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Farmers' export market participation decisions in transition economies: a comparative study between Armenia and Uzbekistan

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ABSTRACT

The Russian import ban on Western food products has stimulated a discussion about whether and how countries in Central Asia and Caucasus might benefit from this political decision by expanding their agrifood exports to Russia. Given this background, our study compares farmers' willingness to participate in export markets in Armenia and Uzbekistan. Discussions are based on the analysis of surveys of 400 farmers from each country conducted in the spring of 2015. The results show that farmers already participating in local markets have a higher motivation to engage in the production of exportable commodities when a sudden export opportunity emerges. Beyond this general finding, the relative importance of farm and infrastructure characteristics were identified under different commercialization levels. Although both types of factors have been identified as important determinants in the existing literature, our analysis provides further evidence. We demonstrate that variables related to farm characteristics play a rather crucial role in more subsistence-oriented small-scale farming systems as found in the case of Armenia. In contrast, infrastructure may become more important than farm endowments in more commercially oriented farming systems such as observed in Uzbekistan.

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Supply chains; cooperation; extension; subsidy; commercialization; Central Asia; Caucasus

Introduction

A review of the literature over the last two decades demonstrates a widespread interest in the analysis of how the globalization of agrifood systems has affected smallholder farms in developing countries (e.g. von Braun 1995; Pingali and Rosegrant 1995; Barrett 2008; Ouma et al. 2010). In the realm of these studies, the identification of factors which contribute to the market integration of smallholder farmers has become a major research question. The rapid spread of supermarket chains in many developing countries motivated a wave of studies which investigate this phenomenon of a 'supermarket revolution' in the agricultural sector (Minot 1986; Reardon and Berdegue 2002; Swinnen and Maertens 2007; Dries et al. 2009; Schipmann and Qaim 2010). These studies typically explore a wide range of topics including the analysis of factors determining participation decisions in modern supply chains, impact of participation on farm welfare, and the role of food safety and quality standards. Another stream of the literature which is closely related to the above-mentioned studies focuses on the integration of farmers into export markets instead of local markets (e.g. Collins 1995; Maertens 2009; Carletto et al. 2010).

The conventional wisdom of the studies cited above is that farm size, education, and infrastructure are unanimously important factors for farmers' commercialization level and thus participation in modern (both local and global) supply chains in the context of a developing economy. This may in fact also apply to post-Soviet transition economies, but empirical evidence for these countries is limited. Commercialization and supply chain transformation is a rather understudied domain of research, especially in Caucasus and Central Asia (CCA), and most of the studies emerging from the region concentrate on land reforms, resource use, and transboundary water allocation problems. Only a few studies discuss the importance of commercialization and supply chain developments in CCA countries (e.g. Lerman 2004; Sadler 2006; Dries et al. 2012; Djanibekov et al. 2013; Petrick and Oshakbaev 2014; Hornidge, van Assche, and Shtaltovna 2015). Those studies recommend developing supply chains further but empirical evidence on the importance of specific aspects of supply chain development such as access to extension services, cooperatives, and formal contracts are not yet well investigated in these countries.

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The accession of several CCA countries to the World Trade Organization (WTO) (Pomfret 2005), and the establishment of the Eurasian Economic Union (EEU), enormously raised the interests of policy makers in the region to boost commercially based farming systems to become competitive with foreign producers. In particular, increasing agricultural exports is considered a major goal of all CCA countries to maintain or improve their trade balance under new trade regimes. The Russian import embargo of food products from western countries in August 2014 served as an additional push factor for policy debates in CCA to benefit from this political decision by increasing agricultural exports to Russia. The imposed ban concerns all imports of beef, pork, processed meats, poultry, fish, and other seafood, milk and milk products, vegetables, fruits, and nuts from the European Union, United States, Canada, Australia, and Norway (Krivonos 2014).

According to several media reports, policy makers in the CCA countries consider the sanctions on western imports as an opportunity to boost their agricultural exports to Russia. This is illustrated by the following statements: 'Great opportunities for our agricultural producers' (Sersch Sargsjan, President of Armenia, *Armenianlife* 2014) and Now, because of the ban on food imports in Russia, foreign companies will be interested in Kazakhstan, and it is necessary to create all the necessary conditions for an increase in exports to the Customs Union and to attract investors (Nursultan Nazarbayev, President of Kazakhstan, *Easttime* 2014). Similar statements are reported by the Minister of Agriculture of Kyrgyzstan (Kabar 2014) and the Minister of Agriculture of Uzbekistan, with the latter stating that Uzbekistan plans to double its vegetable exports to Russia by 2016 (Noviyvek 2014).

