conditions did not trigger nor allow the possibility to innovate, while 24% have innovated previously, hence, do not feel the need to continue. Other inhibitors to innovation that were scored highly are the availability of finance, the cost of finance, the cost of innovation, and high economic risks. The role of finance is confirmed by the WBES, which finds that 36% of the companies consider access to finance a major or severe obstacle (Enterprise Analysis Unit – World Bank Group 2009). Additionally, out of the 40 CIS companies, only 4 have reported to receive support from the local government, and 3 received support from other European bodies.

In terms of innovation activities, the majority (65-80%) of the CIS companies report investing time and resources into trainings and the acquisition of equipment and innovative software. A smaller fraction (less than 40%) focuses on internal R&D and all forms of design, acquisition of external knowledge and external R&D. The spending as discussed above, confirms this pattern.

Business to business and academic research to business collaborative activities are at a relatively low level. At the enterprise level, companies collaborate with Moldovan competitors, clients, universities and the local government or European suppliers according to the CIS data. The INNOBarometer, covering a larger data sample, emphasizes the closer collaboration with customers and competitors in the CSI region. It also shows that up to 26% of the innovations have been developed and implemented by Moldovan enterprises in collaboration with other firms (AITT 2011). A proxy for collaborations with the academic research centers is the volume of joint publications. Close to 10% of the surveyed companies for the INNOBarometer have contributed to such publications.

The three surveys collect data on innovation, some of the indicators overlap and others complement each other. All three collect data on the level of innovation at the corporate level. Similarly, the determining factors, inhibitors, as well as the revenues from innovation and the costs of R&D are gathered by all three surveys. As has been identified in prior studies, the standardized questions may not comprise the aspects of innovative activities peculiar to developing countries (Arundel, Innovation Survey Indicators: Any Progress since 1996? 2006, Bogliacino 2010, Marins 2008, Mairesse 2010). Hence, a consultant's approach was taken as well, providing firms with the opportunity to express any concerns that were not mentioned in the CIS or the INNOBarometer.

The consultant's approach. A set of open-ended questions was conducted with 10 of the companies that have responded to the CIS survey. The managers were allowed to express their opinions and beliefs about innovation in a free form, not limited to the choices available in CIS. Based on their accounts, it can be determined that companies in Moldova are stuck at the 1st generation model described by Rothwell, where technology acquisition plays the central role in innovation (Rothwell 1994).

The firms interviewed vary by size, age and sector. Three of the firms are from the publishing sector, two offer specialized retail services, one is from the financial industry, one offers private medical services, one is from the entertainment industry and the last one from the beverage sector. The oldest has been on the market for the last 28 years and the youngest was established in 2010. Again, anonymity was provided to the firms and managers to increase the number of respondents and the detail in the questions.

It is important to note that there is no disagreement among the managers of these firms in terms of the perception of innovation, the innovation process and the benefits it can bring. All have agreed that innovation would help their firms overcome recession. Most of them also believe that innovation would improve internal efficiencies and increase the input and output volumes or the turnover.

The publishing companies, however, have limited themselves to a narrow definition of innovation, which mainly involves technology and technological acquisitions more specifically. Given that purchasing the latest publishing technology is expensive and in-house development is not an option, these have identified financing as the ultimate obstacle to becoming more innovative. An additional impediment that is not mentioned in the CIS questionnaire, but was emphasized by the publishing companies is the conservative culture within the firm and the attitude of managers. Conservatism is a very subjective frame of mind, but in this context could be interpreted as a predisposition to Soviet and post-Soviet institutions.

Having said that, the youngest of them, bearing few of the post-Soviet institutions within its culture, has set up an internal formal department that focuses solely on innovations. This is the only one of the 10 companies interviewed that has such a structure. All three publishing companies have confirmed that their internal management system promotes innovation, albeit informally. They improve their knowledge of innovation trends by researching the Internet and the journals in their area, as well as organizing visits at foreign competitor sites.

The perception of the local and foreign competition was also discussed. All publishing companies have reported low levels of local competition. Similarly, all the other companies, except for the entertainment and medical services have stated that competition is weak. This could be explained by the low demand for local services and products. Moldovan consumers although likely to be entertained at a local restaurant, but they, as well as the restaurant, would prefer imported beverages. Competition, however, is critical in promoting innovative activities and has already been shown to have a positive effect in frontier economies (Ayyagari 2011). This could be an indicative point for policy-makers.

The retailers specialized in medical equipment and chemical reagents, as well as the beverage producer find the lack of qualified personnel, the lack of knowledge on the subject of innovation, as well as the conservative culture as the main obstacles to improving innovativeness. Even though the sources for innovation and the benefits the retailers find are similar to those of the publishing companies, the former have slightly more advanced techniques of promoting innovation. The managers delegate employees to participate at business seminars, they brainstorm, analyze and implement any resulting ideas. The beverage producer also uses local and foreign consultants. One retailer managed to implement two very simple programs that analyze competing products, allowing for radical improvements in their own marketing strategies.

