

RESEARCH

Open Access



# Institutional contributions to agricultural producer price stability

Daria Loginova\*  and Stefan Mann

\*Correspondence:  
daria.loginova@agroscope.  
admin.ch  
Department  
Socioeconomics, Research  
Division Competitiveness  
and System Evaluation,  
Research Station Agroscope,  
Federal Office of Economics,  
Tanikon 1, 8356 Ettenhausen,  
Switzerland

## Abstract

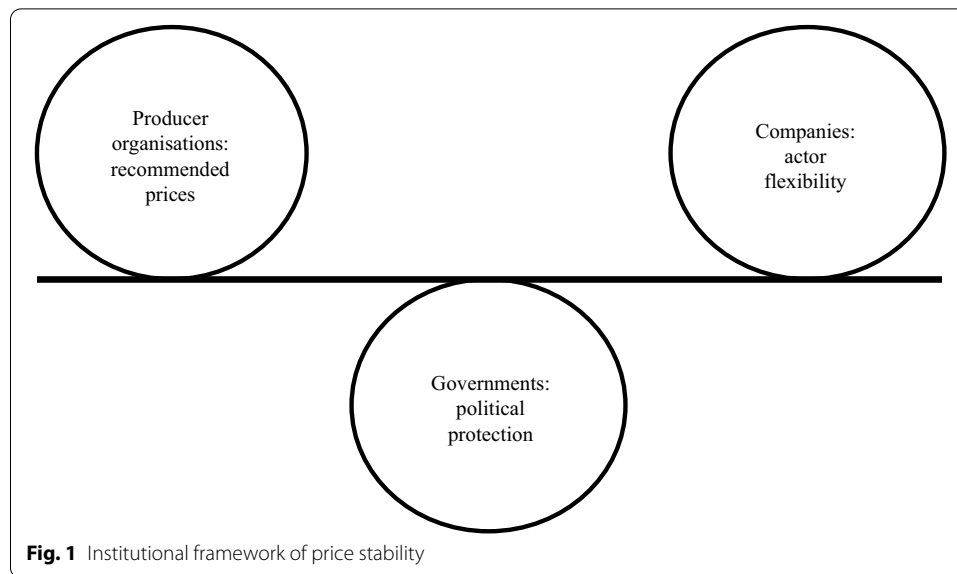
This paper compares the main intersectoral and national agricultural institutions in Russia and Switzerland during the period 2004–2019 and uses data from the Food and Agriculture Organization (FAO), an ordinary least squares model and fixed-effects models to assess the contributions of governments, sectoral producer organisations and companies to agricultural producer price stability. We find significant correlations of price stability with institutional settings that increase actor flexibility—namely a high share of imports in consumption and embedding the supply chain into a network. Our results show that agricultural producer price stability in Russia and Switzerland does not decrease during the period 2004–2019 and depends on both institutional conditions and economic factors.

**Keywords:** Price stability, Agricultural policies, Institutional effects, Russia, Switzerland

**JEL Classification:** O43, Q14, Q18

## Introduction

The stabilisation of agricultural prices through domestic policies and institutions contributes to price variability within and between countries (FAO et al. 2011, p. 8). An ‘export of price fluctuations’ (Pop et al. 2016, p. 540) through border protection is one of the viable ways to keep prices stable, albeit to other countries’ disadvantage. Economists concerned with price stabilisation policies tend to reject such interventions from a welfare perspective. Scholars emphasising the disadvantages of price stabilisation policies (Newbery and Stiglitz 1981; Kanbur 1984; Bevins 1985; Bellemare et al. 2010) soon outnumbered the early defendants of policies that avoided excessive price fluctuations (Keynes 1942; Maizels 1988). Nevertheless, many governments—particularly in the developed world—continue to prioritise price stability in their agricultural policies (Demeke et al. 2012; Spasojević et al. 2018) through various measures. Since Whipple (1986) showed a moderately positive effect of such policies, Pieters and Swinnen (2016), Urruty et al. (2016), Mann (2018) and Muflikh et al. (2021), among others, pointed out the importance of regulations and sectoral structures for agricultural producer prices. Therefore, an analysis of the institutional factors of producer price stability deserves more attention.



In this paper, we understand an institution as ‘an organization or other formal social structure that governs a field of action’ (Rojas 2013). In the context of agricultural price stability, we define institutions both as (1) the aims and the instruments of agricultural and food policies and (2) the market organisation, including price negotiations and corresponding price-setting mechanisms observed in agricultural sectors. We refer the reader to Williamson (2000) for a discussion on the role of institutions in economics and to Reese (2020) for other definitions of institutions. In this paper, we compare the price-stabilising effects of public policies, producer organisations and companies, as Fig. 1 depicts. First, producer organisations attempt to stabilise prices by publishing recommended prices. Potatoes (Swisspatat 2019), milk (LID 2020) and selected grains (Swissgranum 2020) in Switzerland are some examples of this approach. Second, companies in the value chain may create price stability through flexible reactions to domestic shifts in supply or demand (further addressed as ‘actor flexibility’ in this paper). Intermediaries, for example, might store goods or redistribute goods spatially, or importers may become more active if demand expands. Third, governments can provide political protection and favourable economic conditions for production.

To quantify these effects on price stability, we compare Switzerland—a country with a high level of price stabilisation measures—with Russia, where price stability is not an agricultural policy objective.<sup>1</sup> Thus, we compare the producer price stability of a small country with a highly developed and structurally unified agricultural system with that of a large country with a variety of structures in the sector. Our empirical strategy is to carefully discover the most important differences in sectoral, actors’ and governmental development in both countries from the early 2000s until 2020 and to explain producer price variation with a set of variables defining these differences. To the best of our

<sup>1</sup> Agricultural price stability was not found to be mentioned among agricultural or trade policy aims and objectives in the Russian federal legislation. Therefore, a country that has a history of restrictive trade policies (e.g. exports of wheat or an embargo on food imports) minor considers the regulating price stability and focuses mostly on the volumes of supply.

knowledge, this work is the first attempt to quantify the impact of institutions on price stability by comparing the institutions at the sectoral level for these two countries. We employed panel data models with fixed effects and ordinary least squares. These models allow country effects and intersectoral differences to be maintained in one setting.

We present the institutional framework of Switzerland's and Russia's agricultural policies in depth in "[The institutional framework of national agricultural systems](#)" section. In "[Data](#)" and "[Method](#)" sections, we describe the data and the method, and we present our results in "[Results](#)" section. In "[Discussion](#)" section, we discuss our results, and "[Conclusions](#)" section concludes the study.

### **The institutional framework of national agricultural systems**

Switzerland's constitution lays down the basic principles of governance in the Swiss agricultural sector. Russian legislation regulates agricultural and food systems through federal laws. Russia's agricultural producers are classified as agro-companies (SHOs), peasant farms (KFHs) or family farms (LPHs), whereas Swiss agricultural producers are mostly small to medium-sized family farms that mostly produce food for the market.

### **Aims and instruments of agricultural policies**

The Constitution of Switzerland forms the basis for a multifunctional agricultural policy that emphasises the protection of natural resources and agriculture's contribution to food security and rural development (Mann 2012). The relevant document that determines the aims of agricultural policies in Russia is the Federal Law of 29.12.2006N 264-FZ (ed. of 25.12.2018). The agricultural policies in Switzerland and Russia have common aims at the national level, such as the conservation of natural resources and the upkeep of the countryside. In the Constitution of Switzerland, the aims of the agricultural policies do not include competitiveness, the formation of an effectively functioning market or the creation of a favourable investment climate, which are among Russian agricultural policies' main objectives at the federal level. While the Constitution of Switzerland includes a separate article on food security, Russian food security is considered in the Presidential Decree N20 of 2020 (the Doctrine). The Doctrine of 2020 replaced the first version, from 2010, which defined food security mostly as 'import independency' from 2010 to 2020 (Shagaida and Uzun 2015). Switzerland and Russia also consider these and other aims at the cantonal and regional levels.

Both countries have implemented tariffs, quotas and other market interventions. However, while Russia's main legal texts mention these instruments and Switzerland's do not, the actual data contradict this difference. While Russia's producer support estimate (PSE) had been close to zero around the turn of the century and has risen to 12%–15% since 2010 (OECD 2018), Switzerland's PSE has always been above 50%. Contrasting with Switzerland, in Russia, government support concentrates on large farms, small farms rarely participate in food value chains (Wegren et al. 2018; Uzun et al. 2019) and the effect of subsidies on farm revenues differs from region to region (Svetlov et al. 2019). In addition, while Russia's market support consists mostly of product-based subsidies so that Russia does not lock out world market price volatilities, Swiss support measures mainly comprise food market protection.

In Russia in the period from the 1990s through the 2000s, unreliable market organisation<sup>2</sup> and consumer purchasing power<sup>3</sup> pushed retailers to work with guaranteed unified imports rather than look for reliable domestic producers (Strokov 2011). These factors and the depreciating Russian rouble also increased the importance of foreign markets for competitive Russian producers. Russia's agricultural market organisation and support schemes have become a crucial aspect of price formation. The joint enterprises in agricultural markets—so-called 'agro-holdings' (Serova 2007)—have significantly changed the sector's structure since the mid-2000s,<sup>4</sup> which was slightly later than or in line with similar processes in other sectors (Guriev and Rachinsky 2005). For this period, specifically in 2008 compared to 1995, Saraikin and Yanbykh (2014) found an increase in the average technical efficiency of SHOs. After Russia introduced a food embargo on foods from countries supporting sanctions in 2014, domestic producers gained market protection and substituted some imports through domestic production, at least quantitatively.