Although issues related to increasing agricultural exports are popular among policy makers, farmers' motivations and willingness to boost production of exportable crops remain highly unknown. Therefore, this study provides an empirical contribution to the ongoing discussion in CCA about increasing export potentials by exploring the willingness of farmers to increase the production of exportable crops given this external policy shock. More specifically, this study examines the factors which are important determinants of farmers' willingness to engage in export-oriented activities when political opportunities for boosting export potentials emerge. To the best of our knowledge, the willingness of farmers to adjust their production plans toward export markets under a sudden policy shock has not been investigated quantitatively in the international literature. Thus, we provide the first empirical evidence on this issue for a highly understudied region.

Moreover, we provide cross-country comparisons for two selected CCA countries that differ substantially in their governance systems and policy environment. Because existing studies often discuss the importance of the policy environment as an important factor in export market development (e.g. Dolan and Humphrey 2004; Ouma 2010), we selected two countries with very different governmental approaches toward agriculture for a comparison. Armenia was selected as an example of a country with very liberal policy reforms and a market-based agricultural sector. In contrast, Uzbekistan was selected as an example of a country with strong state interventions in agricultural production. Furthermore, whereas Armenia has close relations to Russia both in terms of geographic location and political connections due to its membership in the EEU, Uzbekistan is remotely located to Russia and has not yet shown any interest in entering the EEU.

Agricultural production and exports in Armenia and Uzbekistan

Agricultural reforms

During the Soviet Union period agricultural production was carried out in both countries by large-scale collective farms known as *sovkhozes* and *kolkhozes* (Grigoryan, Hakhnazaryan, and Kwapong 2009; Djanibekov et al. 2012). As have all other post-Soviet Union countries, Armenia and Uzbekistan have implemented several waves of reforms to transform their agricultural systems since their independence. In the first wave of reforms, the state land was allocated to small-scale producer units with different forms of land tenure. Nowadays, household farms and individual farms are the main agricultural producers in these countries. However, household producer and individual farm terminologies are used with slightly different meaning in Armenia and Uzbekistan. Overall, differences between household producers and individual farms are not very pronounced in Armenia but there is a strict distinction in the definition of these farm types in Uzbekistan. Individual farms in Uzbekistan are larger, have legal status, and are considered to be commercial producers which mainly produce according to state procurement policies (Bobojonov et al. 2013). In contrast, household producers have smaller plots and mainly produce for their own consumption and sell the remaining products. Individual farm, household producer, and peasant farm definitions are used interchangeably in the existing international literature on Armenia (ICARE 2012; Lerman 2013).

Agricultural producers in Armenia are small production units owned and operated by family members,

with an average farm size of 4–5 ha. These small units mainly produce potatoes, vegetables, fruits, milk, and eggs, as well as wheat, beef, and pork. Some large-scale farms with 100–500 ha have emerged in mountainous regions, but their number is very limited. Moreover, agricultural support is limited in Armenia and is mainly due to externally funded projects (Robinson 2008). Agricultural production, marketing, and trade are implemented by private entrepreneurs with minimum involvement of the state. However, in reaction to the food crises in 2007–2008, the Armenian government started to implement several support reforms, mainly in the grain sector. Those support programs focus primarily on the provision of seeds, fertilizer, and diesel to increase grain production (ICARE 2012).

The chosen transition path in Uzbekistan is rather different from that of Armenia, which is also reflected in the current farming system. In the first stage, *kolkhoz* and *sovkhoz* farms were transformed into cooperative farms (*shirkats*) which had in fact very similar structures as the former state farms. In the second stage, the land of the cooperative farms was later disseminated to small-scale individual farms with an average size of 10–15 ha. However, because the agricultural infrastructure established during Soviet times was found to be inappropriate for the needs of small-scale farms, in a third stage those small-scale farms were again consolidated to larger farms with average farm sizes of 80–100 ha in 2008 (Djanibekov et al. 2012). Furthermore, agricultural systems in Uzbekistan are strongly shaped by the existence of state procurement for cotton and wheat. There is a mandatory minimum acreage of cotton and wheat set by the state and overall more than 70% of the farmland is allocated to those two crops (Bobojonov et al. 2013). All cotton and about half of wheat produced in Uzbekistan is sold to state processing companies as one of the conditions of the state procurement. In turn, the state provides subsidized credits and supply inputs during the vegetation period under the condition that farmers pay for inputs after the harvest. Similarly, infrastructure in the agricultural sector such as extension services, water allocation, and machinery parks are also financed and maintained by state organizations.

