Cows cross the Merke–Taraz highway at Zhambyl Oblast, Kazakhstan, the site of an ADB investment programme. (Credit: Asian Development Bank, 'CAREC Transport Corridor 1 (Zhambyl Oblast Section) Investment Program in Kazakhstan'/Flickr, licensed under CC BY-NC-ND 2.0, original cropped)

Expert Comment

# Farewell to agriculture? Productivity trends and the competitiveness of agriculture in Central Asia

**Behrooz Gharleghi and Vladimir Popov (2018)**

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This paper is part of research that was conducted for the Food and Agriculture Organization of the United Nations (FAO) on scenarios of agricultural development in Central Asia.

# Farewell to agriculture? Productivity trends and the competitiveness of agriculture in Central Asia

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## Abstract

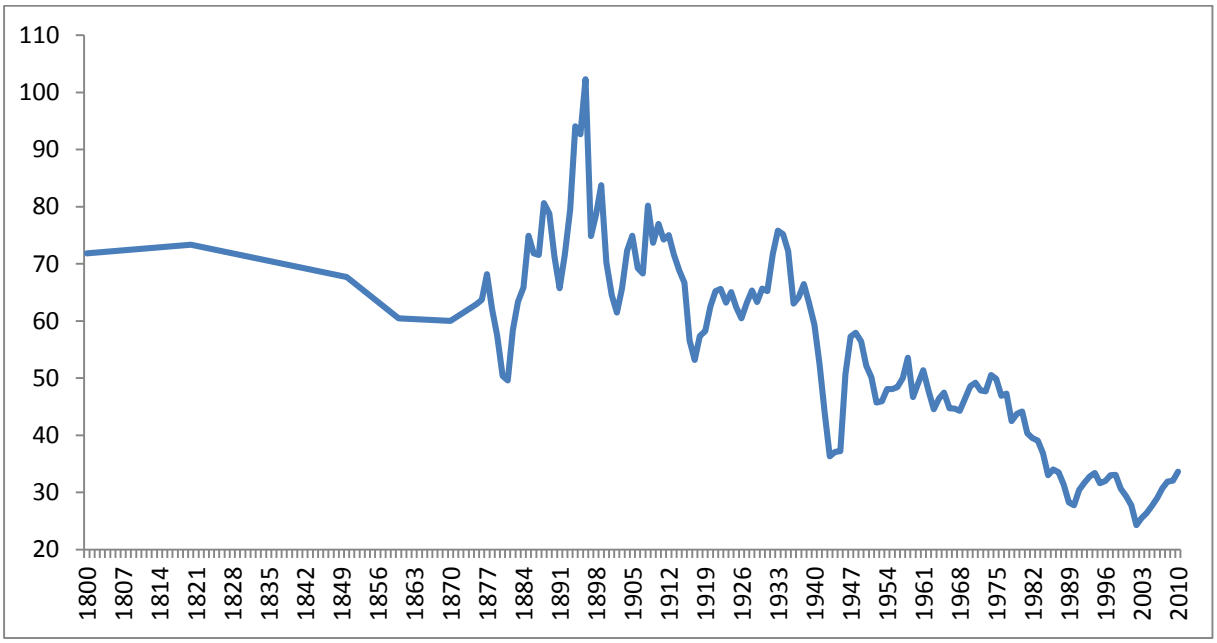
Agricultural productivity in the Central Asian republics of the USSR stopped growing from the late 1970s and declined in the 1990s when the transition to the market occurred. As a result, most agricultural goods were uncompetitive on both the domestic market and the world market, and the agricultural trade balance deteriorated as imports grew faster than exports. Although there have been a few success stories – cereals in Uzbekistan, meat production in Azerbaijan, oil seeds in Kazakhstan – the overall picture is not one of agriculture as the driving force of the region's future growth. We argue, however, that the relative decline of agriculture is consistent with international experience. In 'economic miracle' countries, the share of agriculture fell faster than in other countries because the sector donated labour to the industrial sector, which was the engine of growth. The problem in Central Asia is not the slow growth of agricultural output, but the slow growth of productivity in agriculture, which fails to increase the competitiveness of agricultural products and leads to an inability of the rural population to move to more productive industrial activities.

## Introduction

It is important to recognise that no economic miracle in the last 100 years, anywhere in the world, has been based on either agricultural or service industries. In the 16-19th centuries there were cases of 'Western offshoots' – settlement colonies, like Australia, Canada, New Zealand, and the US, which relied extensively on extractive industries and agriculture. Harold Innis, the Canadian economist, even developed the staples theory of economic development, explaining important stages of Canada's economic development by shifts from one major export commodity to another – from furs to fish, to lumber, to wheat, to mined metals and coal. Even today, the US, Canada, Australia, and New Zealand remain important exporters of agricultural commodities.

In the 20th century, after the industrial revolution in major Western countries, there were no cases of miracle-growth stories being associated with agricultural exports. On the contrary, spectacular failures of growth occurred in countries specialising in the export of agricultural produce. Argentina, a developed country at the turn of the 20th century (fig. 1), lost its rich country status and became a developing country. It remains to be proven, of course, whether this was related to Argentina's agricultural specialisation or not, but the hard facts are that the successful catch-up development of other developing countries only began in the mid-20th century and was always associated with manufacturing exports, not with agricultural or resource exports. In fact, the only cases of successful catch-up – developing countries or territories becoming 'developed'; Japan, South Korea, Taiwan, Singapore, Hong Kong – came through an increasing of manufacturing exports. Later, other Southeast Asian countries (ASEAN) and China followed the same pattern. Only Botswana (diamonds) and Mauritius (sugar cane and fish products in addition to textiles) may be seen as exceptions to the rule.

**Figure 1: Per capita PPP GDP in Argentina as a percentage of US per capita PPP GDP**



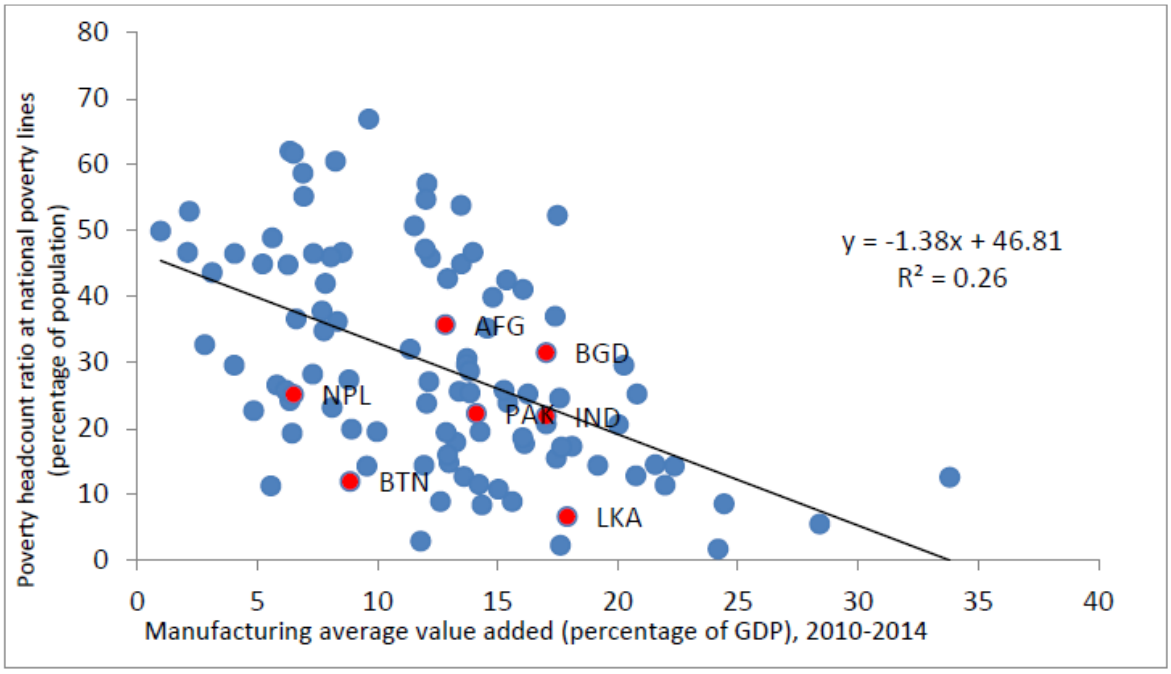

Source: Data from Maddison (2014); figure by present authors.

The reduction of the share of agriculture in GDP and the growth of the share of industry during the industrialisation – and later, an increase of the share of services at the expense of both agriculture and industry – is an objective process (Chenery, 1960; Chenery and Taylor, 1968; Chenery and Syrquin, 1992). However, in fast-growing countries (e.g., China), the decline in the share of industry has been slower than in other countries. At the same time, it appears that the increase in the share of machinery and equipment in manufacturing output, as seen in China, usually accompanies rapid growth or even becomes the engine of growth. We do not know of any cases of rapid growth ('economic miracles'), which are based on the accelerated growth of the service sector.

The results of a recent ESCAP study (2016) suggest that the poverty headcount depends on the share of manufacturing in GDP (fig. 2). It predicts that an industry-oriented structural transformation, enhancing agricultural productivity through sustainable agriculture and making overall efficiency improvements through innovations, has the potential to lift an

additional 71 million people out of poverty, create 56 million additional jobs in South Asia, and boost GDP by 15-30% by 2030.

**Figure 2: Manufacturing value added as a percentage of GDP and poverty headcount (percentage of the population)**




Source: Kumar, Hammill, Raihan, and Panda (2016); used with permission.

Rodrik et al. (2016) consider two sources of productivity growth: growth within an industry and growth due to structural shifts, i.e., reallocations of resources to more productive industries. The role of agriculture in promoting successful catch-up development in a developing country may be not so much to ensure food security or to act as an engine for exports and growth, but to release the labour force to move to industry where productivity is much higher. If employment in agriculture were to decline, it would be easier to achieve productivity increases in agriculture itself, because, *ceteris paribus*, land-to-labour and capital-to-labour ratios would increase.

Policymakers and scholars often see the role of agriculture as a sector that provides employment and livelihood for a significant part of the population. It employs one-third to

one-half of the population in Central Asian countries. If the agricultural sector shrinks, people lose jobs and incomes and unemployment and poverty grow. However, the way to deal with the problem is not to slow down the reduction of employment in agriculture, but to facilitate the re-education and readjustment of the workforce released from agriculture, so that former rural labourers can find more productive employment in urban and rural industry. China's rural Township and Village Enterprises are a case in point. They provided about 20% of total employment at the turn of the century, when rural employment was 50% of total employment: 20 p.p, in industry and 30 p.p. in agriculture. Unemployment and poverty should not be dealt with by promoting obsolete technology and backward sectors – for example, using spades (or even teaspoons, as the saying attributed to Milton Friedman goes) instead of excavation machinery – but by facilitating the reallocation of the workforce into sectors with higher productivity. Such an approach kills two birds with one stone: increasing productivity in agriculture through moving farmers into industry, where productivity is higher.

In a similar vein, Rodrik (2012) describes two approaches to development – bottom-up and top-down. The former focuses directly on the poor and on delivering services like education, health care, and microcredit to communities. This tradition's motto could be, 'Development is accomplished one project at a time'. The other approach takes an economy-wide perspective. It emphasises broad reforms that affect the overall economic environment, and thus focuses on areas such as international trade, finance, macroeconomics, and governance.

The first approach uses widely randomised controlled trials as an instrument towards formulating good policies – e.g., vaccinations, microcredit, additional teachers in schools, mosquitoes bed nets dipped in insecticide. These are considered small projects leading to big breakthroughs. But without reforms at the macro level it is often impossible to ensure the efficiency of micro projects (Reddy, 2013). If assistance provided for particular

investment projects crowds out government or private investment, the macro impact of the assistance will be minimised.

As Rodrik (2012) writes, “poverty is often best addressed not by helping the poor be better at what they already do, but by getting them to do something different”**.** This latter approach is exactly the one defended in this paper. Countries of the Global South can gain much more by moving people from agriculture to manufacturing industries and promoting export-oriented growth based on manufacturing products than by trying to preserve agricultural employment by protecting and subsidising agricultural production. Domestic policies and foreign assistance aimed at structural shifts away from agriculture and in favour of manufacturing would be more beneficial to catch-up development than a thousand small microcredit projects aimed at retaining agricultural employment.