Switzerland applies direct payments in the agricultural sector that help reduce both farm household income risk and farm revenue risk (see more in el Benni et al. 2012). Annual direct payments towards the sector total around three billion francs per year as do total agricultural incomes. This similar magnitude of tax transfers towards farmers and their incomes, despite food prices being considerably higher than in the surrounding European Union (EU), does not cause major debates in the country since Swiss farmers' contributions to food security and environmental stewardship are widely considered key (Mann 2012). The protection of the sector even extends to agricultural industries, as Leinert et al. (2016) describe. In most agricultural sectors, the prices are negotiated between producers and processors.

### Institutions at the product level

Many institutions that are relevant for price stability exist at the sectoral level rather than the national level. The Russian Government, for example, performs market stabilisation measures only in the wheat, barley, rye, corn, milk, butter, milk powder and cheese sectors.<sup>5</sup> In Switzerland, the basic mechanism used by the government at the product level is a product-tailored import regulation. We will subsequently describe the other two

---

<sup>2</sup> Wegren (2020, Table 1.2) notes that food distribution was disrupted in 1992–1999.

<sup>3</sup> See Brooks and Gardner (2004) and Gardner and Brooks (1994) for food price regulation in Russia in 1990–2000 and for a discussion on the corresponding effects on consumers.

<sup>4</sup> Serova (2007) writes: 'Especially evident this process has become after the crisis of 1998 after which a recovery growth in agri-food sector has started. There is no common name for this form in a literature: Rylko and Jolly (2005) call them New Agricultural Operators (NAO), Serova and Khramova (2002)—vertically integrated companies, in Russian official practice the name of agrohholdings is already assigned for these forms. Regardless the name one uses to identify this phenomenon it unites the number of quite different kind of agricultural companies, established in different ways and motivated by different incentives. Moreover, sometimes the structure of these forms differs dramatically. Not necessarily they are organized as the holding companies, not every case is coupled with vertical integration along supply chain. In this respect the term "new operators" reflects the essence of the phenomenon in the most adequate way—something new verse traditional form. These are the big, much bigger than traditional Soviet farm enterprises and their current heirs, farm operations, established with the capital arrived from outside of a primary sector. (...) there is no still clear understanding and definition of this new phenomenon in Russian agriculture, but it rapidly grows in the last decade and plays significant role in agri-food sector of the country. It is quite opposite direction of Russia's agricultural development than it was supposed to transit after a collapse of the Soviet system: the former collective and state farms are not being split into individual farms but are united into even bigger agricultural companies.'

<sup>5</sup> These interventions were established in 2008 for grains and in 2017 for dairy products. In grain markets, the stabilisation measures were represented by purchasing interventions with auction (market) prices and quotas. Uzun et al. (2017) write that these measures were almost unavailable for small producers because a quota was mainly filled by big players, and the mechanism of price formation was generally unclear to small producers. To the best of our knowledge, the performance of purchasing interventions in the dairy sector has not been assessed so far.

sources of price stabilisation at the sectoral level—the activities of producer organisations and the setting up of commercial companies.

### ***Vegetables, potatoes and sugar beets***

In Switzerland, there is an association for vegetable producers, ‘*Verband Schweizer Gemüseproduzenten*’ (VSGP 2020); an association for fruit producers, ‘*Schweizer Obstverband*’ (SOV 2020); one sugar processor (with two sugar factories) for sugar beet producers; and separate organisations for potato producers. Russia’s institutional landscape is more centralised. The National Union of Fruit and Vegetable Producers (Ovoshnoysouz 2020) has represented producer interests since 2014, while the Union of Russian Sugar Producers (Rossahar 2020) has represented producer interests since 1996. Through these arenas, producers receive both informational updates and an avenue through which to ask the government for support. In Switzerland, fruit and vegetable associations negotiate with processors and publish weekly prices, whereas potato producers and processors agree on price recommendations per season. Russia’s producer organisations do not aim to intervene in price setting, according to their statutes, but tackle the major problems in the sector, including storage, greenhouse facilities, subsidies and trade policies.

Switzerland’s average indicative prices usually correspond to average market prices. The factors that the VSGP considers important determinants of the indicative price for vegetables during the domestic season are storage capacity, climate, shares of organic and conventional products on the market, pricing regulations, production volumes and costs of production. The VSGP also organises an expert discussion to analyse the indicative prices weekly during the domestic harvest. Tariff-rate quotas connect these negotiations with the import regime (Loginova et al. 2021). During the domestic season, producers and storage holders agree on the quota amounts based on production volumes, import data from the previous week and the situation in the previous year. The Swiss Federal Office of Agriculture (FOAG) then usually accepts these amounts. The targeted level of quota realisation defined by the FOAG is more than 60% of the amount declared to the FOAG by importers. Stakeholders in Switzerland have agreed that the recommended prices bring more transparency to the market and reduce the information (and price) disparity between the country’s few big retailers and many farmers.<sup>6</sup> Swiss vegetable markets, consequently, have higher prices during the domestic harvest than during the off-season period without import restrictions.

In Russia, seasonal market protection is applied for tomatoes, cucumbers, peppers and apples (Eurasian Economic Commission 2016; International Trade Centre (ITC) 2020). Consumer and producer prices for vegetables and fruits decrease strongly during the harvest time compared to the rest of the year. Stokov (2011) noted that in the 1990s, many Russian fruit and vegetable farms did not adapt to market conditions mostly due to price disparities and a low level of state support. Russian consumers react to economic restrictions by substituting vegetable purchases with cereal purchases and producing their own vegetables. In the 1990s, households produced more than 90% of

---

<sup>6</sup> We understand price disparity as a situation in which one producer gets a lower price than another because of imperfect information about the fair level of price on the market.

Russia's potatoes and 75% of the country's vegetables for home consumption (Strokov 2011). In 2014 (the year of embargo and exchange rate liberalisation), these figures stood at 77.6% for potatoes and 67% for vegetables (Shagaida et al. 2016). In contrast to vegetables, two-thirds of sugar beet production is concentrated on the lands of the five biggest agro-holdings, which own sugar factories in several regions.

### **Milk**

Before the end of the 1990s, the Swiss Government controlled all dairy product markets in the country (Finger et al. 2017). Because of World Trade Organization (WTO) input and overproduction tendencies in the dairy sector, Switzerland prepared for further market liberalisation. The government introduced the Swiss payment for milk processed into cheese in 1999 to soften the reduction of export subsidies in 1995 (Finger et al. 2017). Switzerland's wave of milk market liberalisation continued with the liberalisation of the cheese trade with the EU in 2002–2007 (OECD 2015), and it finished with the abolishment of milk production quotas in 2009 (El Benni and Finger 2013). Mann and Gairing (2011) note that the administration required milk producers to set up contracts after discontinuing the milk quota—which led, in most cases, to replacing the quota amount with the same production amount in the contract. Abandoning these quotas then led to a complex price regime in which producers received higher prices for the amounts within their former quota. Butter and milk powder are still subject to tariffs and tariff-rate quotas (e.g. Hillen and von Cramon-Taubadel 2019). From 2000 to 2018, the number of milk producers halved, while the average production per farm doubled (Agrarbericht 2019). Thus, the sector is undergoing a particularly strong structural change. The sectoral organisation Branchenorganisation Milch (BOM 2020) also publishes recommended prices and adapts them when market conditions change, usually a few times per year.

Vertical integration in the milk sector was not well developed in Russia from 1990 to 2015, imposing downward pressure on producer prices.<sup>7</sup> During this period, domestic milk production was halved because of a reduction in livestock and low productivity compared to West European producers (Shagaida et al. 2016). After the embargo in 2014, the milk imports from the EU were substituted with milk imports from Belarus, and milk powder import volumes increased (ITC 2020) while many dairy products, such as the EU's cheese varieties, permanently disappeared from the shops. Borodin (2016) noted that milk and beef were experiencing serious problems after the embargo and sanctions because of a relatively low share of large enterprises and an underdeveloped market infrastructure.<sup>8</sup> In 2016, Russian SHOs produced 49% of Russia's milk in a rather unprofitable and highly subsidised way (Shagaida et al. 2017). In 2017, the Russian Government introduced purchasing interventions for dairy products. Multi-national processors, such as Danone, have entered Russia to build integrated supply chains in selected regions. They also joined a public non-profit organisation in the Russian milk and dairy

<sup>7</sup> Previous studies found almost no vertical long-run relationship between prices at different stages of milk markets in Russia (Kharin 2015) and Switzerland (Hillen 2021), which contradicts the studies in other countries.

<sup>8</sup> Later, Petrick and Götz (2019) found no evidence that corporate entities and supra-regional agro-holdings had grown more substantially than medium-sized individual farms in the milk sectors of Russia and Kazakhstan.

sector—the National Union of Milk Producers (Souzmoloko 2020)—which was established in 2008 but does not interfere with price setting, according to its statute. The participants in this organisation in 2020 have produced 70% of Russia's milk and dairy products.