Importance of agricultural exports to Russia

Even though more than 25 years have passed since the Soviet Union collapsed, there is still a strong trade concentration of many CCA countries among the Commonwealth of Independent States (CIS), especially Russia, and a rather low integration into world markets (ADB 2006). These persisting close trade relations within the former Soviet Union states are often explained with historical

ties, common borders, and a common language, as well as agricultural specialization inherited from the Soviet Union (Lorentz 2006). For example, the climate in CCA countries is very suitable for growing a variety of fruits and vegetables, and Russia is a major importer of fruits and vegetables. In 2012, 9% of vegetables and 69% of fruits consumed in Russia were imported (Krivonos 2014). However, surprisingly, the share of vegetables and fruits from CCA countries among Russian imports has been rather low with only 15% (vegetables) and 20% (fruits) of total imports, respectively (FedStat 2015). Before the implementation of the import ban Russia mainly imported those products from Western countries with the top four exporters of fruits and vegetables being the United States, Germany, France, and the UK. Higher productivity, developed logistic systems, and well-established certification mechanisms made these exporters more attractive for Russian supermarkets.

Agricultural exports account for large shares of exports of CCA countries, and Russia is still one of the main export destinations. For example, processed food and agricultural commodities exports account for more than 24% of total Armenian exports. Within these categories, the largest share belongs to the export of brandy and grapes. Furthermore, the export volume of fruits have increased during recent years, which may play an important role in rural employment and income (ICARE 2012). For example, the export of fruits and nuts increased from 3.2 million USD in 2009 to 32.5 million USD in 2013.

With the exception of tobacco, about 80% of all food and agricultural products is exported to CIS countries, predominantly Russia. The country's membership in the EEU may even further intensify its cooperation with CIS countries in the economic union. Due to EEU membership, Armenian agricultural products can be sold to the Russian market without customs declaration (FAO 2016). Moreover, it also has an impact on simplification in food safety and quality controls, which might benefit Armenian farmers and exporters.¹

Similarly, agricultural and food product exports also play an important role in Uzbekistan. Cotton is one of the main agricultural export products, which is a result of the above-mentioned procurement mechanisms. However, since 2008 the government has implemented crop diversification policies, mainly with the aim to establish vegetable- and fruit-producing agro-clusters to diversify agricultural exports. This trend toward crop diversification and expanding the horticultural sector is also reflected in a recent loan agreement of 150 million USD between the Uzbek government and the World Bank for a horticulture program (World Bank 2015).

Uzbekistan's export destinations are similar to those of Armenia. The major share of agricultural products is exported to other CIS countries, predominantly Russia and Kazakhstan. For example, on average about 65% of fruits and 28% of vegetables are exported to Kazakhstan. More than 30% of cotton fiber and about 25% of vegetables have been exported to Russia on average during the last three years (UzStat 2014). Unlike Armenia, Uzbekistan is not a member of the EEU and Uzbek products need to pass customs controls before entering the Russian market. Thus, it might be reasonable to assume that Armenian farmers and exporters might have an advantage over Uzbek farmers in terms of customs regulations since theoretically Armenian goods should be treated equally to Russian products in the Russian market. In contrast, goods from Uzbekistan are considered as imported products.

Conceptual framework

We assume that farmers' decisions can be modeled via a random utility framework, which implies that farmers decide to change crop patterns to increase the production of exportable crops to participate in export markets when the expected benefits outweigh the expected costs. This approach has been applied in many studies on farmers' market participation and supply responses (e.g. Barrett 2008; Fischer and Qaim 2012, 2014).² Farmers' utility is thereby modeled as a function of a vector of exogenous variables as follows (e.g. Fischer and Qaim 2014):

$$V_i = (\beta X_i), \quad \text{where } U_i = V_i = (\beta X_i) + u_i \quad (1)$$

with V_i being the part of the utility function that can be observed, U_i being the unobserved utility, and u_i being an error term representing the unobserved part of the utility. The vector X_i includes farm and household characteristics, and β is a vector of parameters to be estimated. The farmer will choose to take advantage of the import ban if the utility U_i^P from export participation is higher than the utility U_i^{NP} derived from nonparticipation.

Thus, the probability of a farmer willing to participate in exporting to Russia is given by $P(u_i < \beta X_i)$ and the willingness to participate in the model can be written as follows:

$$P(P_i = 1) = P(u_i < \beta X_i) = \beta X_i + u_i, \quad (2)$$

where $P_i = 1$ if $U_i^P > U_i^{NP}$ and $P_i = 0$ if $U_i^P < U_i^{NP}$.