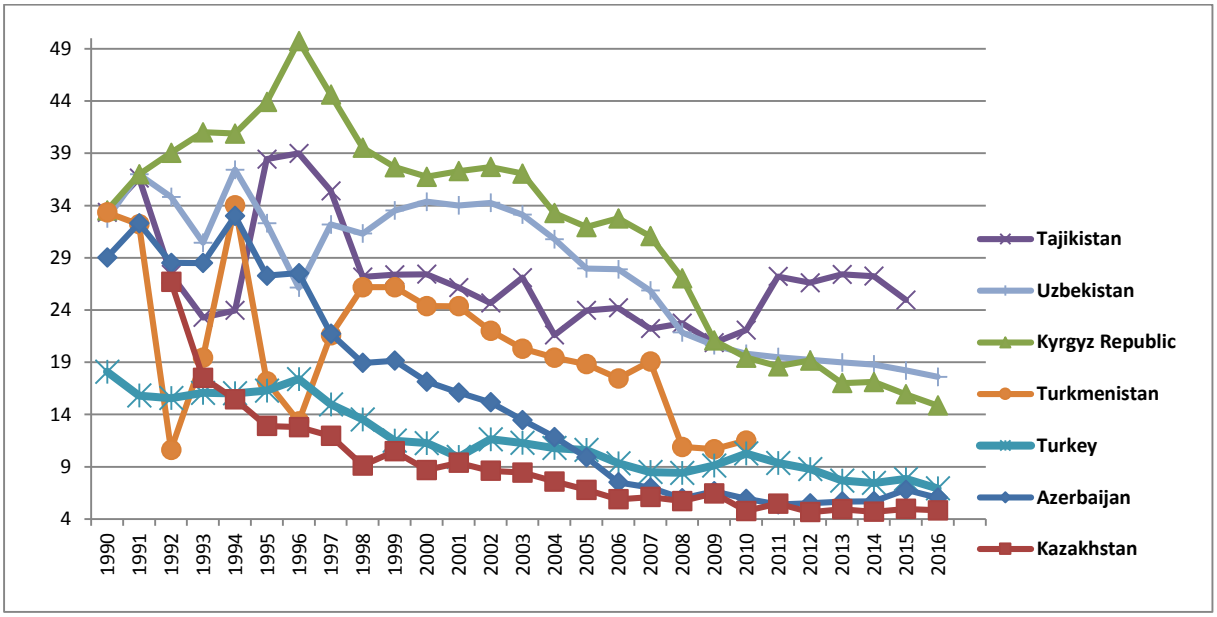
**The share of agriculture in GDP and employment**

In the resource-rich countries of Central Asia and the South Caucasus, the reduction in the share of agriculture in GDP was quite sharp. In Azerbaijan and Kazakhstan, it fell from 27-30% in 1990-92 to 5% in 2016; in Turkmenistan it fell from about 34% to about 10%. The reason may be the Dutch disease – the reallocation of capital and labour to resources from other industries, from agriculture in particular. But in non-resource-rich countries (Kyrgyzstan, Tajikistan, Uzbekistan) the decline in the share of agriculture was less steep: from 30-40% in the early 1990s to 15-25% by 2015 (fig. 3).

The decline in the share of agriculture in total employment was less pronounced than in other countries at the same level of development. The reason is the collapse of the industrial sector after the transition to the market and the transformational recession: the service sector, which usually absorbs the inflow of rural labourers to the cities, was not even able to cope with the ‘redundant’ workers released from industrial plants, let alone the inflows of migrants from rural areas. In Turkey, the share of agricultural employment went

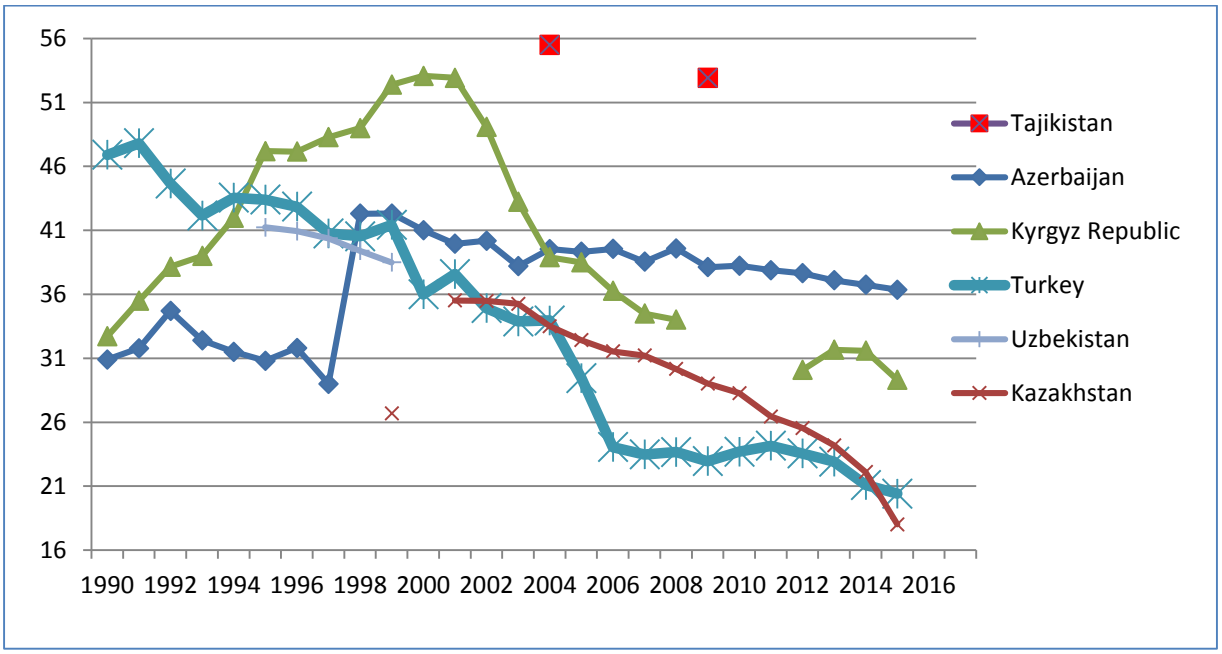
down from 46% in 1990 to 20% in 2016, whereas in the countries of Central Asia the decline was less pronounced and in Azerbaijan it did not happen at all (fig. 4).

**Figure 3: Share of agriculture value added in GDP (percentage)**




Source: Data from the World Development Indicators.

**Figure 4: Employment in agriculture as a percentage of total employment**




Source: Data from the World Development Indicators.

As a result, agricultural productivity either declined or grew very slowly, much more slowly than in other industries of respective countries and in “economic miracle” countries (Japan, South Korea, Taiwan, ASEAN, China).

The international experience is that in fast growing, ‘economic miracle’ Asian economies (1) the share of agriculture in output fell very rapidly (by about 5% a year) and (2) the share of agriculture in employment fell at either the same pace or even faster. As table 1 shows, in South Korea, Japan, Malaysia, and Vietnam the share of agriculture in both output and employment declined in 1980-2010 at a rate of about 3% to 6% annually. To put it differently, agricultural productivity increased no less than productivity in the national economy on average. This was possible due to technical progress in agriculture, which enabled a release of employees from agriculture to other industries, and due to the ability of other industries to absorb these employees and utilise them no less productively than in agriculture.[1] In other Asian economies – Thailand, Indonesia, Bangladesh, Sri Lanka, Philippines, India, Nepal, Pakistan – the declining share of agriculture in output proceeded at a much slower pace: 1% to 2% annually. The decline of the share of agriculture in employment also proceeded, on average, twice as slowly, suggesting that productivity growth in agriculture lagged behind productivity growth in the national economy.[2]

In this respect, the performance of Central Asian countries in the 1990s – and consequently for the whole period of 1991-2017 – was unimpressive, but in the 2000s and 2010s labour productivity in agriculture began to grow in proportion to the national average in all countries except for Kazakhstan and Kyrgyzstan (tables 2 and 3).

[1] China is an exception due to its 3.5% annual decline in the share of agriculture in output and 1.9% decline in the share of agriculture in employment. From this point of view, Chinese development was less successful than that of Japan and South Korea.
[2] Indonesia and Nepal, however, were a little more successful.

**Table 1: Agricultural output and employment in Asia: Speed of reduction**

| Country | Period covered (OS-Longest Available) | OS Start; End (%) | Speed of reduction OS (% per annum) | Period Covered (same for OS and ES) | OS Start; End (%) | Speed of reduction OS (% per annum) | ES Start; End (%) | Speed of reduction ES (% per annum) |
|---|---|---|---|---|---|---|---|---|
| Korea, Rep. of | 1965-2010 | 39.4; 2.6 | 5.74 | 1980-2010 | 16.2; 2.6 | 5.73 | 34; 6.6 | 5.15 |
| Japan | 1970-2009 | 6; 1.4 | 3.57 | 1980-2009 | 3.6; 1.4 | 3.10 | 10.4; 3.7 | 3.39 |
| Vietnam | 1985-2010 | 40.2; 20.6 | 2.54 | 1996-2006 | 27.8; 20.4 | 2.77 | 70; 51.7 | 2.72 |
| Malaysia | 1960-2010 | 34.3; 10.6 | 2.28 | 1980-2009 | 22.6; 9.5 | 2.85 | 37.2; 13.5 | 3.32 |
| Thailand | 1960-2010 | 36.4; 12.4 | 2.09 | 1980-2009 | 23.2; 11.5 | 2.31 | 70.8; 41.5 | 1.76 |
| Indonesia | 1960-2010 | 51.5; 15.3 | 2.35 | 1985-2010 | 23.2; 15.3 | 1.59 | 54.7; 38.3 | 1.36 |
| PRC | 1961-2010 | 35.5; 10.1 | 2.48 | 1980-2008 | 30.2; 10.7 | 3.51 | 68.7; 39.6 | 1.88 |
| Bangladesh | 1980-2010 | 31.6; 18.6 | 1.70 | 1984-2005 | 32.3; 20.1 | 2.13 | 58.8; 48.1 | 0.91 |
| India | 1960-2010 | 42.8; 19 | 1.58 | 1994-2010 | 28.5; 19 | 2.36 | 61.9; 51.1 | 1.12 |
| Philippines | 1960-2010 | 26.9; 12.3 | 1.52 | 1980-2009 | 25.1; 13.1 | 2.14 | 51.8; 35.2 | 1.28 |
| Nepal | 1965-2010 | 65.5; 36.1 | 1.29 | 1991-2001 | 47.2; 37.6 | 2.05 | 81.2; 65.7 | 1.91 |
| Sri Lanka | 1960-2010 | 31.7; 12.8 | 1.76 | 1981-2009 | 27.7; 12.7 | 2.65 | 45.9; 32.6 | 1.17 |
| Pakistan | 1960-2010 | 46.2; 21.2 | 1.52 | 1980-2008 | 29.5; 20.3 | 1.28 | 52.7; 44.7 | 0.57 |

Notes: ES = stands for agriculture's employment share; OS = stands for agriculture's output share; PRC = People's Republic of China

Source: Reproduced from Briones and Felipe's (2013) calculations based on data from the World Development Indicators; licensed under CC BY 3.0 IGO.

**Table 2: Agricultural output and employment shares in Central Asia and Azerbaijan: Speed of reduction,1991-2017**

| | Agriculture Output share in GDP (%) | | | | Agriculture Employment share in Total employment | | | |
|---|---|---|---|---|---|---|---|---|
| | Period covered | Share at Start date | Share at End date | Speed of reduction (% per annum) | Period covered | Share at Start date | Share at End date | Speed of reduction (% per annum) |
| **Azerbaijan** | 1991-2017 | 30.48 | 5.63 | 6.45 | 1991-2017 | 36.96 | 37.40 | -0.04 |
| **Kazakhstan** | 1991-2017 | | 4.43 | n/a | 1991-2017 | 45.72 | 18.05 | 3.50 |
| **Kyrgyzstan** | 1991-2017 | 35.26 | 12.33 | 3.97 | 1991-2017 | 39.07 | 26.69 | 1.42 |
| **Tajikistan** | 1991-2015 | 36.09 | 21.94 | 2.01 | 1991-2017 | 45.58 | 51.62 | -0.46 |
| **Turkmenistan** | 1991-2015 | 32.20 | 9.30 | 5.09 | 1991-2017 | 22.78 | 8.24 | 3.84 |
| **Uzbekistan** | 1991-2017 | 37.09 | 17.32 | 2.86 | 1991-2017 | 34.65 | 21.91 | 1.71 |

Source: Data from the World Development Indicators.

**Table 3: Agricultural output and employment shares in Central Asia and Azerbaijan: Speed of reduction, 2000-2017**

| | **Agriculture output share in GDP (%)** | | | | **Agriculture employment share in total employment** | | | |
|---|---|---|---|---|---|---|---|---|
| | Period covered | Share at Start date | Share at End date | Speed of reduction (% per annum) | Period covered | Share at Start date | Share at End date | Speed of reduction (% per annum) |
| **Azerbaijan** | 2000-2017 | 16.09 | 5.63 | *6.00* | 2000-2017 | 41.42 | 37.40 | *0.57* |
| **Kazakhstan** | 2000-2017 | 8.11 | 4.43 | *3.42* | 2000-2017 | 36.12 | 18.05 | *3.93* |
| **Kyrgyzstan** | 2000-2017 | 34.19 | 12.33 | *5.83* | 2000-2017 | 49.72 | 26.69 | *3.52* |
| **Tajikistan** | 2000-2015 | 25.12 | 21.94 | *0.85* | 2000-2017 | 60.21 | 51.62 | *0.86* |
| **Turkmenistan** | 2000-2015 | 22.54 | 9.30 | *5.69* | 2000-2017 | 26.20 | 8.24 | *6.64* |
| **Uzbekistan** | 2000-2017 | 30.06 | 17.32 | *3.11* | 2000-2017 | 39.81 | 21.91 | *3.37* |

Source: Data from the World Development Indicators.

Briones and Felipe's (2013) economic projections do not envisage a considerable reduction in the share of agriculture in total employment and output (table 4).

**Table 4. Projections for the share of agriculture in total employment and output**

| | Output share % | | Employment share % | |
|---|---|---|---|---|
| | **2010** | **2040** | **2010** | **2040** |
| Kyrgyzstan | 20.7 | 19.1 | 34 | 33.2 |
| Tajikistan | 21.3 | 19.8 | 55.5 | 53.9 |
| Uzbekistan | 19.5 | 12.3 | 38.5 | 35.6 |

Source: Data from Briones and Felipe (2013).

These projections are very different from the actual reduction of the share of agriculture in employment and output in economic miracle countries and territories during their rapid growth periods – Japan in the 1950s-70s; South Korea, Taiwan, Hong Kong, and Singapore in the 1960s-80s; ASEAN countries in the 1970s-1990s; and China in the 1980s-2010s.