### ***Livestock and feed crops***

For the Russian beef sector, Schierhorn et al. (2016) identified, first, 1998–2008 as a period of high export earnings and growing beef consumption and, second, a change in governmental policies towards livestock producers in 2005. The new policy aimed to support large producers, and it became an effective measure in the poultry and pork sectors but had little impact on the beef sector—where small farms, due to the necessity of grasslands for production, seem to have a comparative advantage (Shagaida et al. 2016). Although beef production productivity and beef demand grew throughout the post-Soviet period, and producer prices were higher than in neighbouring countries, Russia's beef sector remained non-competitive. Post-Soviet problems such as property rights for land (Shagaida 2010), high storage costs and import pressure led to a 75% decrease in cattle (Rosstat 2020) and the abandonment of pastures and lands previously sown with feed crops (Meyfroidt et al. 2016). The growing share of imports in the market volume and the depreciating Russian rouble have driven beef prices to rise since 2000. In contrast, agro-holdings in the poultry and pork sectors grew and provided self-sufficiency by meat on the national level, contributing to relatively low prices for producers and consumers. Later, as noticed by Prikhodko and Davleyev (2014), beef was partially replaced by cheaper poultry in the diets of households in Russia, and the country's meat production moved from household farms to larger commercial organisations. In 2014, family farms' share in Russia's domestic beef production stood at 60.8%. These farms produced meat for their own consumption, and they did not participate in food supply chains (Shagaida et al. 2017). After the embargo in 2014, Russia replaced EU beef with frozen beef from Brazil (ITC 2020) and increased domestic production (Rosstat 2020), and in the pork sector, price volatility increased (Götz and Jaghdani 2017). The markets for animal feed (wheat and by-products of sunflower oil and sugar) supported the country's growing livestock sectors and developed into leading exporters in world markets (Svanidze and Götz 2019). The Russian Grain Union (since 2002) and the national unions of producers in the poultry (Rospticesouz since 2001 and NSP since 2019), pork (NSSRF since 2009) and beef (NSPG since 2012) sectors do not aim to coordinate price setting, according to their statutes (Russian Grain Union 2020; Rospticesouz 2020; NSP 2020; NSSRF 2020; NSPG 2020). However, since 2019, producer organisations have promoted the collaboration of meat producers for exports.

In contrast, the Swiss livestock sector is a system of numerous small farms where cattle are produced mainly in the country's mountain regions, while pork and poultry are produced in the lowlands. Swiss farms producing meat are often integrated into the food chain of the country's two large retailers, Migros and Coop. In Switzerland, industrial meat production is limited by the Animal Welfare Ordinance (2008). While the demand for beef and chicken in Switzerland is price-inelastic, in contrast to pork (Feleke and Kilmer 2007), their consumption has grown slightly over the last 15 years (Agrarbericht 2019). The country produces only a small amount of feed crops, and it imports most

concentrates. Supply chains exist even for small quantities of grain. For wheat, producer organisations publish recommended prices (Logatcheva et al. 2019). The Commission of Market-quality Cereals defines the target prices for bread cereals (wheat and rye since 2014), feed cereals and protein crops (both since 2008), but it shows only average prices for sunflower seeds and rapeseed (Swissgranum 2020).

### Summary

Table 1 summarises the price-relevant instruments that public and private actors employ, albeit not always in all sectors. These instruments potentially contribute to actual producer price stability; therefore, they may be introduced as institutional dummies.

Figure 2 clarifies the dummy variables ‘supply chain integration’, ‘large-scale agriculture’ and ‘dominance of small and medium farms in production’ in the context of the structural settings of the agricultural systems. The criterion used to identify a supply chain is the presence of economic relations, agreements and contracts between producers and processors.

We expect different price-setting mechanisms in the classified patterns because the systems with contracts and agreements are less flexible concerning changes compared to single structures, but they can mute the risks by redistributing them across the agents. For instance, processors can keep the producer price stable by compensating the consumer price shock before it transmits to the producer level, whereas a single agent immediately responds to shocks. The forms in Fig. 2 defined as ‘producers with processing and other opportunities’<sup>9</sup> are called ‘agro-holdings’ or ‘agroholdings’ in the Russian literature if these producers are larger compared to other Russian producers (Serova 2007; Wegren 2020) by market share, land use and volume of production. ‘Agro-holdings’ do not usually build relationships with smaller producers of relevant production; however, they sometimes collaborate to provide unified export volumes or rent lands. We can define an *agro-holding* as a large single producer with clear vertical, but not always horizontal, integration. When both horizontal and vertical integration exist between many producers and processors, we call this a *chain* or a *net*. All Swiss sectors are farms in nets, and that is why the distribution of shocks is the task of price negotiations.

### Data

We aim to understand the contributions of institutions to producer price stability in Switzerland and Russia. We defined a new institutional period with a new agricultural policy and relatively constant institutional conditions. Both Switzerland and Russia experienced a significant change in their agricultural sectors in 2014. In Switzerland, new policy came into effect in 2014 and switched from lump-sum payments per animal and hectare to a more targeted agricultural policy (Mann and Lanz 2013). Russia introduced a ban on several foods in February 2014 and an embargo against many Western countries in August 2014 (Liefert et al. 2019; Cheptea and Gaigné 2020; Loginova and Irek 2022). In addition, the Russian economy experienced a strong devaluation of the Russian rouble following the transition from a managed to a free-floating exchange rate regime.

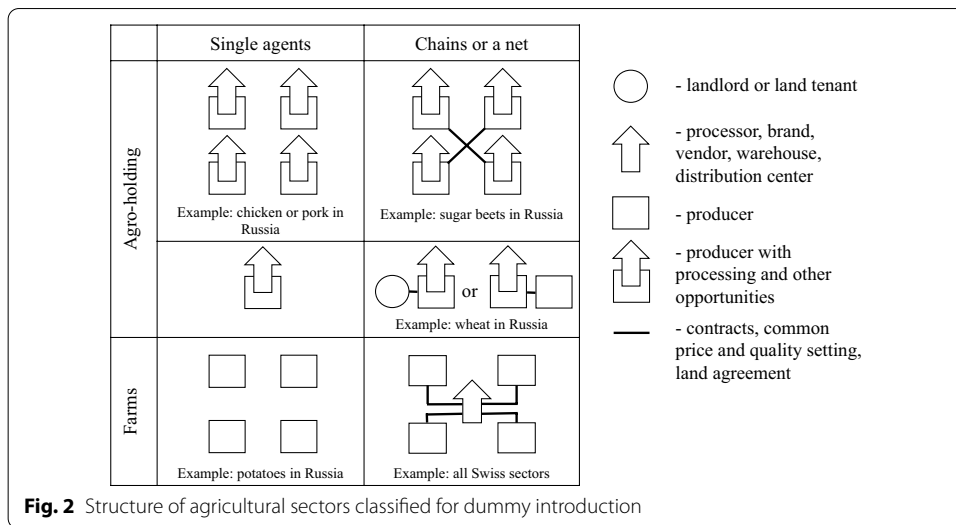
<sup>9</sup> Wegren (2020) writes: ‘Contemporary agroholdings own farms to produce food; possess their own transportation systems, storage and distribution centers; and many have their own networks or retail food stores.’



**Table 1** Institutional instruments of price stabilisation

| Instrument   | Performer              | Switzerland                        |   |   | Russia     |   |   |
|--|------------------------|------------------------------------|---|---|------------|---|---|
|  |                        | 2004–2007                          | 2008–2013   | 2014–2019   | 2004–2007  | 2008–2013   | 2014–2019   |
| Exceptional interventions (purchasing interventions or quotas) | Government             | Sugar beets, milk                  | Sugar beets   | Sugar beets   | No         | Selected grains                                     | Selected grains, milk                               |
| Flexible tariff rate quotas                                    | Government             | Vegetables, fruits                 | Vegetables, fruits                                  | Vegetables, Fruits                                  | No         | No  | No  |
| Price recommendations  | Producer organisations | Vegetables, fruits, milk, potatoes | Vegetables, fruits, milk, potatoes, selected grains | Vegetables, fruits, milk, potatoes, selected grains | No         | No  | No  |
| Supply chain integration (supply nets)                         | Actors                 | All                                | All   | All   | No         | Sugar beets, wheat, sunflowers                      | Sugar beets, wheat, sunflowers                      |
| Large-scale agriculture (agro-holding)                         | Actors                 | No                                 | No  | No  | No         | Pork, poultry, eggs, wheat, sunflowers, sugar beets | Pork, poultry, eggs, wheat, sunflowers, sugar beets |
| Dominance of small and medium farms in production              | Actors                 | All                                | All   | All   | All        | Milk, potatoes, grains (excl. wheat and sunflowers) | Milk, potatoes, grains (excl. wheat and sunflowers) |
| Investment subsidies   | Government             | No                                 | No  | No  | No         | Meat production                                     | Meat production                                     |
| Producer prices above world prices                             | All                    | All                                | All   | All   | Milk, beef | Milk, beef  | Milk, beef  |
| Sector liberalisation  | Government             | No                                 | Milk trade with EU                                  | Milk trade with EU                                  | All        | All   | Grains, eggs, coffee, tea, spices                   |
| Specialisation   | All                    | Beef, milk                         | Beef, milk  | Beef, milk  | No         | Feed wheat, sunflowers, sugar beet                  | Feed wheat, sunflowers, sugar beet                  |

All mentioned events defined the period of 2014–2015 as one of transition, with strong price effects on the domestic agricultural markets. For both Switzerland and Russia, we defined the *food crisis* of 2008 as a significant event of high volatility in the world food markets. This crisis was a challenge for Russia's import-dependent food sectors and also for the Swiss tariff system, which aims to decouple the effects of world market volatility on domestic food markets. We considered the transition and crisis years and, finally, examined the price stability of the following periods: 2004–2005, 2006–2007, 2008–2009, 2010–2011, 2012–2013, 2014–2015, 2016–2017 and 2018–2019, where 2004–2007, 2010–2013 and 2016–2019 are the periods of stable institutions, while 2008–2009 and 2014–2015 are the institutional periods of crisis and transition, respectively.