More specifically, factors that have been identified in previous studies as relevant for farmers' decisions to participate in a certain market can be classified into three categories: (i) farm head characteristics (i.e. human capital), (ii) farm characteristics, and (iii) institutional

and infrastructure-related factors (e.g. supply chain, policies). With respect to farm head characteristics, previous studies found gender, age, and education to be important determinants of farm decision-making (e.g. Carletto et al. 2010; Ouma et al. 2010; Hernandez, Berdegué, and Reardon 2015). Farm characteristics are considered to measure the farm's endowments of productive assets and production technologies, as well as their geographic location. Examples of farm characteristics employed in previous studies are farm size, number of workers employed, ownership of a truck or other relevant equipment, and geographic location (Collins 1995; Barrett 2008). With respect to institutional characteristics, studies usually distinguish between physical infrastructure (e.g. roads, electricity) and institutional infrastructure (e.g. access to credit, extension services, cooperatives). Weak institutional and physical infrastructure may cause very high transaction costs which may reduce the possibility of smallholders to participate in the market (Barrett 2008; Kandilov and Zheng 2011). In contrast, participation in cooperatives and access to formal supply chains can help farms to overcome the high transaction costs burden (Wollni and Zeller 2007; Miyata, Minot, and Hu 2009). The selection of variables influencing export participation perceptions in this paper is based on the studies mentioned above.

Data and descriptive statistics

Farm survey

The analysis is based on the survey responses of 405 farmers and household producers in Uzbekistan and 401 household farms in Armenia. The surveys were mainly implemented to investigate supply chain developments in the agricultural sector with an objective to investigate willingness to participate in export commodities. Most of the Armenian farmers belong to the category of household farms, which is the dominant farm type in Armenia. In Uzbekistan, both individual farms and household producers were surveyed.

One of the main criteria in sample selection was to have similar farming systems in Armenia and Uzbekistan to conduct a comparative study. Therefore, regions that specialized in the production of wheat as well as vegetable and livestock products were selected at the first stage. Those farming systems are considered to be in place where export orientation is expected to increase at the expense of production of traditional crops (e.g. wheat, cotton). At the second stage, three to four representative villages were selected in each region. At the third stage, a representative number of farms (according to the number of farms in each village) were randomly

sampled within the chosen villages. We used a quantitative structured questionnaire with specific modules on farm and household characteristics, production data, cooperation activities, access to information and extension services, and uncertainty and risk management. Moreover, we included two questions specifically addressing farmers' willingness to participate in export markets. The first asked whether or not the farmer is willing to introduce any change to his farming activities due to the Russian import embargo. The second question listed the possible types of activity changes that could be implemented to produce more exportable crops. The list of potential activities was identified in pre-survey interviews with farmers and local experts. Production intensification, increasing area under export crops, increasing livestock head, and building greenhouses were the specific activities that were found to be possible options to increase export market participation of farms in these countries. Furthermore, the questionnaire and survey design also considered information about the particularities of agricultural production and agricultural services found important in the regional studies (Lerman 2004; Djanibekov et al. 2013; Petrick and Oshakbaev 2014; Shtalovna and Hornidge 2014).

All interviews were conducted in late winter 2014 and early spring 2015 so that producers had not planted anything since the announcement of the import ban. Rather, they were mainly in the onset of the vegetation period and planning their farming activities for 2015. The surveys were conducted by local institutes in the local language. Mobile devices were used in the surveys instead of standard paper-based questionnaires to facilitate the speed of the interviews as well as to improve the supervision quality.

Descriptive statistics

According to the conceptual framework discussed above, we consider three different categories of variables: (1) farm head characteristics (i.e. human capital), (2) farm characteristics, and (3) institutional variables. Table 1 shows descriptive statistics with respect to those characteristics for both samples.³

The share of female-headed households was very limited in both countries (9% in Armenia, 4% in Uzbekistan). The average age of an Armenian farmer in our sample is about 52 years and the average Uzbek farmer is 47 years old. Years of education were very similar in both countries.

The variables LANDSIZE, FARMWORKERS, ASSETS, and LORRY are considered as farm characteristics. LANDSIZE is the overall land size of the farm in hectares. The average farm size in our Armenian sample is 7.74 ha

Table 1. Descriptive statistics.

| | Armenia (N=392) | | Uzbekistan (N=396) | |
|---|-----------------|-----------|--------------------|-----------|
| | Mean | Std. Err. | Mean | Std. Err. |
| <i>Farm head characteristics:</i> | | | | |
| FEMALE | 0.09 | 0.29 | 0.04 | 0.2 |
| AGE | 52.15 | 12.46 | 47.03 | 10.43 |
| EDUCATION | 12.56 | 2.84 | 13.66 | 2.27 |
| <i>Farm characteristics:</i> | | | | |
| LANDSIZE | 7.74 | 9.33 | 40.51 | 33.62 |
| FARMWORKERS | 4.17 | 4.48 | 16.93 | 18.75 |
| ASSETS | 27.9 | 29.61 | 247.69 | 2825.93 |
| LORRY | 0.21 | 0.41 | 0.08 | 0.26 |
| <i>Supply chain and policy variables:</i> | | | | |
| FERTSUBSIDY | 0.73 | 0.44 | 0.84 | 0.37 |
| COMMERCIALIZATION | 40.12 | 37.04 | 85.58 | 18.17 |
| COOPERATIVEMEMBER | 0.25 | 0.43 | 0.62 | 0.49 |
| QUALITYCONTROL | 0.78 | 0.1 | 0.54 | 0.46 |
| EXTENSION | 0.20 | 0.4 | 0.66 | 0.47 |
| CONTRACT | 0.02 | 0.14 | 0.81 | 0.39 |
| INSURANCE | n.a. | n.a. | 0.43 | 0.5 |

Source: Author's presentation.