**Labour, capital, land, and total factor productivity (TFP)**

The share of agriculture in total value added and in total employment fell in all post-communist countries, but output share usually fell faster than employment share, so labour productivity either declined or grew more slowly than in other sectors. In 1990-2016 in Turkey, for example, which did not go through a transition to the market and a transformational recession, agricultural output and GDP increased almost twofold in constant prices, but the share of agricultural value added in GDP decreased from 18% to 7%, and the share of agriculture in total employment fell from 47% to 20% (see the statistical appendix). This happened because agricultural output roughly doubled, whereas the number of employees in agriculture fell by about 50% – so agricultural productivity grew fourfold, but the share of agriculture in GDP fell because agricultural goods became half as expensive in comparison with other goods.

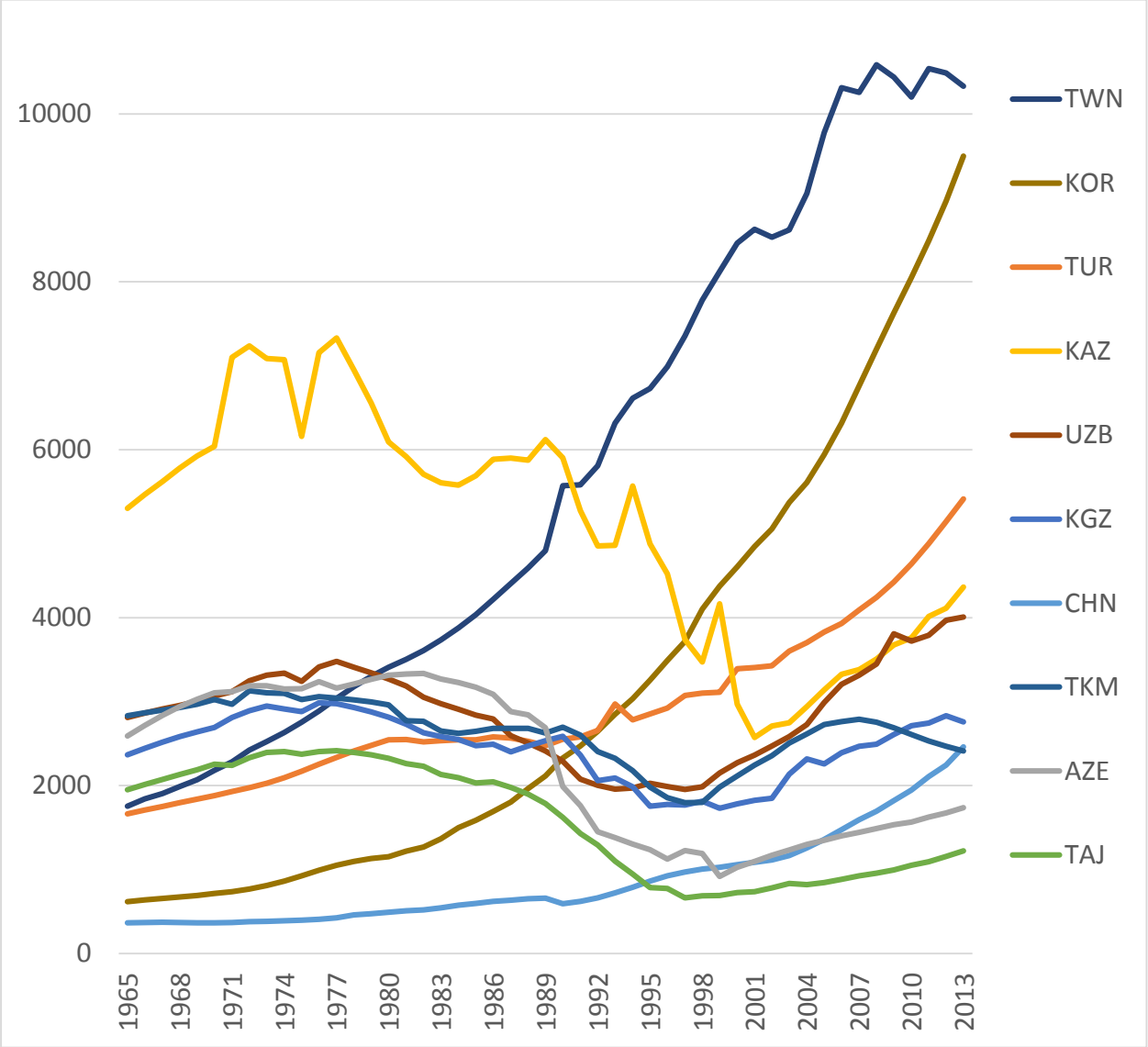
But in Central Asian countries and Azerbaijan, labour productivity stopped growing from the late 1970s, declined in the 1980s and 1990s, and has been recovering very slowly since then. As fig. 5 and table 5 show, labour productivity in Central Asian countries grew much more slowly than in South Korea, Taiwan, and China in the 1960-2013 period, even following the transition to the market economy and transformational recession after 1995.

**Table 5: Labour productivity in agriculture (constant 2004-06 US dollars)**

| Country/ Year | **1965** | **1975** | **1980** | **1995** | **2013** | **2013 as a percentage of 1965** |
|---|---|---|---|---|---|---|
| China | 366 | 396 | 491 | 860 | 2461 | 672 |
| Turkey | 1664 | 2172 | 2546 | 2851 | 5414 | 325 |
| Azerbaijan | 2589 | 3153 | 3316 | 1235 | 1735 | 67 |
| Kazakhstan | 5302 | 6160 | 6093 | 4878 | 4363 | 82 |
| Kyrgyzstan | 2367 | 2881 | 2815 | 1754 | 2759 | 117 |
| Tajikistan | 1949 | 2371 | 2322 | 786 | 1223 | 63 |
| Turkmenistan | 2830 | 3022 | 2961 | 1981 | 2411 | 85 |
| Uzbekistan | 2810 | 3239 | 3268 | 2025 | 4007 | 143 |
| USA | 26243 | 37135 | 41242 | 58396 | 101739 | 388 |
| Korea | 616 | 924 | 1153 | 3254 | 9496 | 1542 |
| Taiwan | 1755 | 2756 | 3410 | 6731 | 10329 | 589 |
| France | 8602 | 14490 | 19970 | 39742 | 84095 | 978 |

Source: Author’s calculations based on FAO statistics.

**Figure 5: Labour productivity in agriculture (output per employee in constant prices, 2005 US dollars)**

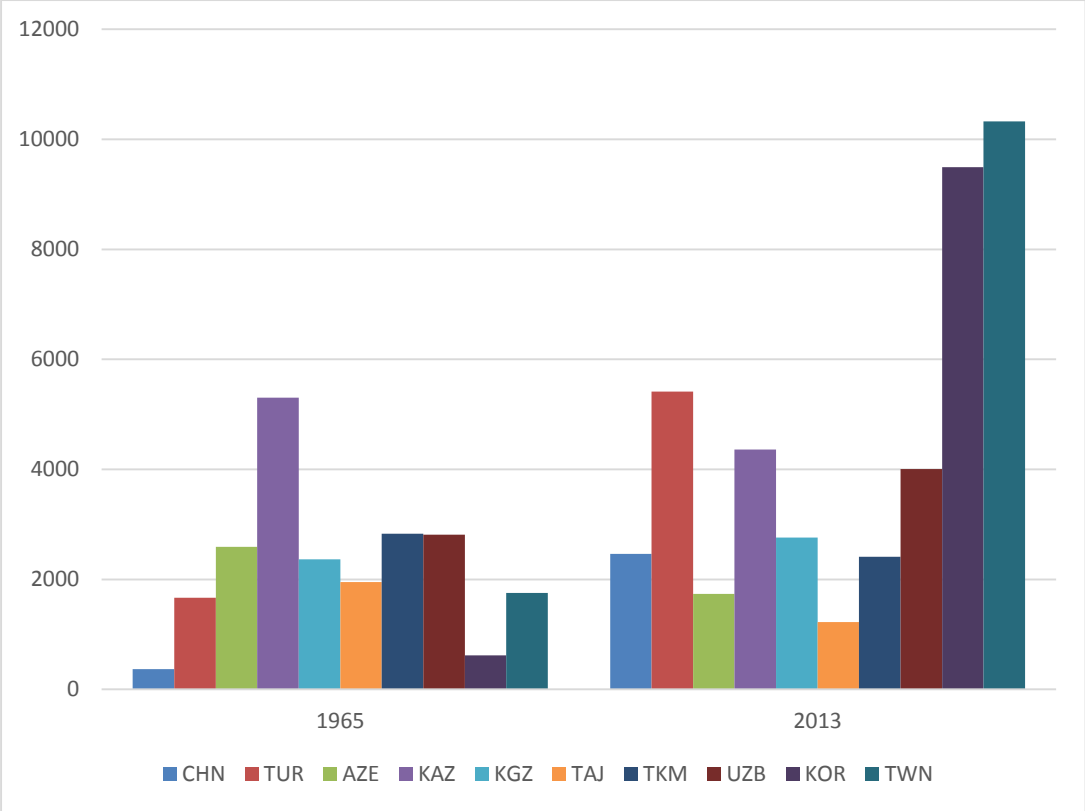



Source: Data from FAOSTAT; figure by present authors.

It is not only that the absolute levels of labour productivity in Central Asia are way below those of fast growing East Asian countries and territories (Taiwan, South Korea, China) and lower than US levels by nearly two orders of magnitude (table 5), but in all Central Asian countries except Turkey and Uzbekistan, labour productivity in 2013 was lower than in the 1975-80 period (table 5, fig. 5). In fast growing Taiwan, South Korea, and China, labour productivity increased over about 50 years between six fold and fifteen fold; in Turkey, it

grew at an average pace, rising threefold; whereas in Azerbaijan, Kazakhstan, Tajikistan, and Turkmenistan it fell, and in Kyrgyzstan and Uzbekistan it increased by only 20% to 40% (fig. 6, table 5).

**Figure 6: Labour productivity in agriculture (constant US dollars of 2004-06) in 1965 and 2013**

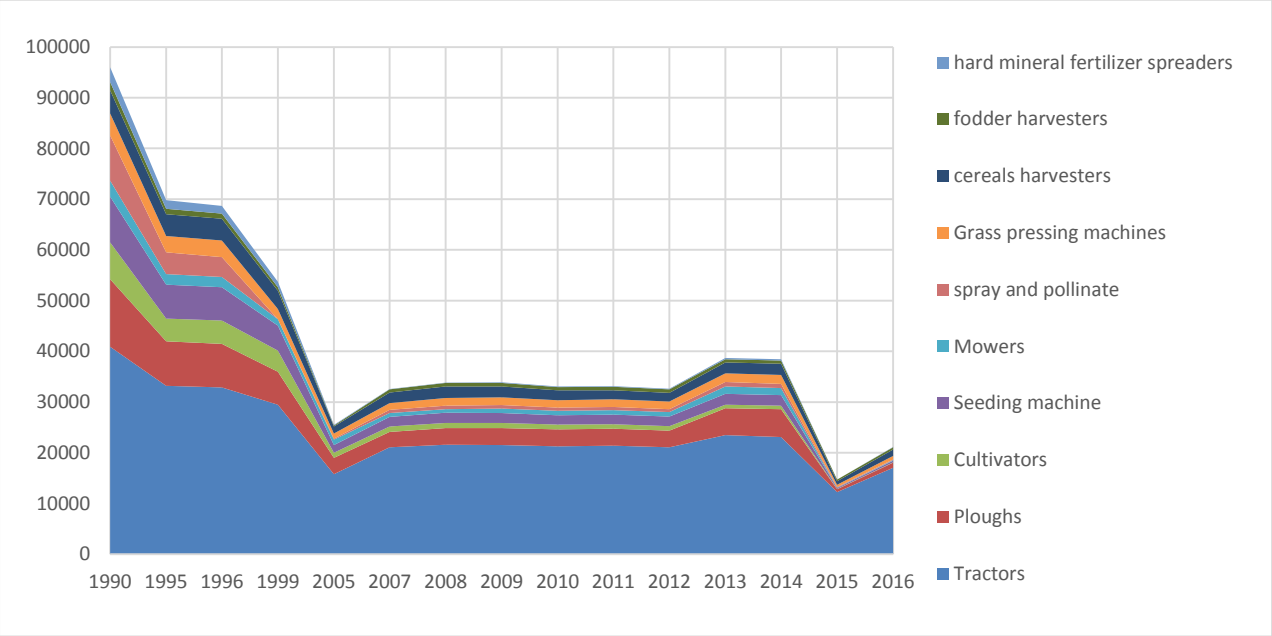



Source: Data from FAOSTAT; figure by present authors.

Capital productivity increased in all former Soviet countries because investment into agriculture, which in the 1980s had accounted for up to one-third of all investment, fell to just a small percentage of total investment between the 1990s and the 2010s. However, the other side of the coin of high capital productivity was the degradation of capital stock and infrastructure. In Azerbaijan, for example, the volume of fixed capital stock decreased (fig. 7) because investment did not compensate for wear and tear and retirement of equipment.

Only in 2005-2014, due to increased investment, was there no decrease in the number of machines.