For both countries, we attempted to use the most reliable data. We used producer price data from the Food and Agriculture Organization (FAO) of the United Nations (2020). The FAO provides officially declared yearly farm gate prices for many countries and unified product categories. There were data for only 15 products produced in both Russia and Switzerland since 2004 onwards, namely barley, eggs, grapes, maize, cattle meat, chicken meat, pig meat, milk, oats, potatoes, rye, sugar beets, sunflower seeds, tomatoes and wheat. For each Russian and Swiss agricultural product with sufficient data availability, we measured price stability, referring to Bedeian and Mossholder (2000), using the coefficient of variation. The coefficient of price variation is a unified-scale measure of diversity, which (i) allows us to compare price (in) stability for different products and countries, (ii) is never negative for positive prices and (iii) is intuitive for price stability understanding. A lower coefficient of price variation indicates more stable prices, whereas an increase in the coefficient of price variation indicates a decrease in price stability. To calculate the price stability measures (dependent variables), we deflated the yearly average producer prices in US dollars for both countries into price levels for 2019, and we calculated the coefficients of variation (the ratios of the standard deviations  $\sigma$  to the means  $\mu$ ) within the defined two-year periods ( $t$ ) for each of the commodities ( $i$ ) produced in each of the two countries ( $c$ ) as follows:

$$y_{i,t,c} = \frac{\sigma_{i,t,c}}{\mu_{i,t,c}}$$

Therefore, we used two observations on prices to calculate the average distance of these observations to their mean. We used prices in US dollars to ensure the prices' comparability between the countries and to consider the relative depreciation of the currencies. We also considered US dollar inflation to make the prices comparable between the years. The use of yearly observations is justified by the absence of monthly observations for most studied years and the seasonality of production for

most crops. Most coefficients of price variation were higher in Russia than in Switzerland (“Appendix 1”).

A list of potential explanatory dummies for institutions was constructed based on the literature review (Table 1). Each dummy was equal to 1 if the corresponding institution has been observed for the country, sector and two-year period, otherwise it was equal to 0. The periods of crisis and transition used the dummy values of the previous period. We also considered sectoral economic data, namely imports, exports, production and food consumption in tonnes provided by the FAO Food Balances. For each combination of country, period and product (sector), we calculated import dependency as the ratio of imports to consumption and export orientation as the ratio of exports to production. As a dependent variable was calculated for each of the two-year periods, we averaged the explanatory variables for the corresponding periods. In total, our analysis was based on 240 observations for two countries, eight periods, 15 products and 19 explanatory variables. The price data were not available for chicken meat in Switzerland in 2016–2019. Therefore, in total, 238 observations were used for the analysis.

### Method

We aimed to use information from all sectors and both countries to distinguish institutional and country contributions to producer price stability in one model. We employed an ordinary least squares (OLS) model and linear models with fixed effects (FELM, ‘*felm*’ function from the ‘*lfe*’ R-package authored by Gaure 2020), namely a linear model with country fixed effects (CFE) and a linear model with fixed effects on institutional periods (IPFE). We estimated different models to illustrate the robustness of the coefficients. The models with fixed effects have higher credibility in terms of assumptions compared to OLS models and, in many cases, eliminate omitted variable bias (Wooldridge 2013). The preferred model satisfies the following criteria: (a) it explains the coefficient of price variation with at least a country dummy (or CFE), price negotiations and an institutional period, (b) it has the best explanatory power among the models of its type (OLS, CFE or IPFE) and passes the necessary tests despite the minimum number of explanatories additional to those mentioned in ‘a’, (c) it contains all significant explanatories which are robust to the specification, and (d) it avoids multicollinearity. Therefore, the list of explanatory variables cannot be the same for all models, which also gives stronger evidence on the estimates that show minor variation across the models. In addition, for the period we analysed, many scholars have described increasing price volatility in food markets (Marsden et al. 2002; Banse et al. 2008; Coulibaly 2013); thus, we considered time trends for price stability.

Formally, for each sector  $i$ , country  $c$  and time  $t$ , we defined the coefficient of price variation  $y_{i,t,c}$  and explained it with a trend  $t$ , an institutional period  $\varphi$ , a country  $X_{i,t,c,1}$ , a dummy on price negotiations in the sector  $X_{i,t,c,2}$  and a set of other explanatory economic variables and institutional dummies, each denoted with index  $k$ , that is  $X_{i,t,c,k}$ . The formulas for the regressions we assessed are as follows:

$$\text{OLS : } y_{i,t,c} = \alpha + \beta_0 * t + \sum_{k=1}^K \beta_k * X_{i,t,c,k} + \sum_{\hat{\varphi}} \tau_{\varphi} * IP_{i,t,c,\varphi} + u_{i,t,c} \tag{1}$$

$$\text{CFE : } y_{i,t,c} = \alpha_c + \beta_0 * t + \sum_{k=2}^K \beta_k * X_{i,t,c,k} + \sum_{\hat{\varphi}} \tau_{\varphi} * IP_{i,t,c,\varphi} + u_{i,t,c} \quad (2)$$

$$\text{IPE : } y_{i,t,c} = \alpha_{\varphi} + \beta_0 * t + \sum_{k=1}^K \beta_k * X_{i,t,c,k} + u_{i,t,c} \quad (3)$$

where  $\alpha$  is a constant and  $\beta_0$  is the slope of the trend. In the OLS and IPFE models,  $\beta_1$  is the country difference (Switzerland compared with Russia) in price variation because  $X_{i,t,c,1}$  is introduced as a dummy. In the CFE model,  $X_{i,t,c,1}$  is excluded from the equation; instead,  $\alpha_c$  is individual for each country, meaning a country fixed effect for country  $c$ .  $\beta_2$  is the contribution of price negotiations to the coefficients of price variation. In the IPFE model,  $\alpha_{\varphi}$  is the individual constant (fixed effect) for each institutional period  $\varphi$ . In the OLS and CFE models, institutional periods are represented as a set of dummies  $IP_{i,t,c,\varphi}$  for each of the institutional periods. We have five institutional periods, and  $\tau_{\varphi}$  denotes the contribution of institutional period  $\varphi$ . However, including all the dummies  $IP_{i,t,c,\varphi}$  into the model leads to multicollinearity; therefore, we use  $\hat{\varphi}$  to denote a subset that excludes one or more institutional periods from  $\varphi$ . A contribution of another explanatory variable  $X_{i,t,c,k}$  is denoted with  $\beta_k$ , and  $u_{i,t,c}$  is an error of the model. We tested dummy variables from a list of institutions (Table 1) as well as sectoral economic indicators (see the descriptive statistics in “Appendix 2”). We do not include any variables for the markets of inputs into the model ‘as output price risks appear to be more important for the farmers’ decision-making’ (Newbery and Stiglitz 1981, p. 63). Each variable described one of the three blocks of influence depicted in Fig. 1, while each  $\hat{\beta}_k$  and  $\hat{\tau}_{\varphi}$  was an estimate of their contributions to price stability.

Governments gain price stability through multiple complex, country-specific policies. We expected lower coefficients of price variation in Switzerland compared to Russia because the Swiss Government is more active in pursuing price-stabilising measures than the Russian Government. However, some policy tools may have a detrimental impact on price stability. This detrimental impact applies, for example, to investment subsidies that increase capital costs and, therefore, sunk costs. Driven by endogenous technological change, price-taking competition may shift to monopolistic competition (Romer 1990), with a corresponding shift in prices. Therefore, the sectors after investment subsidies are expected to experience a decrease in price stability. By contrast, sector liberalisation and product specialisation are expected to increase price stability due to risk allocation.

Producer organisations can also influence price volatility by evening out domestic disruptions through trade and by decreasing information deficiencies. If organisations’ performance is weak in these respects, then market powers will not prevent occasional shortages or overproduction, destabilising prices. Companies can increasingly export during overproduction and import during shortages in the market. We expect that a country attracts imports when it needs to stabilise its markets, while export volumes can be sold abroad in cases of domestic market oversupply. Therefore, we expected negative estimates for export and import variables in the models.

A second potentially stabilising activity is that branch organisations can regularly publish recommended prices. Recommended prices aim to bring more transparency into the market. The VGSP, for instance, argues that operating without recommended prices would result in an even greater information disparity between Switzerland's few big retailers and many farmers. Therefore, the price recommendations in the sectors may decrease information disparities between producers. While price negotiations and recommendations do not primarily aim to stabilise market prices, they can contribute to two-year coefficients of price variation. Sectors where domestic producer prices are higher than world prices are expected to buffer short-term price fluctuations and experience more stable producer prices.

On the farm level, we hypothesised that institutionalised supply chains in which farmers do not rely on self-marketing or internal consumption can reduce farm risks and help to gain producer price stability. This fact is ubiquitous in all Swiss agricultural sub-sectors but not all Russian sectors. We expect agro-holdings to be more flexible concerning price changes and unable to mute risks by redistributing them across the agents. Therefore, we expect significantly higher coefficients of price variations in the sectors with agro-holdings.<sup>10</sup> We expect lower price volatility in the sectors where small farms compete. In addition, we hypothesise that the price variability of crop products exceeds that of meat, eggs and milk as weather irregularities influence crop production much more than animal production.

## Results

We aim to discover the contributions of institutions to producer price stability in Switzerland and Russia. We used sectoral information from both countries to distinguish institutional and country effects with OLS and fixed effects models. Table 2 depicts the results. The presented three models have minor differences in terms of signs, significance and parameter magnitudes so that the estimates seem to be robust. As empty cells in the table indicate, many explanatories were excluded from the final models because of their robust insignificance, minor contribution to the explanatory power of the models (we found lower adjusted coefficients of determination in the models that included these explanatories) and multicollinearity. For the sake of readability, we show the results as they are for ratios and interpret the results as percentages.

The CFE model has shown that the estimated average coefficients of producer price variation are 17% for Russia and 16% for Switzerland. The estimated difference between the coefficients of producer price variation in these two countries is one to four percentage points and insignificant in all the models that included this difference as an explanatory dummy for the coefficients of price variation. The time trend coefficients reveal that, in contrast to conventional wisdom, price stability does not decrease over time, at least the trend was insignificant in all the models we assessed. However, the average coefficients of producer price variation may be 24–25% in times

---

<sup>10</sup> Petrick and Götz (2019) found insignificant effects of agro-holdings in their model for herd growth in the farms of Russia and Kazakhstan.