(Figure 1), whereas the average Uzbek farm has 40.51 ha (Figure 2). Thus, the general differences in farm size described in Section 2 are reflected in our sample. The average farm size in Armenia in our sample is higher than the national-level sample size because we consider only wheat farms and those are usually larger than vegetable and horticulture farms. FARMWORKERS counts the number of permanent workers of the farm and ASSETS sums up the value (in thousand USD) of buildings, machinery, and other equipment. LORRY is a dummy variable that indicates whether a farm possesses a lorry or not. It can be seen from Table 1 that on average, farms in Uzbekistan have more workers and a higher value of assets. However, at the same time a very high standard deviation of assets points at a large difference in availability of assets by farmers within Uzbekistan.

FERTSUBSIDY, COMMERCIALIZATION, COOPERATIVE-MEMBER, QUALITYCONTROL, EXTENSION, CONTRACT,

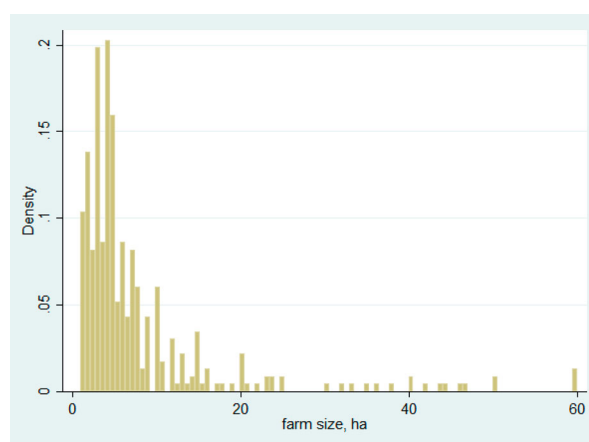


Figure 1. Farm size distribution in Armenia.

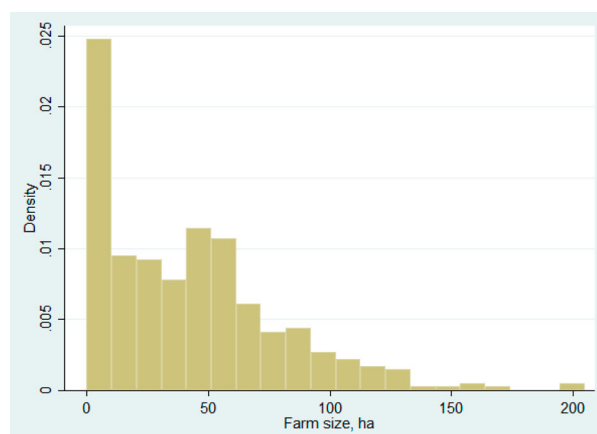


Figure 2. Farm size distribution in Uzbekistan.

and INSURANCE are considered as variables representing the institutions and infrastructure in which farms operate. QUALITYCONTROL mainly indicates if any of the produced products are tested for dryness, cleanness (e.g. percentage of foreign substances) and germs. FERT-SUBSIDY is a dummy variable which takes the value of 1 if a farmer has access to subsidized fertilizer. The share of farmers who have access to subsidized fertilizers is 73% in Armenia and 84% in Uzbekistan. COMMERCIALIZATION is a variable which shows the percentage of crops which are sold via different marketing channels. This is estimated by dividing the marketed (all market channels) value of all commodities by the total value of all produced products. The total value of product is estimated by multiplying the produced amount by the price of the product (both values were recorded in the survey). Furthermore, the market value was also asked in the questionnaire. Armenian farmers (40.1%) are less commercialized when compared to farmers in Uzbekistan (85.6%). More specifically, Armenian farmers market on average about 40% of their produce, while in Uzbekistan around 86% is marketed. Put differently, Armenian farmers keep about 60 of the products they produce for their own use. This substantial difference in commercialization levels between Armenian and Uzbek farmers could be considered as an outcome of the different privatization processes chosen. Due to the land privatization strategy adopted in Armenia, very small-scale subsistence-oriented farmers emerged, and they mainly produce for their own needs. In contrast, the Uzbek government allocated land on the basis of competition, and only individuals with higher potential to be involved in commercial cotton and wheat production obtained land. COOPERATIVEMEMBER is a dummy variable which takes the value of 1 if farmers are members of any formal or informal cooperative. The inclusion of this variable is based on the assumption that collective action