Out of the 10 firms, only the financial service provider takes advantage of local centers for research and development to develop their own IT structure. Yet, the acquisition and adaptation of these systems is very hierarchical. For the medical service providers, the equipment is critical, but improving the technique even more so. Here, innovations are do not face bureaucratic pitfalls, but are rather sourced individually

from medical journals and trainings. The entertainment service provider only acquires new technologies if necessary, but they do rely on non-technological innovations as well. They offer monetary incentives for employees that develop their innovative ideas.

In summary, the open-ended questionnaires allowed for the identification of a number of issues that could have not been captured by the other surveys. First of all, the perception of innovation as limited to technology and technological acquisition. The focus on this innovative activity can help further identify what would need to be done to leap-forward to Rothwell's 5th generation model for innovation processes (Rothwell 1994), or even structure the innovation network to follow Floricel's games of innovation (Floricel 2007). Second, inhibiting factors, such as the conservative culture and its root causes can only be studied within in-depth interviews and longitudinal studies. The CIS or INNOBarometer could help by collecting the statistic on such factors, based on which policies could address the issue of de-institutionalization. Lastly, open-ended questionnaires should be conducted on a recurring basis to help policy-makers and surveyors adapt their strategies and evolve with the evolution of the industry.

Discussions. There are currently four sources of data that can help build the innovation infrastructure in the Republic of Moldova, identify the points, channels and resources that could be strengthened, and the ones that can be used as a competitive advantage. However, the study of the system must continue in order to ensure goals are being reached and to revert any policies that are damaging the system. The goal of this study was to contrast the data sources and adapt the CIS in a way that would serve the stated purpose.

The table below summarizes the findings gathered from the large-scale surveys, the preliminary CIS data and the open-ended questionnaires in terms of sample characteristics and the breakdown of innovators. It is already evident that these projects are surveying similar information. However, this has been done within different time frames or for different sample features, thus making a study of the national innovation system hard if not impossible.

All the surveys collect data for all firm sizes. However, the regional breakdown slightly differs. The WBES only differentiates between North and Southeast region, whereas the INNOBarometer looks at the two largest cities separate from the North, South and Central regions. A large-scale implementation of the CIS would most likely follow the INNOBArometer.

Table 2

Sample characteristics and innovation levels within the WBES, INNOBarometer, CIS and the open-ended questionnaires

	WBES*	**INNOBarometer****	**Preliminary CIS**	**Open-ended questions**
Sample size	363	1127	40	10
Period	2007-2009 (2010-2012 upcoming)	2008-2010	2009-2012	2012
Region	N, SE	Chisinau, Balti, N, S, C	Chisinau and distribution by activity market	Chisinau
Age	Varies	Varies	Varies	Varies
Size	S, M, L	S, M, L	S, M, L	S, M, L
Type of ownership	Public, private, mixed	Public, private, mixed	Public, private, mixed	Public, private, mixed
Innovative companies by breakdown of innovation type	53% new products and services 64% significantly improved products and services	28% new or improved products for market 30% new or improved services for market 20% new product or service for the market 30% new or improved products and services for company 23% new or improved processes 25% organizational innovations 23% marketing innovations	36% new or improved products and services for the market 55% new or improved processes for the market 42% new or improved products and services for the firm 64% new or improved processes for the firm 81% marketing innovations 33% organizational innovations 37% management innovations 56% strategic innovations	

Sursa/Source: * Enterprise Analysis Unit – World Bank Group 2009, ** AITT 2011.

The difference in the sample sizes causes the known sample bias effect. Hence, smaller samples may be overestimating the level of innovation. For the innovators of the sample, the breakdown is richer in the case of the CIS survey, but the data collected from the INNOBarometer gives a very good indication of the new vs. improved, market vs. firm and products & services vs. processes, marketing and organizational innovations.

Table 3 below gives an indication of the data collected from each survey and implies where each of the data source falls short in or adds useful information. For example, the WBES has significant data on the availability of technology, such as Internet and basic computers within companies. This is useful in combination with the innovation sources from the CIS survey or the open-ended questionnaires. Companies assign a high priority to internal sources such as the use of Internet or ideas from employees. Based on the WBES, the availability of Internet and computers within Moldovan companies is quite low. Hence, innovative activity is expected to be scarcer.

Similarly for the human capital, a statistic about the level, quality and specialty of the qualifications is useful to determine the value of the resource. The INNOBarometer is a great supply of the national level data, whereas the questions available in the CIS are relatively weak to make the argument. Moreover, the capacity to engage this resource has not been studied. The open-ended questionnaires allowed managers to discuss the extent to which they engage employees in developing and promoting their ideas via formal or informal routes.

In terms of facilitators and barriers to innovation, the WBES and the CIS could be used in parallel to discuss and understand the main micro and macro environmental factors that either promote or inhibit innovative activities. A similar discourse applies here – indicators must measure both the availability of resources that inhibit or facilitate, as well as the capacity of the firms to avoid or employ these effectively. For this, the INNOBarometer data on the availability of credit and C&D on national level is critical.