**Table 2** Results of models explaining the coefficients of producer price variation

| Explanatory variable   | Main models    |                |                | Supplementary model                 |
|--|----------------|----------------|----------------|-------------------------------------|
|  | OLS            | CFE            | IPFE           | IPFE with all explanatory variables |
| Intercept  | 0.27(0.04)***  |                |                |                                     |
| Country (Russia = 0; Switzerland = 1)                        | − 0.01(0.03)   |                | − 0.02(0.03)   | − 0.04(0.04)                        |
| Russia   |                | 0.17(0.03)***  |                |                                     |
| Switzerland  |                | 0.16(0.04)***  |                |                                     |
| Time: trend  | − 0.01(0.01)   | 0(0)           | − 0.01(0.01)   | − 0.01(0.01)                        |
| Institutional period: stable institutions                    |                |                |                |                                     |
| 2004–2007  | − 0.06(0.02)*  |                | 0.2(0.04)***   | 0.24(0.05)***                       |
| 2010–2013  | − 0.03(0.01)*  | − 0.01(0.01)   | 0.21(0.07)**   | 0.25(0.08)**                        |
| 2016–2019  | − 0.04(0.02)*  | − 0.06(0.02)** | 0.19(0.11)     | 0.23(0.11)*                         |
| Institutional period: transitions                            |                |                |                |                                     |
| 2008–2009–Crisis   |                | 0.04(0.02)*    | 0.25(0.06)***  | 0.30(0.06)***                       |
| 2014–2015–Policy change                                      |                |                | 0.24(0.09)**   | 0.27(0.1)**                         |
| Agro-holding structure                                       |                |                |                | − 0.03(0.03)                        |
| Domestic producer price is higher than world price (yes = 1) |                |                |                | − 0.02(0.02)                        |
| Dummy on type of production (crop = 0; animal = 1)           | − 0.03(0.01)** | − 0.03(0.01)** | − 0.03(0.01)*  | − 0.02(0.02)                        |
| Investment subsidies in previous period (yes = 1)            |                |                | − 0.02(0.03)   | − 0.01(0.03)                        |
| Purchasing interventions or quotas (yes = 1)                 |                |                |                | − 0.01(0.02)                        |
| Price negotiations or recommendations (yes = 1)              | − 0.01(0.01)   | − 0.01(0.01)   | − 0.01(0.01)   | − 0.01(0.01)                        |
| Production in small and medium farms (yes = 1)               |                |                |                | − 0.02(0.03)                        |
| Sector liberalisation (yes = 1)                              |                |                |                | − 0.02(0.02)                        |
| Ratio of exports to production                               | 0.05(0.06)     | 0.04(0.06)     | 0.04(0.06)     | 0.07(0.07)                          |
| Ratio of imports to consumption                              | − 0.07(0.02)** | − 0.07(0.02)** | − 0.07(0.02)** | − 0.07(0.03)*                       |
| Specialisation (yes = 1)                                     |                |                |                | − 0.0004(0.02)                      |
| Supply net integration (yes = 1)                             | − 0.06(0.03)*  | − 0.06(0.03)*  | − 0.05(0.03)   | − 0.04(0.04)                        |

Significance codes: \*\*\*\* =  $p \leq 0.001$ ; \*\*\* =  $p \leq 0.01$ ; \*\* =  $p \leq 0.05$ ; \* =  $p \leq 0.1$ . The years under study: 2004–2019. The number of observations is 238. All models are significant according to the F-test on overall significance in regression analysis, where  $H_0$ : The fit of the intercept-only model and the assessed model are equal (the model is significant if  $H_0$  is rejected). The models are selected by best adjusted coefficient of determination, which amounts from 0.32 to 0.33. \* Supplementary model for (i) testing the robustness of the coefficients to adding other explanatories and (ii) presenting the coefficients that we obtained for other explanatories; we do not interpret this model because it has a potential overfit

of crisis and transitions and are lower during the periods of stable institutions, as the IPFE model demonstrates. The OLS model has shown that the coefficients of producer price variation are significantly lower than average during the periods of stable institutions.

The magnitude and significance of most estimates were robust across the specifications that passed the necessary tests. The coefficients of producer price variation are, on average, three to four percentage points higher for crops than for animal products. Each percentage point increase in the share of imports in consumption may be associated with the lower coefficients of producer price variation by 0.07 percentage points. The share of exports in production has the opposite estimate with slightly lower magnitude, and this estimate is insignificant. We do not find any evidence that sectors with a dominance of agro-holding structures have significantly higher or lower price variation. Instead, the sectors with integration of the producers into the supply net (as defined in Sect. "Summary" ) experience lower coefficients of price variation by approximately five to six percentage points. The estimated coefficients for investment subsidies, purchasing interventions, price recommendations, higher domestic prices than world prices in the sector, specialisation and liberalisation are not significant in our models.

The OLS model is inconsistent when the error term is correlated with the institutional settings. The fixed-effects regressions might alleviate this problem, but they are not robust to reverse causality problems. Therefore, the estimates might not consistently estimate the causal effects of the regressors of interest. The mentioned limitations of the models do not allow interpreting the results causally; however, the signs, magnitudes and statistical significance of the estimates give a good indication of the potential differences in the coefficients of price variation under different institutions, which we aimed to quantify. Our results demonstrate that many institutional variables are significant for understanding producer price stability on the sectoral level.

## Discussion

This article brings together the main agricultural policies and institutional development facts from Russia and Switzerland from the early 2000s to 2020, defines the main beneficiaries of producer price stability (the governments, sectoral producer organisations and enterprises) and distinguishes price setting for production in agro-holdings and producer networks. The intersectoral and binational comparison using an ordinary least squares and fixed effects models allowed us to quantify the contributions of the three potentially stabilising blocks of institutional variables.

The main message of our statistical results is the importance of institutional settings that increase flexibility. The sectors with higher share of imports in consumption experience more stable prices, and this relationship can also be read as part of agricultural trade policy. However, the significantly lower coefficients of price variation in the sectors with producer networks show that producers in networks succeed in steering more stable prices compared with producers in other studied types of integration (single agro-holdings or none). Our results suggest that the organisation of agricultural

sectors, trade and intersectoral risks are powerful enough to dominate country-differences in coefficients of producer price variation even when comparing countries as different as Switzerland and Russia. This paper also finds that price stability, at least in Switzerland and Russia, did not decrease in the first two decades of this century. In addition, price variability in the weather-dependent crop sector exceeds price variability in the animal sector.

Switzerland, by buffering world market price fluctuations with tariffs, is effective in reducing price fluctuations. Russia has fewer opportunities to protect domestic markets and suffers from higher price variability. However, neither the size of the country difference estimate nor its significance dominates the other sectoral and institutional factors. The sectors with active price recommendations for producers do not have significantly lower coefficients of producer price variation than the sectors without price recommendations.

The higher actor inflexibility in price setting and stable prices can be viewed also as a slow system adoption to changes or as the producers' self-protection from market risks. Our concept and results advanced the significance of institutional background for producer price stability. For policymakers, initiating price changes in markets with producer supply nets is as much a challenge as trying to stabilise prices among random, non-connected producers, including large and individual producers, such as single agricultural holdings. More stable prices in the sectors with producer networks allow for recommendation to develop producer networks in the sectors where price stability is needed. Our models for Switzerland and Russia for the period from the early 2000s to 2020 have also shown more stable prices in the sectors with higher share of imports in domestic consumption. Therefore, trade policies may help stabilise producer prices.

## Conclusions

We contribute to the existing studies on price stability explanations by defining and quantifying the roles of governments, actors and producer organisations in steering price fluctuations, and we advance the significance of institutional sectoral differences for price volatility studies. Our approach and results are interesting because they help comparing price stability during different institutions using data available for many countries and markets. Although our results are robust for the set of studied institutions and countries, institutional diversity across countries allows for many other explanatory variables and for further model improvement even though the present model has already passed the necessary statistical tests. Therefore, conducting similar institutional studies on price fluctuations in additional sectors and countries is a justified avenue for further research.



**Appendix 1**

See Table 3.