through cooperatives is a possible institutional solution to overcome high transaction costs and other market failures (Fischer and Qaim 2014). According to our results, Armenian farmers cooperate much less with each other when compared to Uzbek farmers. QUALITYCONTROL is also a dummy variable which takes the value 1 if a farm sells its products with official quality control measures (e.g. certificates). Seventy-eight percent of Armenian and 54% of Uzbek farmers participate in quality control measures. The dummy variable EXTENSION accounts for the impact of access to extension services, and about 20% of farmers in Armenia and 66% of farmers in Uzbekistan indicated that they obtain extension services. The government of Uzbekistan established several service and extension organizations in rural areas to provide support to farmers participating in the cotton and wheat state procurement. This explains the very high share of access to extension agencies in Uzbekistan when compared to Armenia, where efforts to implement and develop extension services have started only in recent years. CONTRACT is a dummy variable indicating the sales via official contracts. Only 2% of farmers in Armenia sell their products with an official contract. In contrast, 81% of farmers in Uzbekistan sell their products with an official contract. The dummy variable INSURANCE indicates whether or not a farmer purchased crop insurance. Such services are not available to farmers in Armenia. In Uzbekistan 43% of farmers in our sample stated that they were insured with multiple or specific peril crop insurance.

Determinants of export participation

As discussed above, we employ a binary probit model to investigate the influence of the different characteristics on the probability to participate in export markets in the future. The willingness to participate in export markets is thereby analyzed by the answer to the question of whether or not the farmer is willing to introduce any change to his farming activities due to the Russian import embargo regardless of the type of change planned.

The results of the survey data show large differences in farmers' willingness to increase production of exportable crops due to emerged market opportunities associated with the Russian import ban across the two countries. Only 5.2% of Armenian agricultural producers in the sample expressed an interest in introducing changes in the coming season associated with potential increased demand for agricultural products by the Russian Federation. In contrast, 69.9% of interviewed agricultural producers in Uzbekistan indicated an interest in introducing changes in their farming activities due to the import ban.

Table 2. Farmers' plans on activity changes due to better export opportunities (% of respondents).

| | Armenia | Uzbekistan |
|---|---------|------------|
| Willingness to participate in export market | 5.2 | 69.9 |
| <i>Specific activities:</i> | | |
| Use more inputs | 4.2 | 55.3 |
| Expand wheat area | 3.5 | 19.8 |
| Shrink wheat area | 1 | 15.8 |
| Expand vegetable area | 1.2 | 50.6 |
| Increase animal stock | 2 | 36.5 |
| Increase trees, orchards | 0.5 | 48.9 |
| Construct a greenhouse | 1 | 33.6 |

Source: Author's presentation.

Asked about specific plans, most farmers mentioned that they are planning to intensify their production patterns by using more inputs such as fertilizer, manure, and machinery (Table 2). Furthermore, a rather high share of Uzbek farmers is planning to increase vegetable, fruit, and livestock production, in response to demand in the Russian market.

Given these large differences in motivation of farmers coupled with the pronounced differences in institutional characteristics, the data were not pooled but empirical analyses were carried out for each country separately.

Table 3 presents the probit analysis results. Surprisingly, farm head characteristics such as AGE and EDUCATION have a significant influence on export participation willingness only in Armenia.

Furthermore, none of the variables related to farm characteristics are significant in Armenia or in Uzbekistan.

Table 3. Probit analysis of factors influencing on willingness to participate in export markets.

| | Armenia N=392 | | Uzbekistan N=396 | |
|----------------------------------|------------------|-----------|---------------------|-----------|
| | Coef. | Std. Err. | Coef. | Std. Err. |
| <i>Farm head characteristics</i> | | | | |
| FEMALE | | | 0.298 | 0.433 |
| AGE | -0.087* | 0.052 | -0.080 | 0.053 |
| AGE Squared | 0.001* | 0.000 | 0.001 | 0.001 |
| EDUCATION | 0.110** | 0.055 | 0.010 | 0.035 |
| <i>Farm characteristics</i> | | | | |
| LANDSIZE | 0.014 | 0.012 | -0.005 | 0.003 |
| ASSETS | 0.000 | 0.000 | 0.000 | 0.000 |
| LORRY | 0.437 | 0.288 | -0.260 | 0.303 |
| <i>Institutional variables</i> | | | | |
| FERTSUBSIDY | -0.119 | 0.321 | 0.337 | 0.221 |
| COMMERCIALIZATION | -0.003 | 0.004 | 0.013*** | 0.004 |
| COOPERATIVEMEMBER | 0.384 | 0.261 | 0.655*** | 0.164 |
| QUALITYCONTROL | 0.527* | 0.308 | 0.201 | 0.215 |
| EXTENSION | 0.151 | 0.286 | -1.066*** | 0.207 |
| CONTRACT | 0.843 | 0.556 | 0.910*** | 0.260 |
| INSURANCE | | | 0.427*** | 0.183 |
| Constant | -1.901 | 1.527 | 0.354 | 1.362 |
| Pseudo-R ² | 0.21 | | 0.29 | |
| Significance | 0.001 | | 0.000 | |