**Figure 7: Stock of main agricultural equipment, end of the year, units, Azerbaijan**

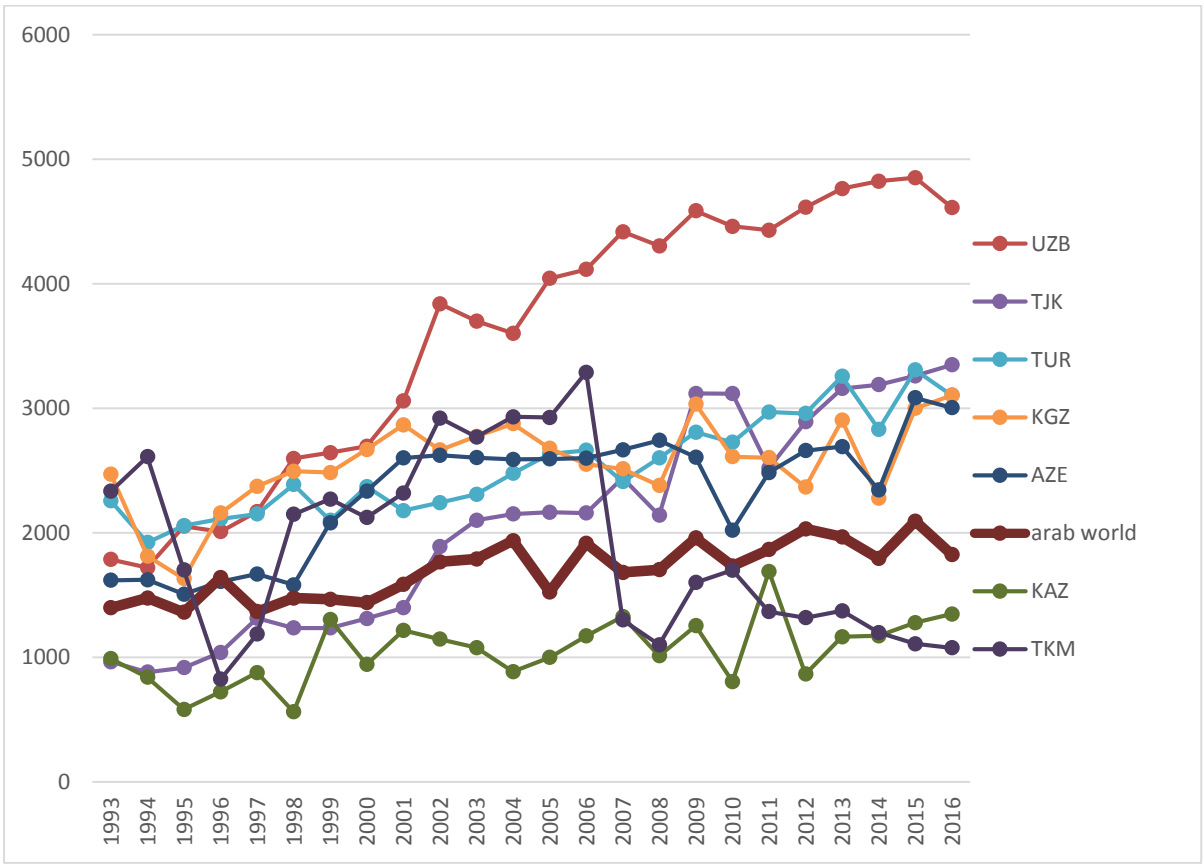



Source: Data from Obara and Valiyev (2017); figure by present authors.

Land productivity, as measured by cereals yields, grew in all countries of Central Asia with the exception of Turkmenistan and Kazakhstan (fig. 8). Uzbekistan and Tajikistan experienced especially strong growth of yields. Uzbekistan carried out a conscious policy of replacing cotton with cereals. The production of cereals in Uzbekistan grew nearly fourfold in the 1993-2016 period (fig. 9); the country now imports only 20% of its consumed cereals and is aiming to achieve self-sufficiency in grain. It was government policy to achieve self-sufficiency in food – successfully achieved in many areas – and to diversify agricultural output. This was predominantly carried out via state orders – less for cotton, more for cereals – so the production of cotton fell by 50% in comparison with the late 1980s and the output of cereals and vegetables rose significantly (Popov, 2013).

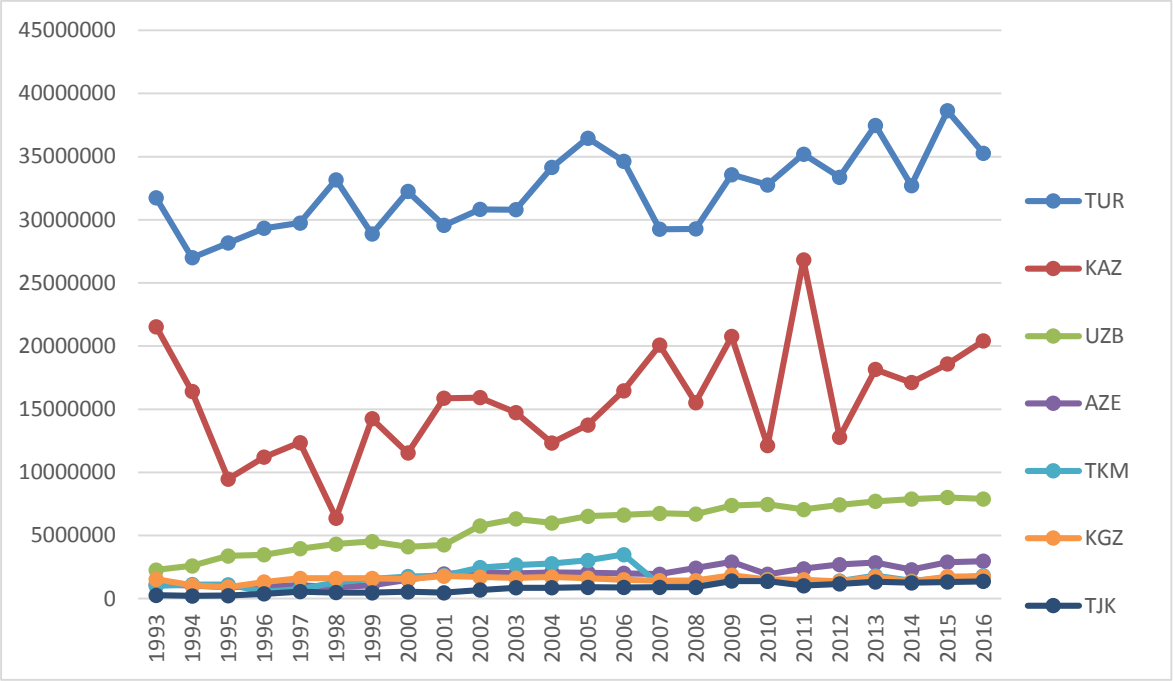
Total factor productivity increased in all Central Asian states over the last half a century (especially for Kyrgyzstan and Kazakhstan), even though these increases were less pronounced than in other countries (fig. 10). No country had total factor productivity growth comparable to China, Taiwan, South Korea; and only Kyrgyzstan could be compared to the US and Turkey, whereas other Central Asian economies and Azerbaijan lagged behind with a less than 50% rise in total factor productivity for over 50 years.

**Figure 8: Cereal yields in Central Asian countries and Arab countries (average), kg per hectare**



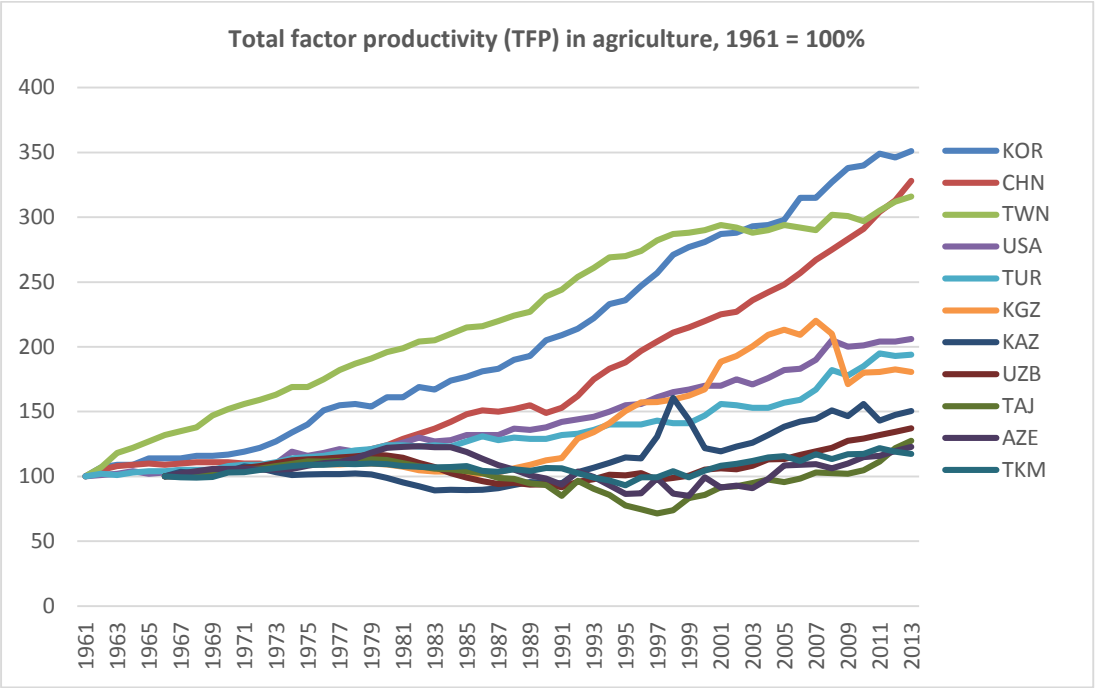

Source: Data from the World Development Indicators.

**Figure 9: Cereal production in Central Asian countries, metric tons**

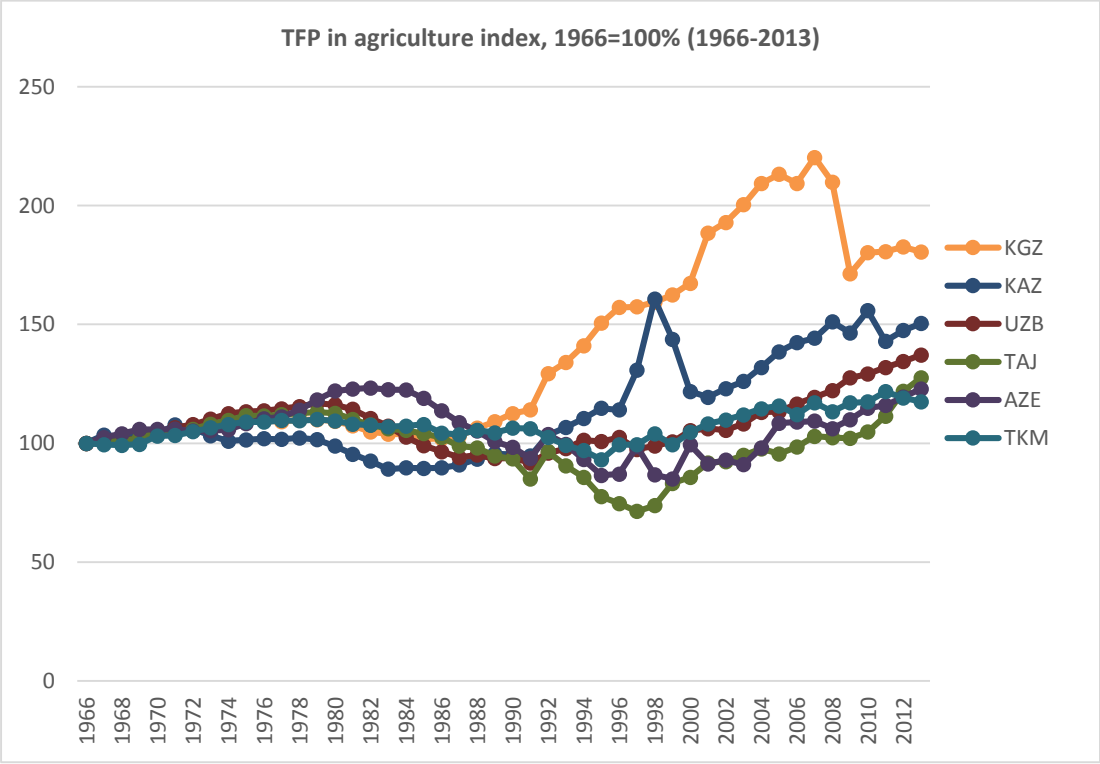



Source: Data from the World Development Indicators.