Table 3

Granularity of the data collected via the WBES, INNOBarometer, CIS and the open-ended questionnaires

	WBES*	**INNOBarometer****	**Preliminary CIS**	**Open-ended questions**
Innovation activities	R&D Use of technology	R&D	R&D, software, training, design, marketing, advertising, market research, external knowledge…	Very specific
Human Resources		National level: distribution by specialty and degree	Company level: distribution by specialty	Formal and informal incentives
Facilitators	Company level: large range of facilitators and inhibitors for business activity in general	National level: finance, venture capital, public spending on C&D	Company level: quality and range of products, market share, new markets, reducing costs, standards and regulations, health and safety…	Allows company to point one and expand on it
Inhibitors			Company level: cost, knowledge, market, or other factors	
Sources			Employees, internet, journals, competitors, suppliers…	
Revenues	%Sales from new products	Firm level: %Sales from new products National level: %High-tech exports %Knowledge-intensive exports	%Sales from new products	
Costs	R&D spending	R&D and non-R&D spending	R&D spending	
Collaboration		In-house innovation Collaborations with other firms Collaborations with universities Private-public publications	In-house innovation Collaborations with other firms Collaborations with universities Collaborations with government	

Sursa/Source: * Enterprise Analysis Unit – World Bank Group 2009, ** AITT 2011.

Only the INNOBarometer collects data around non-R&D spending. Even though it is a vague area, such information may be useful for a country like Moldova, where most likely R&D spending will be directed to external technological acquisitions and less towards internal R&D. Lastly, in terms of collaborative activities, both the INNOBarometer and the CIS surveys collect a sufficient amount of data for analysis of industry and industry-public sector interlinks.

To summarize, there are three key points that have been raised in this paper. First, no one survey or data source will be able to provide all the information necessary to analyze a national innovation system and to propose policies to improve off the back of it. However, to make the use of surveys in analysis more effective, these should be synchronized with the large-scale enterprise surveys, such as the one conducted by the World Bank. If the CIS, the INNOBarometer or any other combined survey were to be conducted, this should be set to follow the 3-year period of the WBES, i.e. 2010-2012 as the current. Second, a dedicated innovation survey is necessary to build on the knowledge of innovation in the private sector. However, holding multiple survey efforts that target similar but slightly different data is ineffective as can lead to slow and small response rate. Consequently, one innovation survey would be ideal.

Thirdly, the innovation survey must address two major areas: the availability or level of resources at the national and company level, as well as the capacity to employ these resources to achieve innovation-related goals. Cases in point serve the availability of Internet and the use of Internet as a source of innovations, the quality and quantity of human capital and the employability of these resources.

Conclusions. The goal of this paper was to research whether the CIS survey alone could help the Republic of Moldova identify the advantages and drawbacks of its national innovation system. As the analysis shows, the short answer is yes but to a certain extent.

Generally, the CIS provides a wealth of information that is useful and can be employed in studies on corporate innovation. A preliminary employment of the questionnaire actually shows the drawbacks and the factors promoting innovation in the corporate world. It also illustrates the major innovation activities, spending and earning based on new or improved products and services.

A thorough study of the Moldovan national innovation system, however, would need to start with the resources available at the national level and continue with those at the corporate level. Furthermore, it would continue with analyzing individual firm's capacities to employ resources effectively, and ultimately the ability to learn and improve on those capacities. The INNOBarometer and the WBES can complement the CIS with data on resources.

Moreover, CIS is limited to a set of predefined answers that may not always include features, concerns or perceptions of the Moldovan corporate sector. Consequently, taking a consultant's approach on a recurring basis would help adapt and improve a national innovation questionnaire, as well as understand whether the leading firms have moved away and leaped forward from Rothwell's 1st generation innovation model.

Thus, it may not be essential to conduct the CIS survey in Moldova from scratch. However, some of its questions should be adapted to the INNOBarometer to allow for the construction of the national innovation system, without taking away from the level of comparability with other European states. This will be more effective in terms of the financing of such projects, as well as the burden on companies themselves, considering the limited availability of funds for the public as well as the private sector. To this extent, synchronizing it with the large-scale WBES would allow their complementary study, similar to the experience of Canada, Italy and China (Mairesse 2010).

This paper only tapped the surface of policy making. As discussed, a dedicated innovation survey must cover both the level of resources and the capacities available to use those resources. This would allow policy-makers to address resource and capacity issues differently. To illustrate this point, a lack of public research would require an increased and more targeted spending on R&D. However, if firms lack the capacity to use public knowledge, then only small benefits will be ripped. The latter would require building formal and promoting informal channels between the industry and universities or public research centers. Similar arguments hold for any of the facilitating factors measured by the CIS survey.

Consequently, to achieve the construction of the national innovation system in Moldova and guide policy makers towards the most effective solutions for promoting innovation, an enhanced INNOBarometer survey with some questions from CIS should be used in parallel with the WBES for the same time frame. Future studies can analyze the results using regressions and statistics, but most importantly would determine the level of resource availability and of capacities to use these resources. Based on such results, policies can be directed towards specific issues, but addressing both the availability and the capacity to use resources. Ultimately, open-ended questionnaires with a selected number of firms would help put the results in perspective, as these would capture issues that have not been addressed by the survey, in terms of the general perception of innovation and innovative concepts.

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