Source: Authors' estimations.

Note: *0.10, **0.05 and ***0.010.

Variable FEMALE is omitted from the analysis in case of Armenia due to limited observations.

The variable QUALITYCONTROL has a significant positive effect in Armenia. Thus, farmers whose products are already part of a certain quality control scheme were more willing to increase production of exportable crops to Russia. All other institutional variables were found to be not significant in Armenia. In contrast, all institutional variables except QUALITYCONTROL and SUBSIDY were found to be significant in Uzbekistan. Farmers with a higher commercialization level are more willing when compared to farmers with less commercialization levels. Thus, farmers already selling their products at local and regional markets have a higher probability to be interested in participating in export markets. Participation in cooperatives (which includes both formal and informal cooperatives), access to extension services, marketing according to formal contracts, and participation in insurance markets were also found to have a statistically significant impact. Most of these institutional variables exhibit a positive sign, meaning that they increase the willingness of farmers to participate in export markets. One exception, however, is extension access. Access to extension services reduced the motivation of farmers in Uzbekistan. The variable INSURANCE has a significant positive effect in Uzbekistan. There is no official crop or livestock insurance offered in Armenia. Therefore, this variable is not considered in the analysis.

Discussion

A wide range of supply chain variables are considered in the scope of our study, especially in comparison to existing studies which mainly consider farm characteristics and few specific supply chain characteristics (e.g. Schipmann and Qaim 2010; Rao and Qaim 2011; Wainaina, Okello, and Nzuma 2014). One central finding in this context is that most of these institutional and infrastructure variables showed a significant impact. Thus, our results are fully in line with the statement by Barrett (2008) that the central role played by physical and institutional infrastructure is too often underappreciated in economic analyses of market-related behaviors. A favorable infrastructure contributed to better informed farmers about opportunities and reduced uncertainties by providing information about stages of participation and associated risk. Thus, such infrastructure may reduce market entry and transaction costs for farmers, which have been found to be important factors in determining export market participation (Kandilov and Zheng 2011). Overall, the effects of the infrastructure variables are stronger in the case of Uzbekistan. But one variable

was also found to be significant in Armenia. The Armenian model shows that farms that participate in official quality control programs for their products are more likely to be interested in increasing production of exportable crops.

In the case of Uzbekistan, access to subsidized fertilizer does not necessarily mean lower prices, but rather a reliable source of input because the state also provides the fertilizer to the farmer via state agencies (Bobojonov et al. 2013). Therefore, farmers with reliable access to fertilizer may feel more secure in adjusting production patterns in Uzbekistan. However, access to subsidized fertilizer did not show a significant impact in the analysis. A high level of significance was found in the case of the commercialization variable. Indeed, it is not surprising that farmers who already benefit from better market integration are more willing to also become involved in producing exportable crops. Similarly, a significant positive effect was found for cooperative participation. Membership in either a formal or informal cooperation seems to increase farmers' confidence in the ability to change their farming practices. Zheng, Wang, and Awokuse (2012) explain the high importance of cooperatives in China with that nation's collectivization process, which also could be equally relevant in the CCA, especially in Uzbekistan. The infrastructure in Uzbekistan, especially the irrigation infrastructure, is designed to serve large-scale collective farms (Djanibekov et al. 2012). Thus, cooperation between the farmers is an important aspect not only in export market participation but also in efficient production in general. Spoor and Visser (2004) also discussed the importance of cooperation in large farming systems in Russia, where farmers integrated vertically and horizontally to establish market infrastructure for themselves after the collapse of the state-managed processing and retail infrastructure.