**Figure 10: Total factor productivity (TFP) in agriculture, 1961 = 100[3]**




**Total factor productivity in agriculture index, 1966=100**

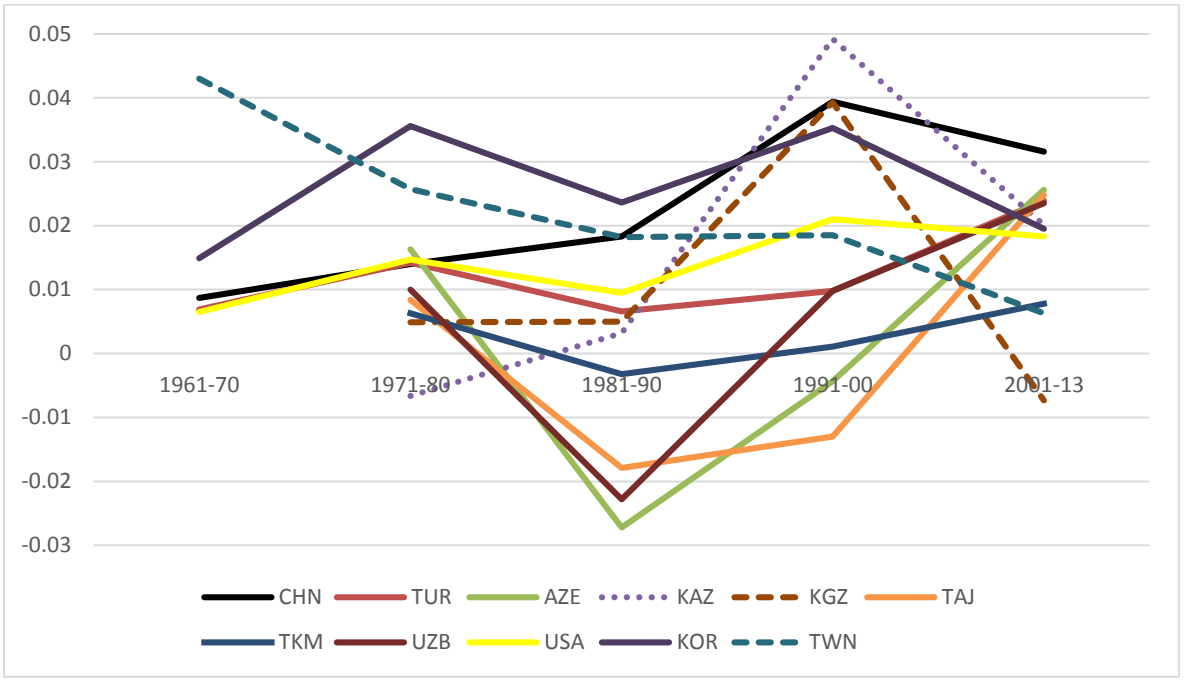


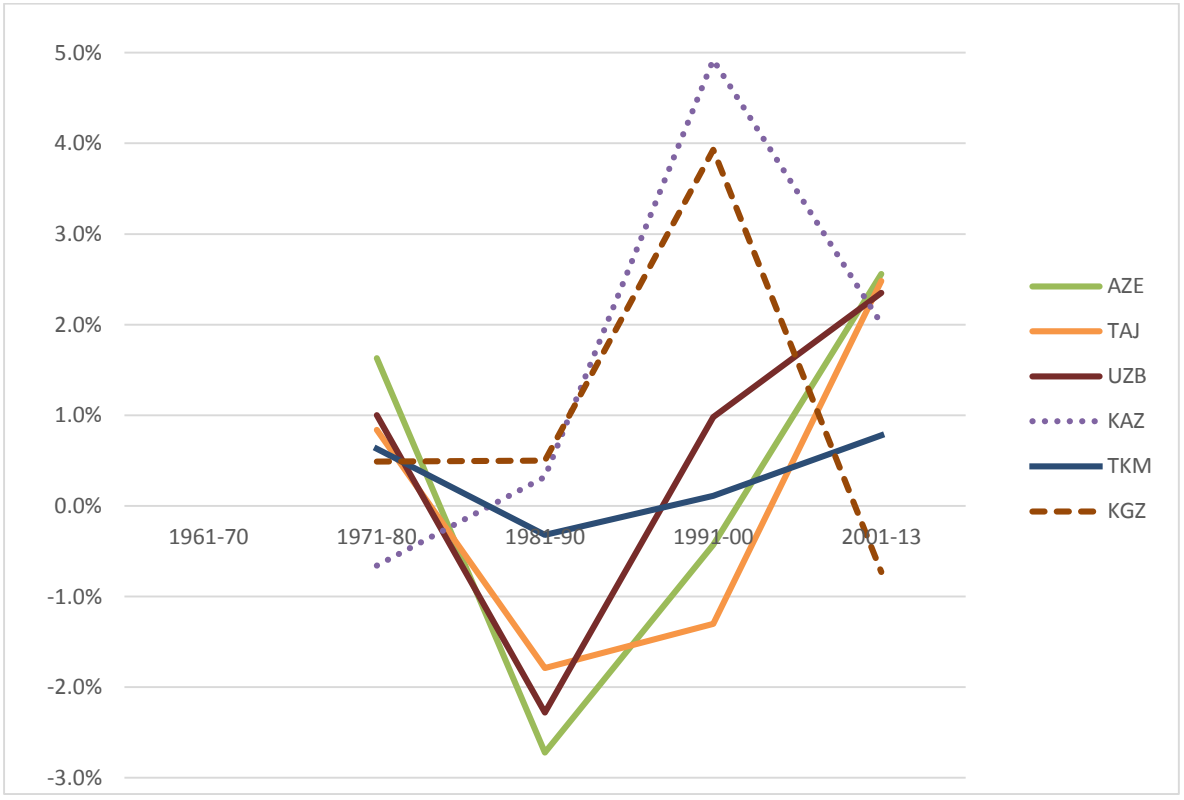

Source: Data from FAOSTAT; figure by present authors.

[3] Total factor productivity in agriculture based on the inputs of labor, land, livestock, machinery, fertilizer, and fodder.

The recent growth rates of total factor productivity in Central Asian countries are a reason for optimism though. Over the 2001-2013 period, Azerbaijan, Tajikistan, Uzbekistan, and Kazakhstan had annual average growth rates of total factor productivity of 2% and more (fig. 11).

**Figure 11: Total factor productivity annual average growth rates in the 1960s-2000s in Central Asia, China, South Korea, Taiwan, and the US**



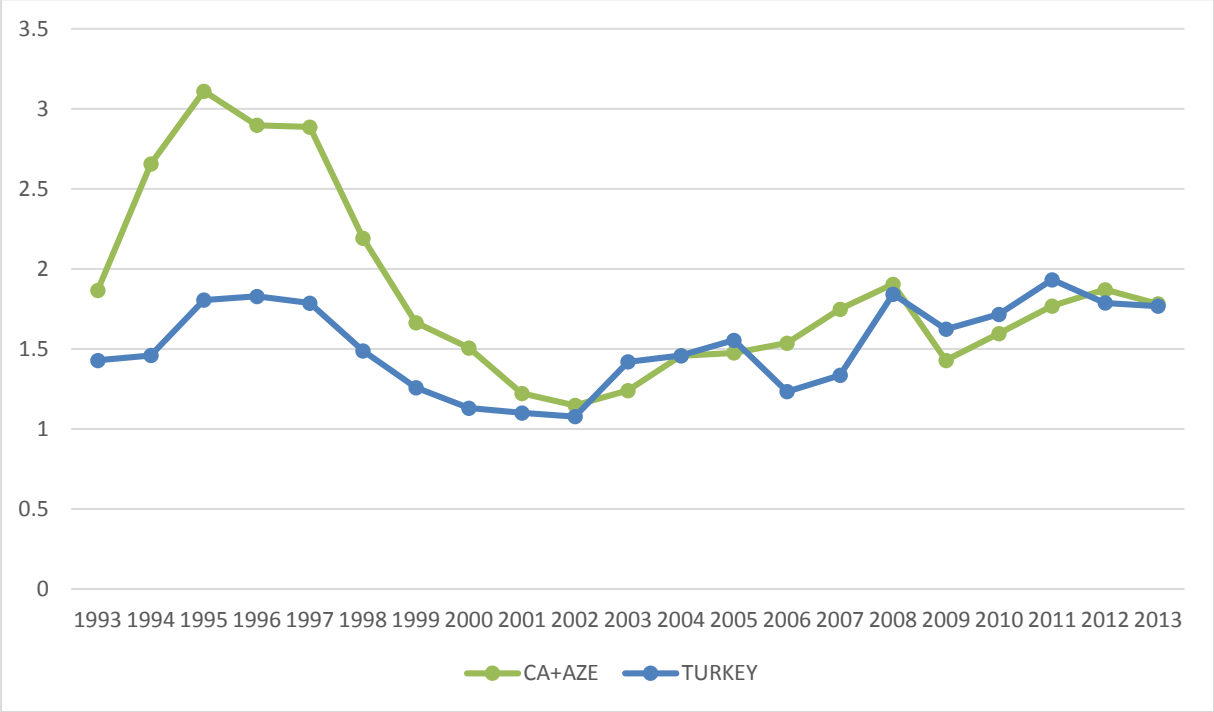

Source: Data from FAOSTAT; figure by present authors.

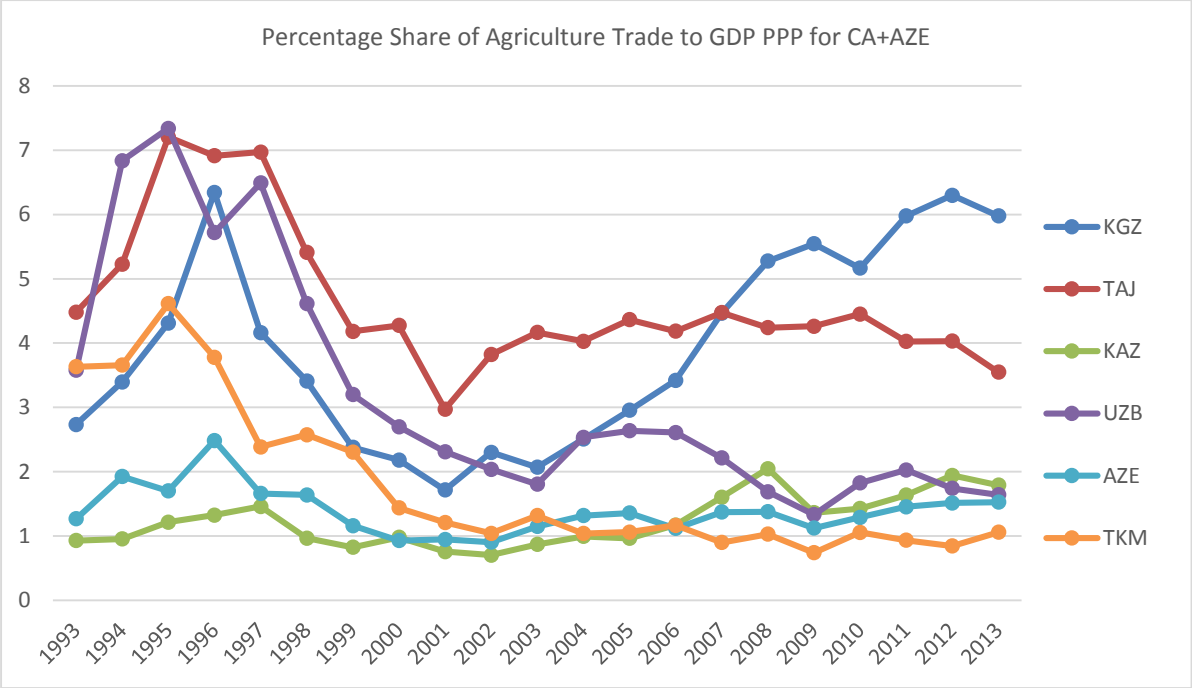
Estimates of factor productivity from national statistics largely confirm this story. In all countries – with the exception of Uzbekistan – total factor productivity in agriculture was below the national average and its dynamics were not favourable (see the statistical appendix).

**Exports, imports, and trade balance as a measure of competitiveness**

The importance of agricultural trade for the Central Asian region as a whole is low and has declined in recent decades. It fell from 3.1% of PPP GDP in 1995 to only 1.8% in 2013 (fig. 12): the ratio declined or remained at the same level after brisk ups and downs for every single country in the region (fig. 12).