**Table 3** The coefficients of price variation (ratio) in the Swiss and Russian agricultural sectors

| Product         | Russian Federation |           |           |           |           |           |           |           |           |           | Switzerland |           |           |           |           |           |           |           |  |  |
|-----------------|--------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|--|--|
|                 | 2002–2003          | 2004–2005 | 2006–2007 | 2008–2009 | 2010–2011 | 2012–2013 | 2014–2015 | 2016–2017 | 2018–2019 | 2002–2003 | 2004–2005   | 2006–2007 | 2008–2009 | 2010–2011 | 2012–2013 | 2014–2015 | 2016–2017 | 2018–2019 |  |  |
| Barley          | 0.22               | 0.04      | 0.37      | 0.33      | 0.31      | 0.04      | 0.12      | 0.02      | 0.11      | 0.11      | 0.02        | 0.04      | 0.08      | 0.14      | 0.03      | 0.06      | 0.01      | 0         |  |  |
| Eggs            | 0.06               | 0.05      | 0.19      | 0.2       | 0.1       | 0.1       | 0.18      | 0         | 0.04      | 0.13      | 0.02        | 0.03      | 0.01      | 0.14      | 0.05      | 0.04      | 0.01      | 0.01      |  |  |
| Grapes          | 0.24               | 0.19      | 0.19      | 0.22      | 0.03      | 0.16      | 0.13      | 0.25      | 0.01      | 0.33      | 0.02        | 0.07      | 0.01      | 0.12      | 0.02      | 0.01      | 0.04      | 0.01      |  |  |
| Maize           | 0.02               | 0.26      | 0.35      | 0.36      | 0.21      | 0.03      | 0.11      | 0.01      | 0.16      | 0.15      | 0.06        | 0.01      | 0.05      | 0.07      | 0.06      | 0.01      | 0.01      | 0.01      |  |  |
| Meat, cattle    | 0.02               | 0.19      | 0.07      | 0.1       | 0.19      | 0.01      | 0.08      | 0.05      | 0.01      | 0.21      | 0           | 0.07      | 0.06      | 0.14      | 0.04      | 0         | 0.04      | 0.01      |  |  |
| Meat, chicken   | 0.09               | 0.09      | 0.13      | 0.08      | 0.07      | 0.03      | 0.24      | 0.11      | 0.05      | –         | 0           | 0.01      | 0.01      | 0.13      | 0.03      | 0.04      | –         | –         |  |  |
| Meat, pig       | 0.01               | 0.22      | 0.02      | 0.09      | 0.1       | 0.12      | 0.25      | 0.11      | 0.03      | 0.15      | 0.18        | 0.08      | 0.11      | 0.1       | 0.19      | 0.16      | 0.02      | 0.1       |  |  |
| Milk            | 0.12               | 0.13      | 0.17      | 0.21      | 0.14      | 0.09      | 0.29      | 0.19      | 0.05      | 0.1       | 0           | 0.03      | 0.13      | 0.15      | 0.07      | 0.1       | 0.03      | 0.01      |  |  |
| Oats            | 0.11               | 0.05      | 0.18      | 0.14      | 0.2       | 0.15      | 0.25      | 0.13      | 0.09      | 0.11      | 0.01        | 0.03      | 0.06      | 0.12      | 0.03      | 0.05      | 0.05      | 0.01      |  |  |
| Potatoes        | 0.14               | 0.11      | 0.15      | 0.16      | 0.11      | 0.13      | 0.31      | 0.2       | 0.13      | 0.16      | 0.1         | 0         | 0.02      | 0.11      | 0.05      | 0         | 0.07      | 0.02      |  |  |
| Rye             | 0.08               | 0.02      | 0.32      | 0.27      | 0.15      | 0.04      | 0.25      | 0.05      | 0.25      | 0.17      | 0.08        | 0.15      | 0.25      | 0.13      | 0.05      | 0.04      | 0.02      | 0         |  |  |
| Sugar beets     | 0.13               | 0.12      | 0         | 0.13      | 0.03      | 0.04      | 0.02      | 0.08      | 0.22      | 0.12      | 0.02        | 0.08      | 0.19      | 0.09      | 0.08      | 0.03      | 0.05      | 0.01      |  |  |
| Sunflower seeds | 0.04               | 0.01      | 0.49      | 0.28      | 0.1       | 0.04      | 0.07      | 0.06      | 0         | 0.12      | 0.05        | 0.1       | 0.21      | 0.21      | 0.03      | 0.07      | 0.01      | 0         |  |  |
| Tomatoes        | 0.17               | 0.09      | 0.27      | 0.1       | 0.03      | 0.03      | 0.26      | 0.2       | 0.12      | 0.11      | 0.02        | 0.03      | 0.06      | 0.04      | 0.01      | 0.02      | 0.03      | 0.03      |  |  |
| Wheat           | 0.26               | 0.15      | 0.35      | 0.3       | 0.24      | 0.02      | 0.15      | 0.02      | 0.12      | 0.1       | 0.03        | 0.1       | 0.14      | 0.13      | 0.02      | 0.01      | 0.03      | 0.01      |  |  |

**Appendix 2**

See Table 4.

**Table 4** Descriptive statistics of the studied variables

| Descriptive statistics                                       |  | All data               |       |      | Switzerland |       |      | Russia |       |      |     |
|--|--|------------------------|-------|------|-------------|-------|------|--------|-------|------|-----|
| The institutions controlled                                  |  | Performer              | Mean  | Max  | Min         | Mean  | Max  | Min    | Mean  | Max  | Min |
| Coefficient of price variation                               |  | –                      | 0.10  | 0.49 | 0           | 0.06  | 0.25 | 0      | 0.14  | 0.49 | 0   |
| Time trend   |  | –                      | –     | 8    | 1           | –     | 8    | 1      | –     | 8    | 1   |
| Country (Switzerland = 1, Russia = 0)                        |  | Government             | 0.5   | 1    | 0           | 1     | 1    | 1      | 0     | 0    | 0   |
| Stable Institutions 2004–2007                                |  | Government             | 0.25  | 1    | 0           | 0.25  | 1    | 0      | 0.25  | 1    | 0   |
| Stable Institutions 2010–2013                                |  | Government             | 0.25  | 1    | 0           | 0.25  | 1    | 0      | 0.25  | 1    | 0   |
| Stable Institutions 2016–2019                                |  | Government             | 0.25  | 1    | 0           | 0.25  | 1    | 0      | 0.25  | 1    | 0   |
| Crisis 2008–2009   |  | Government             | 0.125 | 1    | 0           | 0.125 | 1    | 0      | 0.125 | 1    | 0   |
| Transitions 2014–2015  |  | Government             | 0.125 | 1    | 0           | 0.125 | 1    | 0      | 0.125 | 1    | 0   |
| Dummy on type of production (crop = 0; animal = 1)           |  | Actors                 | 0.33  | 1    | 0           | 0.33  | 1    | 0      | 0.33  | 1    | 0   |
| Price negotiations (yes = 1)                                 |  | Producer organisations | 0.18  | 1    | 0           | 0.41  | 1    | 0      | 0     | 1    | 0   |
| Purchasing interventions or quotas (yes = 1)                 |  | Government             | 0.14  | 1    | 0           | 0.08  | 1    | 0      | 0.23  | 1    | 0   |
| Supply chain integration (yes = 1)                           |  | Actors                 | 0.5   | 1    | 0           | 1     | 1    | 1      | 0.15  | 1    | 0   |
| Agro-holdings (yes = 1)                                      |  | Actors                 | 0.14  | 1    | 0           | 0     | 0    | 0      | 0.34  | 1    | 0   |
| Small farms (yes = 1)  |  | Actors                 | 0.8   | 1    | 0           | 1     | 1    | 1      | 0.54  | 1    | 0   |
| Specialisation (yes = 1)                                     |  | All                    | 0.13  | 1    | 0           | 0.13  | 1    | 0      | 0.15  | 1    | 0   |
| Investment subsidies in previous period (yes = 1)            |  | Government             | 0.05  | 1    | 0           | 0     | 0    | 0      | 0.12  | 1    | 0   |
| Domestic producer price is higher than world price (yes = 1) |  | All                    | 0.6   | 1    | 0           | 1     | 1    | 1      | 0.17  | 1    | 0   |
| Liberalisation (yes = 1)                                     |  | Government             | 0.45  | 1    | 0           | 0.05  | 1    | 0      | 0.85  | 1    | 0   |
| Ratio of imports to domestic consumption                     |  | All                    | 0.24  | 0.9  | 0           | 0.37  | 0.9  | 0.003  | 0.12  | 0.8  | 0   |
| Ratio of exports to domestic production                      |  | All                    | 0.04  | 0.62 | 0           | 0.03  | 0.3  | 0      | 0.06  | 0.62 | 0   |

### Abbreviations

BOM: Branch organisation of Swiss milk producers (SMP), Bern, Switzerland; CFE: A linear model with country fixed effects; EU: European Union; FAO: Food and Agriculture Organization of the United Nations; FAOSTAT: Food and Agriculture Organization Corporate Statistical Database; FE: Fixed effects; FOAG: Swiss Federal Office of Agriculture, Bern, Switzerland; GEWISOLA: Society for Economic and Social Sciences of Agriculture, Halle, Germany; IEP: Gaidar Institute for Economic Policy, Moscow, Russia; IFAD: International Fund for Agricultural Development; IFPRI: International Food Policy Research Institute; IMF: International Monetary Fund; IPFE: A linear model with fixed effects on institutional periods; ITC: International Trade Centre; JEL: Journal of Economic Literature; KFH: Peasant farms in Russia; LEI: Agricultural Economics Institute, Wageningen, Netherlands; LID: Swiss agricultural information service, Switzerland; LPH: Private family farms in Russia; MPRA: Munich Personal RePEc Archive, Munich, Germany; NBER: National Bureau of Economic Research, Cambridge, Massachusetts; NSP: Russian Union of Poultry Producers (since 2019), Moscow, Russia; NSPG: Russian Union of Beef Producers, Moscow, Russia; NSSRF: Russian Union of Pork Producers, Moscow, Russia; OECD: Organisation for Economic Co-operation and Development; Ovoshnoysoyuz: National Union of Fruit and Vegetable Producers, Moscow, Russia; RANEPa: Russian Presidential Academy of National Economy and Public Administration, Moscow, Russia; Rospicesoyuz: Russian Union of Poultry Producers (since 2001), Moscow, Russia; Rossahar: Russian Union of Sugar Producers, Moscow, Russia; Rosstat: Russian Statistics, Moscow, Russia; RUB: The Russian rouble; SECO: State Secretariat for Economic Affairs, Bern, Switzerland; SHO: Agro-companies in Russia; Souzmloko: Russian Milk Union, Moscow, Russia; SOV: Association of Swiss fruit producers; SSRN: Social Science Research Network; Swissgranum: Swiss branch organisation for cereals, oilseeds and crops, Bern, Switzerland; Swissspatat: Swiss branch organisation for potatoes, Bern, Switzerland; SZG: Swiss Centre for Vegetable Production and of the Special Crops, Bern, Switzerland; UN: United Nations; UN HLTf: High-Level Task Force on Global Food Security of the UN; UNCTAD: United Nations Conference on Trade and Development; US(A): United States of America; USD: The dollar of the United States of America; VIAP: Russian Institute of Agrarian Problems and Informatics named after A. Nikonov; VSGP: Association of Swiss Vegetable Producers, Bern, Switzerland; WFP: World Food Programme; World Bank: World Bank Group; WTO: World Trade Organization; ZHAW: Zurich University of Applied Sciences.