Farmers in Uzbekistan who sell their products via official contracts and farmers with insurance contracts are more open to adjusting their production practices to more exportable crops. This might be explained by the security provided by official and insurance contracts which reduce production risks. The negative impact of the extension access variable comes as a surprise. However, this kind of result is also found elsewhere (Wainaina, Okello, and Nzuma 2014). In Uzbekistan it might reflect the challenges that are associated with the strong state involvement in the supply chains and service infrastructure (Swinnen and Vandeplass 2007; Hornidge, van Assche, and Shtaltovna 2015). More specifically, those extension services are tailored to serve cotton producers and may reduce the opportunity of

farmers to expand the production of alternative crops, as discussed by Bobojonov et al. (2013). Therefore, our results indicate that Uzbekistan needs to reduce the quotas for state procurement crops and improve the capacity of the extension services for crops which are not in the state procurement system. In fact, this type of change has already been observed in the vegetation year of 2016, when the state announced some reduction of procurement of cotton.

The analysis further shows a very weak explanatory power of variables related to farm head characteristics in the Uzbekistan model. These results differ slightly from results of studies analyzing adoption and supply chain participation in developing countries. Carletto et al. (2010) found that age and education of the household head play an important role in the adoption of non-traditional export crops in Guatemala. Similarly, Schipmann and Qaim (2011) show that education, gender, and age of the household head; land size; household labor; and availability of a pickup truck are important determinates of the adoption of sweet pepper production in Thailand. Geoffrey et al. (2013) also observed that age, gender, and education are important factors in influencing farmers' participation in the pineapple market in Kenya. Simmons, Winters, and Patrick (2005) show that farm size and smallholders' age and education all have important effects on participation in contract farming. Thus the results of the Uzbekistan model differ from the findings of these studies. However, estimations from the Armenian model are in line with the findings of the above-mentioned literature; education, farm assets, and availability of a lorry are found to be important factors influencing farmers' willingness to engage in export markets. These differences between Armenia and Uzbekistan could mainly be explained by farm size and commercialization level. Farms in Armenia are relatively small (e.g. Table 1) and more subsistence oriented when compared to farms in Uzbekistan. Therefore, it is not surprising to find similar results in Armenia compared with studies conducted in many developing countries where farms are also rather small (e.g. Wollni and Zeller 2007; Miyata, Minot, and Hu 2009; Carletto et al. 2010; Hernandez, Berdegué, and Reardon 2015). Thus, our results indicate that the integration of farmers into local markets is a prerequisite to develop the agricultural export potential of these countries.

Comparing the above-mentioned results for Armenia and Uzbekistan, the study identifies clear differences in determinants of farmers' export market participation decisions. The results show that farm head and farm characteristics may play the most important role in farmers' export market decisions in small and more

subsistence-oriented farming systems, as observed in Armenia. Physical and institutional infrastructure is underdeveloped and there are very limited possibilities to participate in export markets. Farmers have very high transaction costs to enter export markets, and only farmers with good education and experience may overcome the high transaction cost hurdle. In contrast, supply chain and policy-related factors become a bottleneck or serve as accelerating factors in large-scale, more commercial farming systems in Uzbekistan.

Conclusions

The analyses of this study demonstrate clear differences between Armenia and Uzbekistan in the willingness of farmers to increase the production of exportable commodities. Only about 5% of farmers in Armenia are motivated to increase exportable commodities, compared to about 69% of farmers in Uzbekistan. Overall, this difference can be explained by differences in farm characteristics, commercialization levels of farms, and supply chain development. However, the relative importance of these factors is not uniform across countries. Farm head and farm characteristics are relatively more important in export orientation decisions in Armenia, whereas institutional variables play a more important role in Uzbekistan. Thus, we conclude that variables related to the farm may play a more pronounced role in small-scale and less commercial farming systems, as is often found in Africa and Asia. Transaction costs in these farming systems are very high and farmers need to rely on their own capacity to enter alternative markets when infrastructure is underdeveloped. Farm programs in Armenia need mainly consider issues related to farmer education, easing access to credit, and facilitating the modernization of the supply chains (e.g. establishing formal contract schemes). In contrast, policy and supply chain becomes the main bottleneck in more commercial and large-scale farming systems, as observed in Uzbekistan. Nevertheless, selected variables related to supply chains such as participation in quality control and marketing with contracts were also important in the small-scale farming system in Armenia.

Our analysis also shows the drawback of current supply chain development policies in Uzbekistan, where extension services are mainly concentrated in the development of strategic crops such as cotton, which may reduce the motivation of farmers to diversify their production of other export commodities. Therefore, extension services need to modernize to serve farmers producing alternative export crops.

Notes

1. The simplification process has occurred since the membership of Armenia to the EEU, but is not yet fully finalized.
2. Even though we investigate willingness to participate in export markets in the future rather than actual participation in export markets, we assume that the same factors discussed in the rather large participation literature are also relevant in our case.
3. Very large-scale farms (Armenia: larger than 100 ha; Uzbekistan: larger than 150 ha) are excluded from the analysis. All variables differ significantly from each other according to a *t*-test except for the EDUCATION variable.

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