**Figure 12: Agricultural trade as a percentage of PPP GDP in Central Asia**



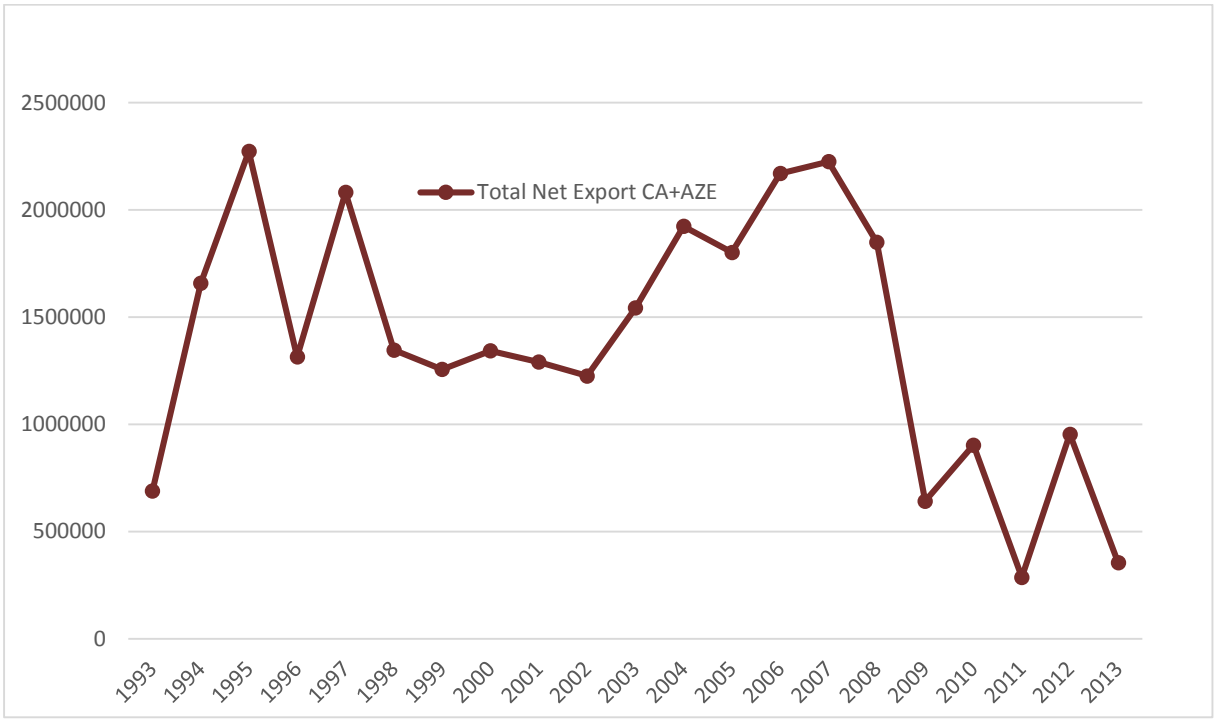


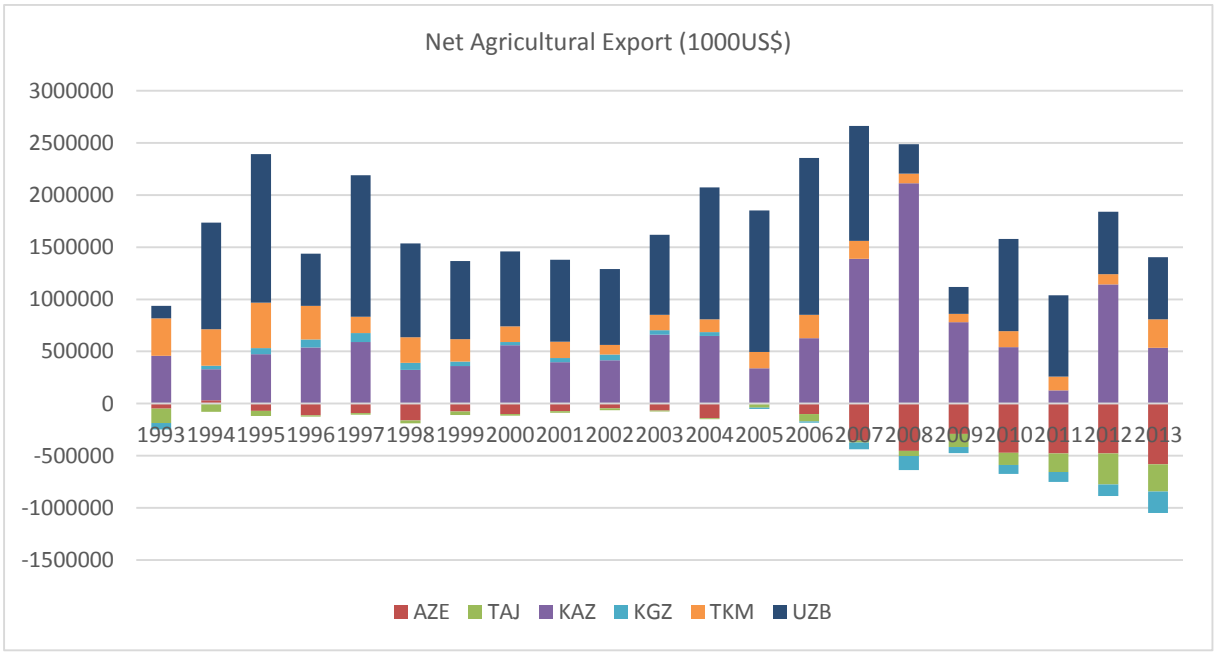

Source: Data from FAOSTAT; figure by present authors.

The reduction of exports was more pronounced than the reduction of imports, so the trade balance for the region as a whole declined from over two billion US$ in 1995-97 to $0.5 billion in 2010-13. Only for Turkey has the trade balance in agricultural goods improved, but for other countries it has either deteriorated or changed very little (fig. 13).

For resource-rich countries like Azerbaijan, Kazakhstan, and Turkmenistan, a decline in agricultural exports and an increase in imports was aided by the Dutch disease: an overvaluation of the exchange rate due to the increased production and export of hydrocarbons, leading to a loss of competitiveness and relative decline for all other industries. For other countries, poor competitiveness for agricultural goods was the result of low productivity growth in agriculture. Only Turkey was able to noticeably increase its trade surplus in agricultural trade (fig. 14). Central Asian countries' trade in agricultural goods with the EU went from surplus in the early 2000s to a deficit of 0.3 billion in 2014-16 (fig. 15).

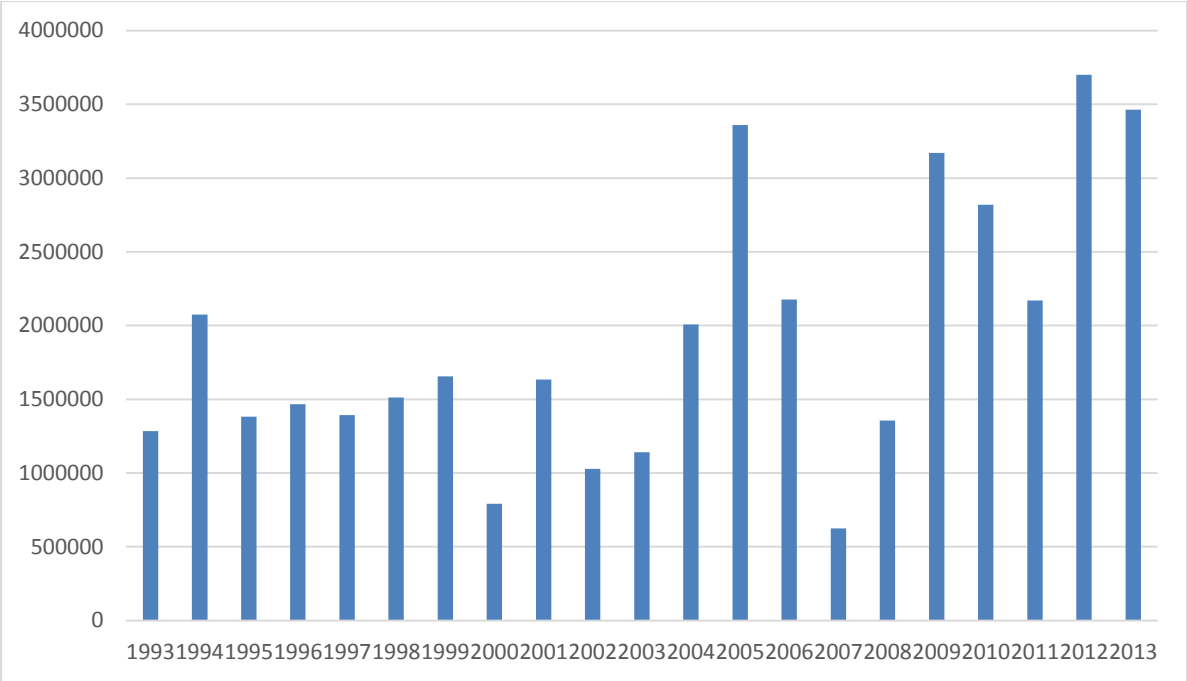
**Figure 13: Net agricultural exports of Central Asian countries in 1993-2013, thousands US$**



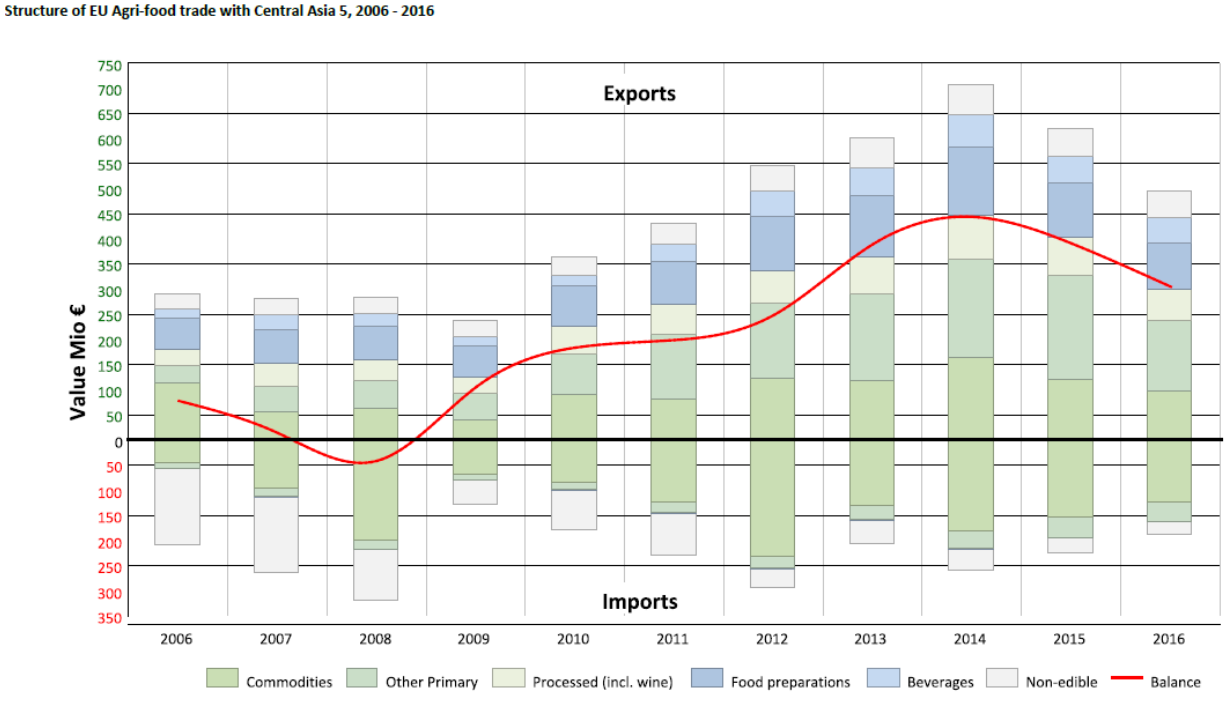

Source: Data from FAOSTAT; figure by present authors.

**Figure 14: Balance of trade in agricultural goods in Turkey, in thousands of US dollars**




Source: Data from FAOSTAT; figure by present authors.

**Figure 15: EU agricultural trade with Central Asian countries, million $**




Source: European Commission, DG Agriculture and Rural Development (2017); used with permission.

Figure 16 presents the normalised trade balance (NTB) in six major agricultural goods for seven Central Asian countries.[4] Turkey stands out with sharp fluctuations in its NTBs, but no clear cut trend. Turkey was a net exporter of fruits and vegetables, meat, and tobacco; and a net importer of textile fibres, oil seeds, and cereals. Other Central Asian countries were strong on exports of fruits and vegetables – with the exception of Kazakhstan – and textile fibre (i.e., cotton), with the exception of Kazakhstan and Turkmenistan. Kazakhstan, with its huge steppes, was a net exporter of cereals and oil seeds. Most countries were net importers of cereals, oil seeds, meat, and tobacco although exceptions included

[4] Normalized trade balance is the trade balance (export minus import) divided by the sum of export and import; i.e., (X-M)/(X+M), where *X* is exports, and *I* is imports. It ranges from -1 to +1. The higher it is, the more competitive the industry.

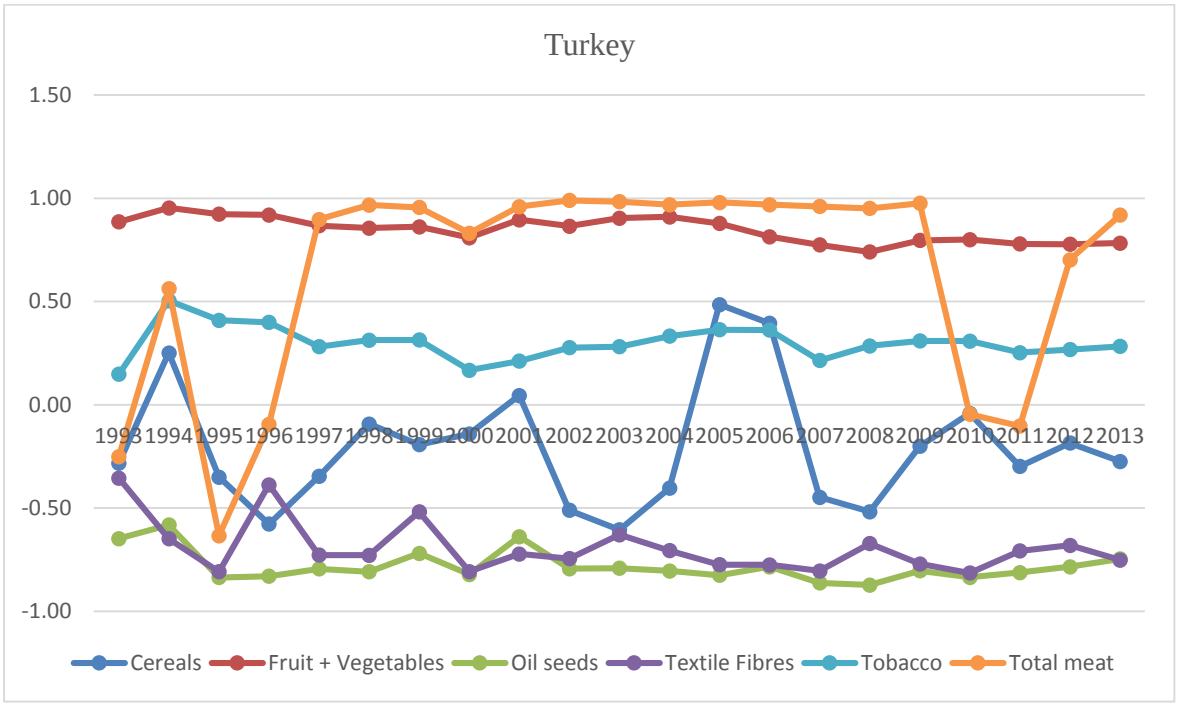
Kazakhstan, as a net importer of meat, but not cereals and oil seeds; Tajikistan, which exported oil seeds; and Turkmenistan, which imported fruits and vegetables.