### Acknowledgements

Not applicable.

### Authors' contributions

DL: software, data curation, validation, modelling; SM: conceptualization, supervision, reviewing and editing; Both: investigation, methodology, visualization, original draft preparation. Both authors read and approved the final manuscript.

### Funding

This work was supported by Agroscope.

### Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

### Declarations

#### Competing interests

The authors declare that they have no competing interests.

Received: 9 June 2021 Revised: 8 March 2022 Accepted: 18 March 2022

Published online: 31 March 2022

### References

- Agrarbericht (2019) Swiss agricultural data. FOAG, Bern. <https://www.agrarbericht.ch/de>. Accessed 1 Dec 2021
- Animal Welfare Ordinance (2008) Tierschutzverordnung (TSchV) of 23.04.2008 (status as of 14.07.2020). <https://www.fedlex.admin.ch/eli/cc/2008/416/de>. Accessed 1 Dec 2021
- Banse M, Nowicki P, van Meijl H (2008) Why are current food prices so high? Wageningen, LEI. <https://edepot.wur.nl/28538>. Accessed 1 Dec 2021
- Bedeian A, Mossholder K (2000) On the use of the coefficient of variation as a measure of diversity. *Organ Res Methods* 3(3):285–297. <https://doi.org/10.1177/109442810033005>
- Bellemare M, Barrett C, Just D (2010) The welfare impacts of price fluctuations: evidence from rural Ethiopia. MPRA Paper No. 24457. <https://mpa.ub.unimuenchen.de/24457/>. Accessed 1 Dec 2022.
- Bevins R (1985) Farm policy—the emerging agenda. Missouri, Agricultural Experiment Station. <https://core.ac.uk/download/pdf/75906529.pdf>. Accessed 1 Dec 2021
- BOM (2020) Branch organisation of Swiss milk producers, Bern. <https://www.swissmilk.ch/de>. Accessed 1 Dec 2021
- Borodin K (2016) The impact of the embargo and sanctions on the agri-food markets in Russia: analysis of consequences. *Vopr Ekon* 4:124–143. <https://doi.org/10.32609/0042-8736-2016-4-124-143>
- Brooks K, Gardner B (2004) Russian agriculture in the transition to a market economy. *Econ Dev Cult Change* 52:571–586. <https://doi.org/10.1086/386534>
- Cheptea A, Gaigné C (2020) Russian food embargo and the lost trade. *Eur Rev Agric Econ* 47(2):684–718. <https://doi.org/10.1093/erae/jbz032>
- Coulibaly A (2013) The food price increase 2010–2011: causes and impacts. Ottawa, Library of Parliament. [https://publications.gc.ca/collections/collection\\_2016/bdp-lop/bp/YM32-2-2013-2-eng.pdf](https://publications.gc.ca/collections/collection_2016/bdp-lop/bp/YM32-2-2013-2-eng.pdf). Accessed 1 Dec 2021

- Demeke M, Dawe D, Tefft J, Ferede T, Bell W (2012) Stabilizing price incentives for staple grain producers in the context of broader agricultural policies. ESA Working paper No. 12–05. Rome, FAO. [https://www.canr.msu.edu/afre/uploads/files/Tefft\\_James/ap536e.pdf](https://www.canr.msu.edu/afre/uploads/files/Tefft_James/ap536e.pdf). Accessed 1 Dec 2021
- El Benni N, Finger R (2013) Gross revenue risk in Swiss dairy farming. *J Dairy Sci* 96(2):936–948. <https://doi.org/10.3168/jds.2012-5695>
- El Benni N, Finger R, Mann S (2012) Effects of agricultural policy reforms and farm characteristics on income risk in Swiss agriculture. *Agric Finance Rev* 72(3):301–324. <https://doi.org/10.1108/00021461211277204>
- Eurasian Economic Commission (2016) Decision No. 101 of the Council of the Eurasian Economic Commission. [https://docs.eaeunion.org/docs/en-us/01512218/cncd\\_09122016\\_101](https://docs.eaeunion.org/docs/en-us/01512218/cncd_09122016_101). Accessed 1 Dec 2021
- FAO, OECD, IFAD, IMF, UNCTAD, WFP, the World Bank, the WTO, IFPRI, UN HLTf (2011) Price volatility in food and agricultural markets: Policy responses. Policy report. [http://www.fao.org/fileadmin/templates/est/Volatility/Interagency\\_Report\\_to\\_the\\_G20\\_on\\_Food\\_Price\\_Volatility.pdf](http://www.fao.org/fileadmin/templates/est/Volatility/Interagency_Report_to_the_G20_on_Food_Price_Volatility.pdf). Accessed 1 Dec 2021
- Feleke S, Kilmer R (2007) Analysis of the demand for imported meat in Switzerland using a dynamic specification: implications for the European Union. *Agribusiness* 23(4):497–510. <https://doi.org/10.1002/agr.20138>
- Finger R, Listorti G, Tonini A (2017) The Swiss payment for milk processed into cheese: ex post and ex ante analysis. *Agric Econ* 48(4):437–448. <https://doi.org/10.1111/agec.12345>
- Food and Agriculture Organization (FAO) of the United Nations (2020): FAO (2020) FAO statistics, Rome. <http://www.fao.org/faostat/en/>. Accessed 1 Dec 2022.
- Gardner BL, Brooks KM (1994) Food prices and market integration in Russia: 1992–93. *Am J Agric Econ* 76(3):641–646. <https://doi.org/10.2307/1243681>
- Gaure S (2020) 'lfe' R-package. <https://www.rdocumentation.org/packages/lfe/versions/2.8-5.1/topics/felm>
- Götz L, Jaghdani T (2017) Russia's agricultural import substitution policy: Price volatility effects on the pork supply chain. Weihenstephan, GEWISOLA-57, 262003. <https://doi.org/10.22004/ag.econ.262003>
- Guriey S, Rachinsky A (2005) The role of oligarchs in Russian capitalism. *J Econ Perspect* 19(1):131–150. <https://doi.org/10.1257/0895330053147994>
- Hillen J (2021) Vertical price transmission in Swiss dairy and cheese value chains. *Agric Food Econ* 9:13. <https://doi.org/10.1186/s40100-021-00187-3>
- Hillen J, Cramon-Taubadel S (2019) Protecting the Swiss milk market from foreign price shocks: public border protection vs. quality differentiation. *Agribusiness* 35(4):516–536. <https://doi.org/10.1002/agr.21602>
- ITC (2020) Trade data. Geneva, International Trade Centre. <https://www.trademap.org/>. Accessed 1 Dec 2021
- Kanbur R (1984) How to analyse commodity price stabilization? A review article. *Oxf Econ Pap* 36(3):336–358
- Keynes J (1942) The international regulation of primary products (reprint). In: Keynes JM, *Collected works*, Volume XXVII, Macmillan, 1982
- Kharin S (2015) Vertical price transmission along the [dairy] supply chain in Russia. *Stud Agric Econ* 117(2):80–85. <https://doi.org/10.7896/j.1517>
- Leinert L, Brand F, Duma F (2016) Food sector study: Figures, structure, forces of change, and development potential of the Swiss food industry. Zurich ZHAW School Manag Law. <https://doi.org/10.21256/zhaw-1188>
- LID (2020) Target price for milk remains unchanged. *Bauernzeitung*, 29 January 2020. <https://www.bauernzeitung.ch/artikel/richtpreis-milch-bleibt-unverändert>
- Liefert W, Liefert O, Seeley R, Lee T (2019) The effect of Russia's economic crisis and import ban on its agricultural and food sector. *J Eurasian Stud* 10(2):119–135. <https://doi.org/10.1177/1879366519840185>
- Logatcheva K, van Galen M, Janssens B, Rau M, Baltussen W, van Berkum S, Mann S, Ferjani A, Cerca M (2019) Factors driving up prices along the food value chain in Switzerland—case studies on bread, yoghurt, and cured ham. *Strukturberichterstattung No 60/3*. Bern, State Secretariat for Economic Affairs SECO. [https://www.seco.admin.ch/seco/de/home/Publikationen\\_Dienstleistungen/Publikationen\\_und\\_Formulare/Strukturwandel\\_Wachstum/Branchenanalysen/factors-driving-up-prices-along-the-food-value-chain-in-switzerland.html](https://www.seco.admin.ch/seco/de/home/Publikationen_Dienstleistungen/Publikationen_und_Formulare/Strukturwandel_Wachstum/Branchenanalysen/factors-driving-up-prices-along-the-food-value-chain-in-switzerland.html). Accessed 1 Dec 2021
- Loginova D, Irek J (2022) Russian meat price transmission and policy interventions in 2014. *Agric Food Econ* 10(1):2. <https://doi.org/10.1186/s40100-021-00208-1>
- Loginova D, Portmann M, Huber M (2021) Assessing the effects of seasonal tariff-rate quotas on vegetable prices in Switzerland. *J Agric Econ* 72(2):607–627. <https://doi.org/10.1111/1477-9552.12424>
- Maizels A (1988) Commodity instability and developing countries: the debate. Helsinki, United Nations University. <https://digitallibrary.un.org/record/56689>. Accessed 1 Dec 2021
- Mann S (2012) Swiss agricultural policy—taking multifunctionality to the extreme. *Ann Pol Assoc Agric Aribus Econ* 14(6):182–185
- Mann S, Gairing M (2011) Post milk quota experiences in Switzerland. *EuroChoices* 10(2):16–21. <https://doi.org/10.1111/j.1746-692X.2010.00160.x>
- Mann S, Lanz S (2013) Happy Tinbergen: Switzerland's new direct payment system. *EuroChoices* 12(3):24–28. <https://doi.org/10.1111/1746-692X.12036>
- Mann S (2018) *Socioeconomics of agriculture. Switzerland*, Springer International Publishing, p 23. <https://doi.org/10.1007/978-3-319-74141-3>
- Marsden D, Banks J, Bristow G (2002) The social management of rural nature: Understanding agrarian-based rural development. *Environ Plan A* 34(5):809–825. <https://doi.org/10.1068/a3427>
- Meyfroidt P, Schierhorn F, Prishchepov A, Müller D, Kuemmerle T (2016) Drivers, constraints and trade-offs associated with reutilizing abandoned cropland in Russia, Ukraine and Kazakhstan. *Glob Environ Change* 37:1–15. <https://doi.org/10.1016/j.gloenvcha.2016.01.003>
- Muflikh Y, Smith C, Brown C, Aziz A (2021) Analysing price volatility in agricultural value chains using systems thinking: a case study of the Indonesian chilli value chain. *Agric Syst*. <https://doi.org/10.1016/j.agry.2021.103179>
- Newbery D, Stiglitz J (1981) *The theory of commodity price stabilization. A study in the economics of risk*. Oxford, Clarendon Press
- NSP (2020) National union of poultry producers of Russia, Moscow. [poultryunion.org/](http://poultryunion.org/). Accessed 1 Dec 2021
- NSPG (2020) National union of beef producers of Russia, Moscow. [www.nspg.ru/](http://www.nspg.ru/). Accessed 1 Dec 2021