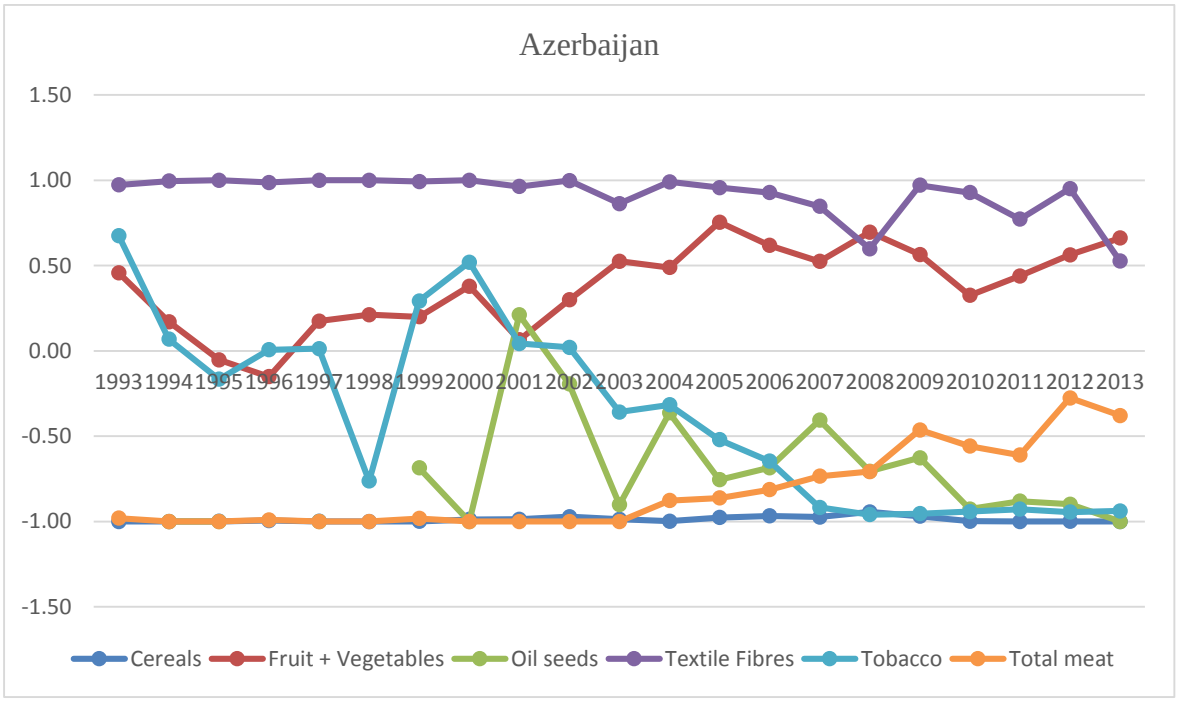
For our study, however, what is more important than the present situation are trends, and these trends are not encouraging. Most agricultural sectors lost competitiveness in domestic and international markets: NTBs for major agricultural goods groups deteriorated for Azerbaijan (tobacco and oil seeds), Kazakhstan (meat), Kyrgyzstan (meat, oil seeds, and tobacco), Tajikistan, and Uzbekistan (tobacco). Only Azerbaijan succeeded in improving its NTB in meat and only Uzbekistan succeeded in oil seeds, although this was only in the 2004-2011 period, and in the 2012-13 period it deteriorated again.[5]

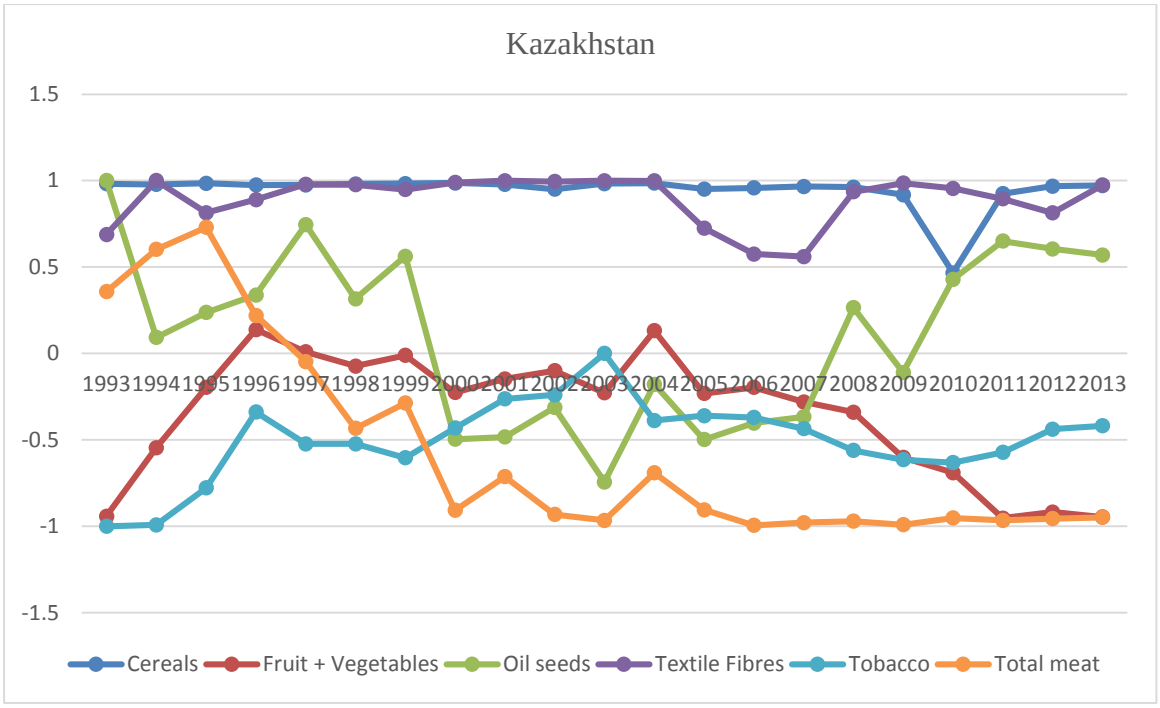
Meat production was not competitive in the USSR, so the liberalisation of prices and opening up of previously closed economies resulted in a reduction of the cattle population and a decline in meat production. Tobacco production seems to have followed a similar path. But it is surprising that in Uzbekistan, which switched from cotton to vegetables and cereals, there was no increase in the competitiveness of the industries that received land, capital, and labour resources. On the other hand, the example of the reduction of the net trade deficit for meat products in Azerbaijan seems to be a success story that deserves close scrutiny.

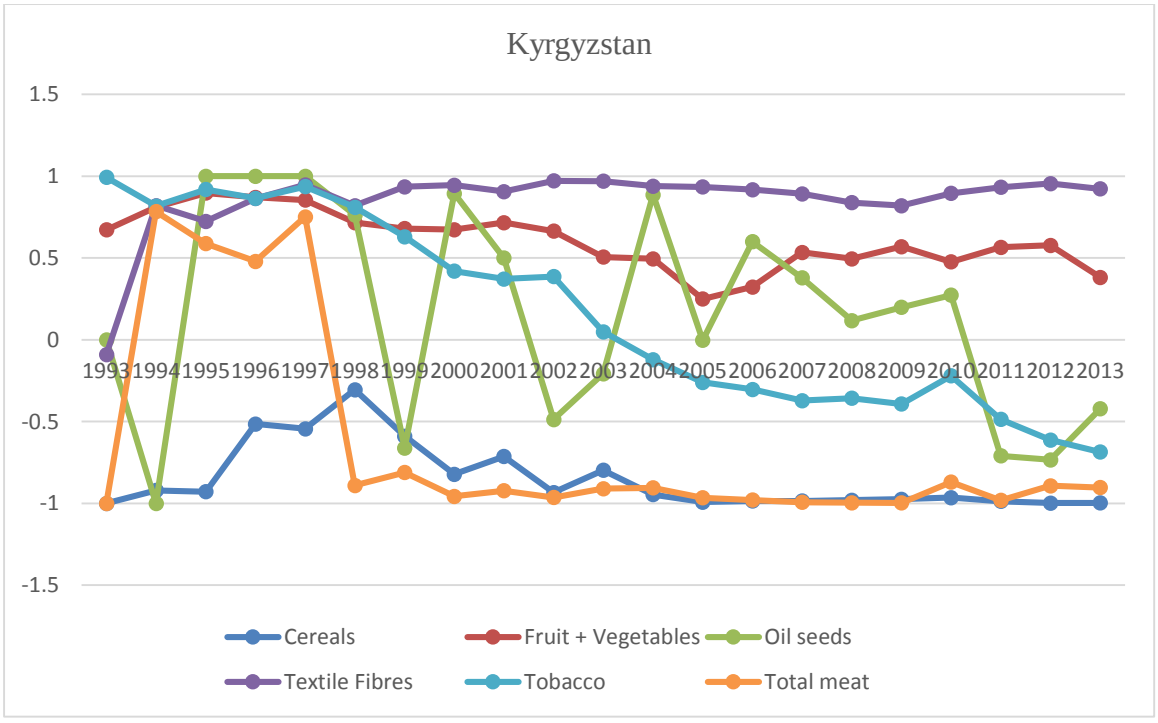
[5] Kazakhstan's oil seed NTB deteriorated in the early 2000s, but recovered afterwards so oil seed may well be a competitive industry. Oilseed production is currently estimated at US$ 411 million, or almost 4% of gross agricultural production. The sector has quadrupled in the past ten years and continues to grow (FAO Regional Office for Europe and Central Asia, 2017**)**.

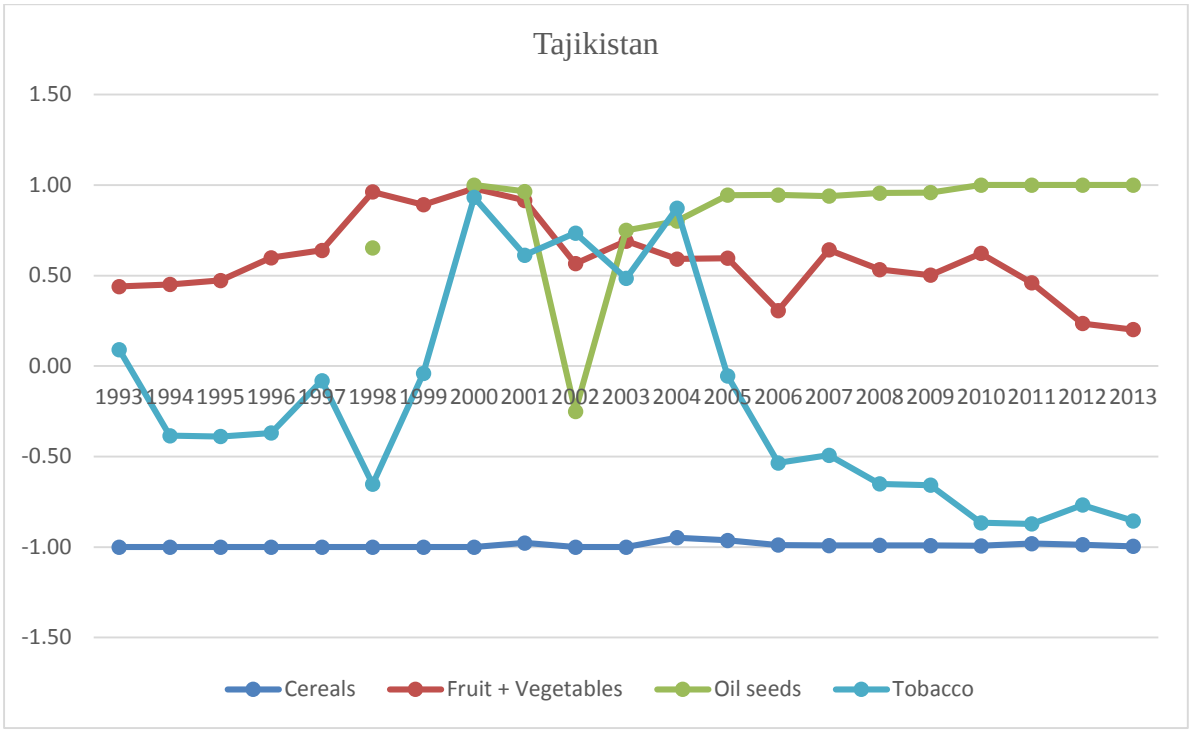
**Figure 16: Normalised trade balance for six major food and agricultural products in Central Asian countries**