- NSSRF (2020) National union of pork producers of Russia, Moscow. [www.nssrf.ru/](http://www.nssrf.ru/). Accessed 1 Dec 2021
- OECD (2015) OECD review of agricultural policies: Switzerland 2015. Paris OECD Publishing. <https://doi.org/10.1787/9789264168039-en>
- OECD (2018) Agricultural policy monitoring and evaluation 2018. Paris OECD Publishing. [https://doi.org/10.1787/agr\\_pol-2018-en](https://doi.org/10.1787/agr_pol-2018-en)
- Ovoshnoysouz (2020) National union of fruit and vegetable producers of Russia, Moscow. <https://ovoshnoysouz.ru/>. Accessed 1 Dec 2021
- Petrick M, Götz L (2019) Herd growth, farm organisation and subsidies in the dairy sector of Russia and Kazakhstan. *J Agric Econ* 70(3):789–811. <https://doi.org/10.1111/1477-9552.12318>
- Pieters H, Swinnen J (2016) Trading-off volatility and distortions? Food policy during price spikes. *Food Policy* 6:27–39. <https://doi.org/10.1016/j.foodpol.2016.01.004>
- Pop L, Rovinaru M, Rovinaru F (2016) Managing the agricultural price volatility—A governmental approach from a global and European perspective. *Interdisciplinary Management Research Conference* 12:531–544. ISSN 1847-0408. <https://imr-conference.com/en/past-issues/>. Accessed 1 Dec 2021
- Presidential Decree N20 of 21.01.2020, Doctrina prodovolstvennoy besopasnosti (in Russian). <https://www.garant.ru/products/ipo/prime/doc/73338425/>. Accessed 1 Dec 2021
- Presidential Decree N120 of 30.01.2010, Doctrina prodovolstvennoy besopasnosti (in Russian). [http://www.consultant.ru/document/cons\\_doc\\_LAW\\_96953/](http://www.consultant.ru/document/cons_doc_LAW_96953/). Accessed 1 Dec 2021
- Prikhodko D, Davleyev A (2014) Russian Federation: meat sector review. Rome, FAO. <https://www.fao.org/3/i3533e/i3533e.pdf>. Accessed 1 Dec 2021
- Reese J (2020) Institutional change and the limitations of consumer activism. *Palgrave Commun* 6(1):1–8. <https://doi.org/10.1057/s41599-020-0405-8>
- Rojas F (2013) Institutions. *Oxford bibliographies*. [www.oxfordbibliographies.com](http://www.oxfordbibliographies.com). Accessed 1 Dec 2021
- Romer P (1990) Endogenous technological change. *J Polit Econ* 98(5):71–102
- Rospicesouz (2020) Russian union of poultry producers, Moscow. [www.rps.ru](http://www.rps.ru)
- Rossahar (2020) Russian union of sugar producers, Moscow. [www.rossahar.ru](http://www.rossahar.ru)
- Rosstat (2020) Russian agricultural data. Federal State Statistic Service, Moscow. <https://rosstat.gov.ru/>. Accessed 1 Dec 2021
- Russian Grain Union (2020) Russian grain union, Moscow. [www.grun.ru](http://www.grun.ru). Accessed 1 Dec 2021
- Saraikin V, Yanbykh R (2014) Analysis of changes in technical efficiency of Russian agricultural organizations during the reform period. *Stud Russ Econ Dev* 25(4):343–350. <https://doi.org/10.1134/S1075700714040108>
- Schierhorn F, Meyfroidt P, Kastner T, Kuemmerle T, Prishchepov A, Müller D (2016) The dynamics of beef trade between Brazil and Russia and their environmental implications. *Glob Food Sec* 11:84–92. <https://doi.org/10.1016/j.gfs.2016.08.001>
- Serova E (2007) Agro-holdings: vertical integration in agri-food supply chains in Russia. In: Swinnen J (ed) *Global supply chains, standards and the poor: how the globalization of food systems and standards affects rural development and poverty*. Wallingford
- Shagaida N, Gataulina E, Uzun V, Yanbykh R (2017) Development of mechanisms for embedding small forms of management in food chains. SSRN J. <https://doi.org/10.2139/ssrn.2958801>
- Shagaida N, Uzun V (2015) Food security: problems of assessing. *Vopr Ekon* 5:63–78 (in Russian). <https://doi.org/10.32609/0042-8736-2015-5-63-78>
- Shagaida N, Uzun V, Gataulina E, Shishkina E, Zhorova M (2016) Elaboration of approaches for depicting the priorities of Russian agriculture development. RANEPa Report. SSRN J. <https://doi.org/10.2139/ssrn.3071505>
- Shagaida N (2010) Land market in Russian agriculture: Institutes' transformation and practice. Moscow, Gaidar Institute for Economic Policy (IEP). [https://www.iep.ru/files/text/working\\_papers/142.pdf](https://www.iep.ru/files/text/working_papers/142.pdf). Accessed 1 Dec 2021
- Souzmoloko (2020) Russian milk union, Moscow. <http://souzmoloko.ru>
- SOV (2020) Association of Swiss fruit producers, Zug. <https://www.swissfruit.ch/>
- Spasojević B, Đukić A, Erić O (2018) Price stability of agricultural products in the European Union. *Ekon Poljopr* 65(4):1585–1598. <https://doi.org/10.5937/ekoPolj18045855>
- Strokov A (2011) Economic justification and scenarios of development of vegetable and potato subcomplex of Russia. Dissertation, All-Russian Institute of Agrarian Problems and Informatics (VIAPi), Moscow. <https://istina.msu.ru/dissertations/7958418/>. Accessed 1 Dec 2021
- Svanidze M, Götz L (2019) Spatial market efficiency of grain markets in Russia: Implications of high trade costs for export potential. *Glob Food Sec* 21:60–68. <https://doi.org/10.1016/j.gfs.2019.07.004>
- Svetlov N, Yanbykh R, Loginova D (2019) On the diversity of the effects of the state support for agriculture. *Vopr Ekon* 4:59–73. <https://doi.org/10.32609/0042-8736-2019-4-59-73>
- Swissgranum (2020) Swiss branch organisation for cereals, oilseeds and crops, Bern. <https://www.swissgranum.ch>. Accessed 1 Dec 2021
- Swisspatat (2019) Average potato harvest with good food quality expected. Swiss branch organisation for potatoes. <https://www.kartoffel.ch>. Accessed 1 Dec 2021
- Urruty N, Tailliez-Lefebvre D, Huyghe C (2016) Stability, robustness, vulnerability and resilience of agricultural systems. A review. *Agron Sustain Dev* 36:1–15. <https://doi.org/10.1007/s13593-015-0347-5>
- Uzun V, Shagaida N, Lerman Z (2019) Russian agriculture: growth and institutional challenges. *Land Use Policy* 83:475–487. <https://doi.org/10.1016/j.landusepol.2019.02.018>
- Uzun V, Svetlov N, Shagaida N, Loginova D, Shishkina E (2017) Improvement of mechanisms of state regulation of the Russian grain market (7 June 2017). <https://doi.org/10.2139/ssrn.2982309>
- VSGP (2020) Association of Swiss vegetable producers, Bern. <https://www.gemuese.ch/>. Accessed 1 Dec 2021

- Wegren S (2020) Russia's food revolution: the transformation of the food system. Routledge, Routledge Contemporary Russia and Eastern Europe Series
- Wegren S, Nikulin A, Trotsuk I (2018) Food policy and food security: putting food on the Russian table. Lexington Books, Lanham
- Whipple G (1986) Market stability and the welfare effects of dairy market regulation. *North Cent J Agric Econ* 8(1):29. <https://doi.org/10.2307/1349079>
- Williamson O (2000) The new institutional economics: taking stock, looking ahead. *J Econ Lit* 38(3):595–613. <https://doi.org/10.1257/jel.38.3.595>
- Wooldridge J (2013) *Introductory econometrics: a modern approach*, 5th edn. Cengage Learning, South-Western

### **Publisher's Note**

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

**Submit your manuscript to a SpringerOpen<sup>®</sup> journal and benefit from:**

- ▶ Convenient online submission
- ▶ Rigorous peer review
- ▶ Open access: articles freely available online
- ▶ High visibility within the field
- ▶ Retaining the copyright to your article

---

Submit your next manuscript at ▶ [springeropen.com](https://www.springeropen.com)

---