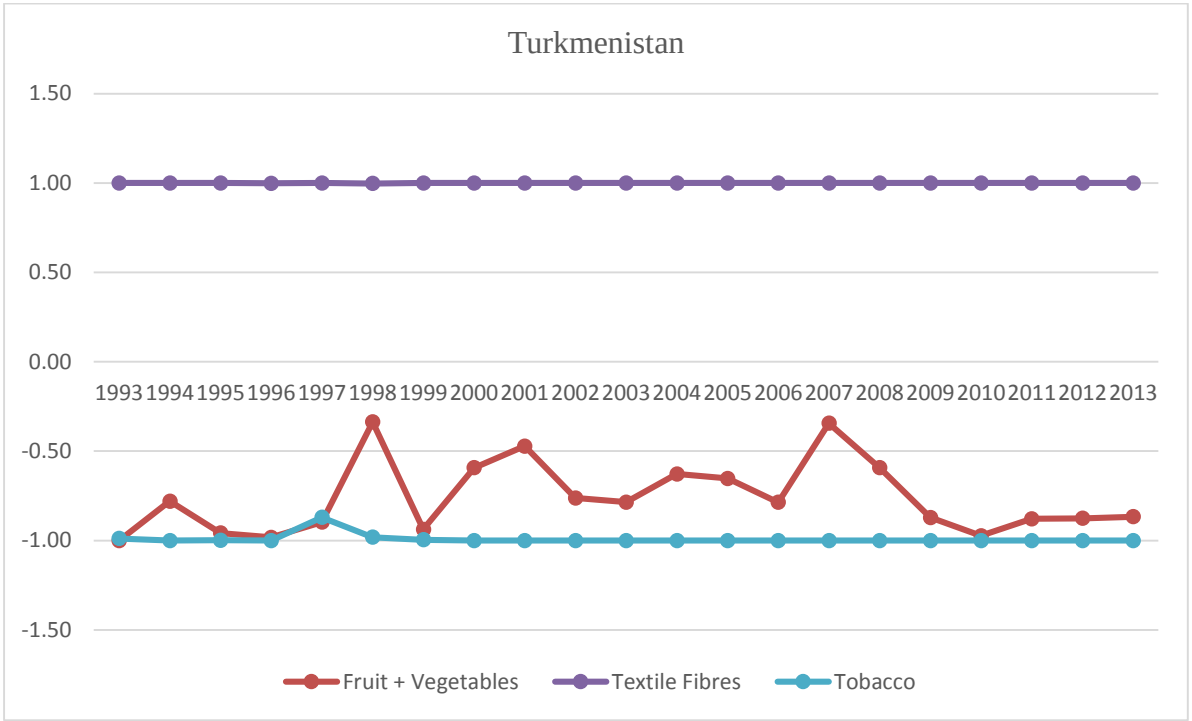


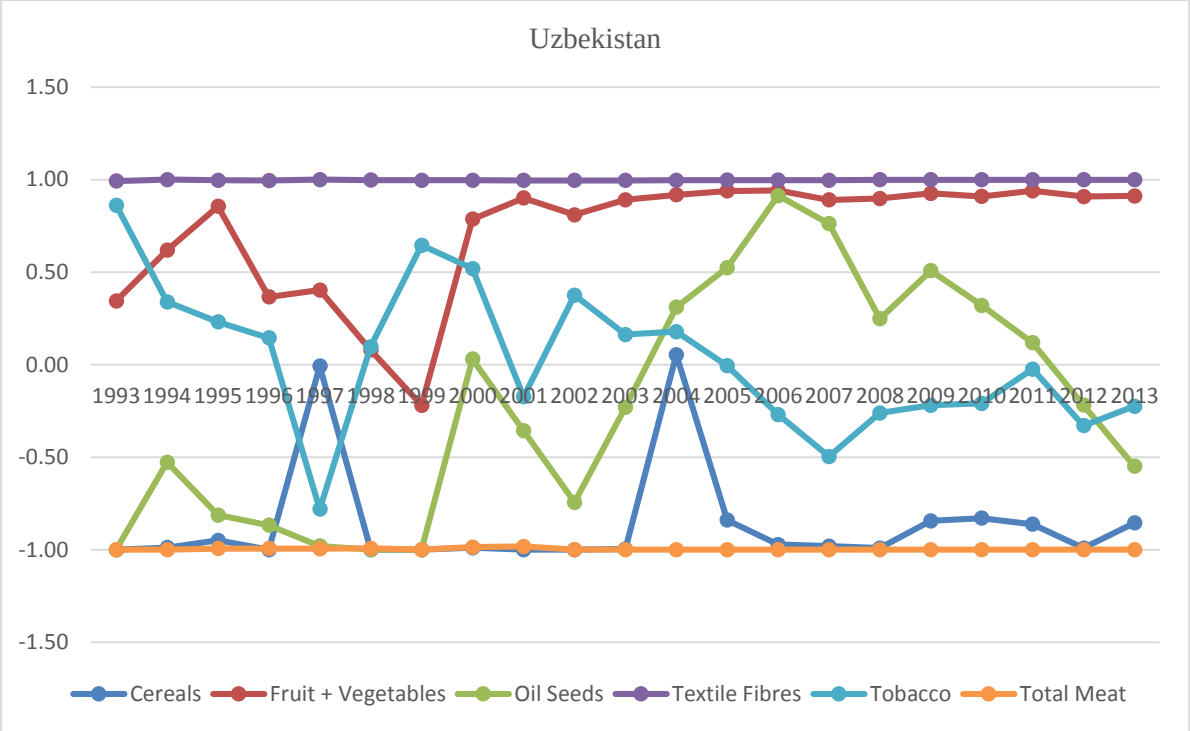




Kazakhstan
1.5
1
0.5
0
-0.5
-1
-1.5
1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013
Cereals
Fruit + Vegetables
Oil seeds
Textile Fibres
Tobacco
Total meat


Kyrgyzstan
1.5
1
0.5
0
-0.5
-1
-1.5
1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013
Cereals
Fruit + Vegetables
Oil seeds
Textile Fibres
Tobacco
Total meat


Tajikistan
1.50
1.00
0.50
0.00
-0.50
-1.00
-1.50
1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013
Cereals
Fruit + Vegetables
Oil seeds
Tobacco


Turkmenistan
1.50
1.00
0.50
0.00
-0.50
-1.00
-1.50
1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013
Fruit + Vegetables
Textile Fibres
Tobacco




Note: Values of exports and/or imports for some goods (cereal exports, oil seeds imports, total meat exports) for Azerbaijan, Tajikistan, and Turkmenistan and for certain years are not available and not shown on the charts.
Source: Data from FAOSTAT; figure by present authors.

## Conclusions

The productivity of agriculture in the Central Asian republics of the USSR stopped improving from the late 1970s and declined in the 1990s when the transition to the market occurred. As a result, most agricultural goods were uncompetitive on the both domestic and world markets, and the trade balance for agricultural trade became negative as imports grew faster than exports. Whereas there were some success stories – cereals in Uzbekistan, meat production in Azerbaijan, oil seeds in Kazakhstan – overall, it does not look like agriculture will be a driving force of future growth in the region.

However, this is not inconsistent with international experience. In economic miracle countries the share of agriculture fell faster than in other countries because it donated labour to the industrial sector, which was the engine of growth. The problem in Central Asia is not

the slow growth of agricultural output, but the slow growth of productivity in agriculture, which does not allow the rural population to move to industrial activities.

The goal of industrial policy in Central Asia should be to support potentially competitive export-oriented industrial enterprises and to facilitate the reallocation of labour and capital from less competitive agriculture to more competitive industry. Only promising agricultural industries, which are already showing high levels of competitiveness, should be supported; otherwise there would only be non-economic reasons to continue with agricultural subsidies.

**Behrooz Gharleghi**
*Senior Researcher, Dialogue of Civilizations Research Institute*

**Vladimir Popov**
*Research Director, Dialogue of Civilizations Research Institute*

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Rodrik, D., McMillan, M., and Sepúlveda, C. (2016). Structural Change, Fundamentals, and Growth. In M. McMillan, D. Rodrik, and C. Sepúlveda. (Eds.) *Structural Change, Fundamentals, and Growth. A Framework and Case Studies*. Washington, DC*:* International Food Policy Research Institute Washington (IFPRI), p. 1-38. Retrieved from http://drodrik.scholar.harvard.edu/files/dani-rodrik/files/structural_change_fundamentals_and_growth.pdf.

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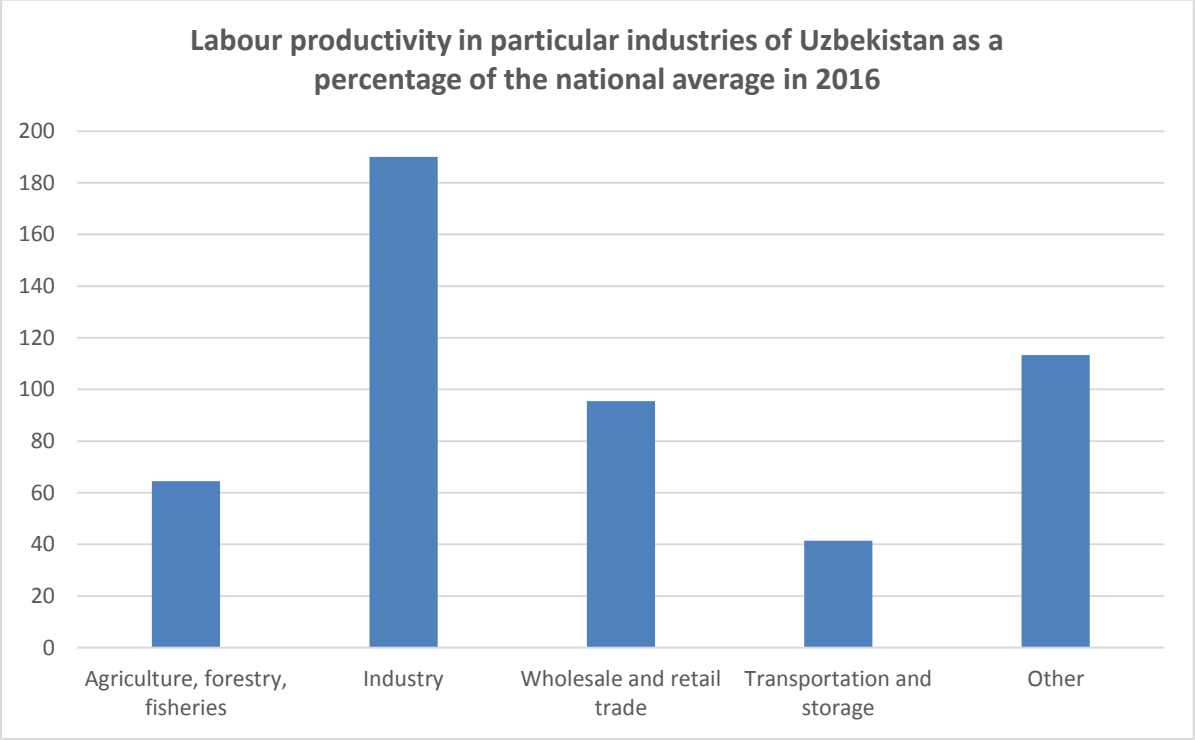
## Statistical appendix

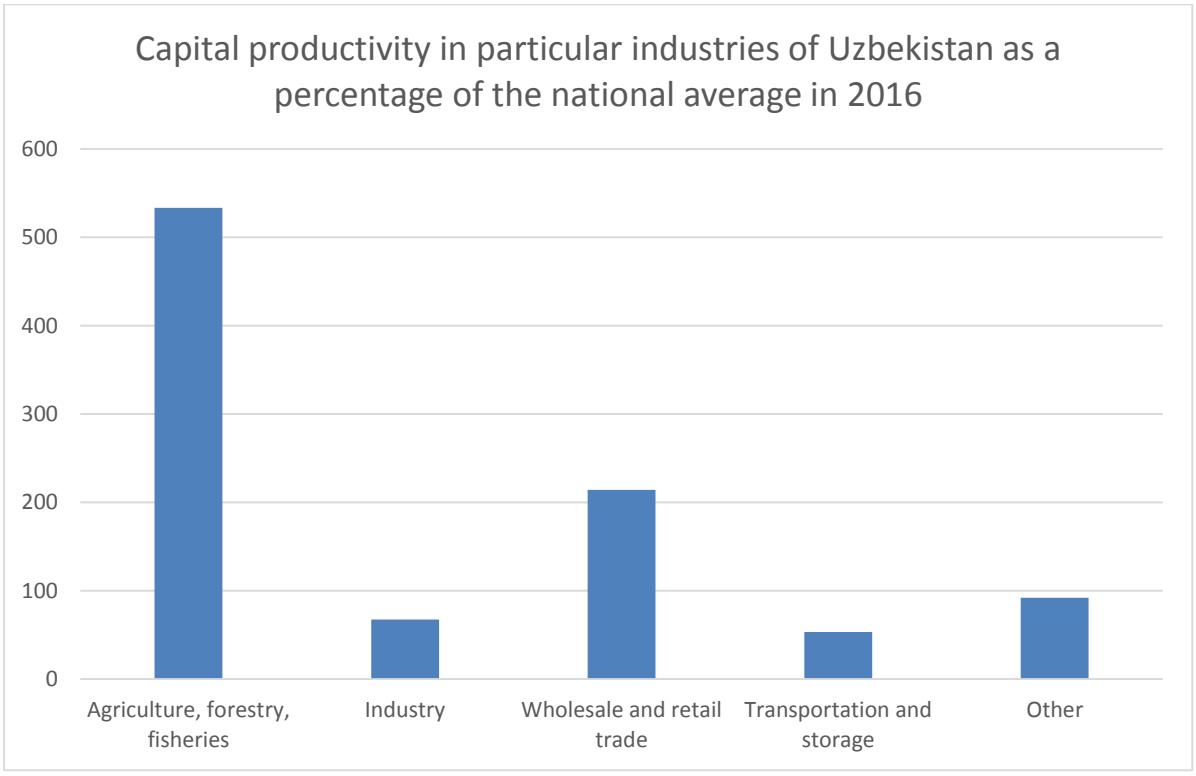
### Appendix A. Labour, capital and total factor productivity (national statistics)

### Uzbekistan

In 2016, labour productivity in agriculture was just over 60% of the national average, but capital productivity was over five times (500%) the national average. Total factor productivity (TFP) computed with the simplest production function (without land, only with capital and labour) in agriculture was higher than in industry and in services (fig. 1A, table 1A). Uzbekistan was the only country of Central Asia for which TFP in agriculture was higher than in TFP for the whole economy.

**Figure 1A: Labour, capital and total factor productivity in agriculture as compared to other industries**




Capital productivity in particular industries of Uzbekistan as a percentage of the national average in 2016
600
500
400
300
200
100
0
Agriculture, forestry, fisheries
Industry
Wholesale and retail trade
Transportation and storage
Other

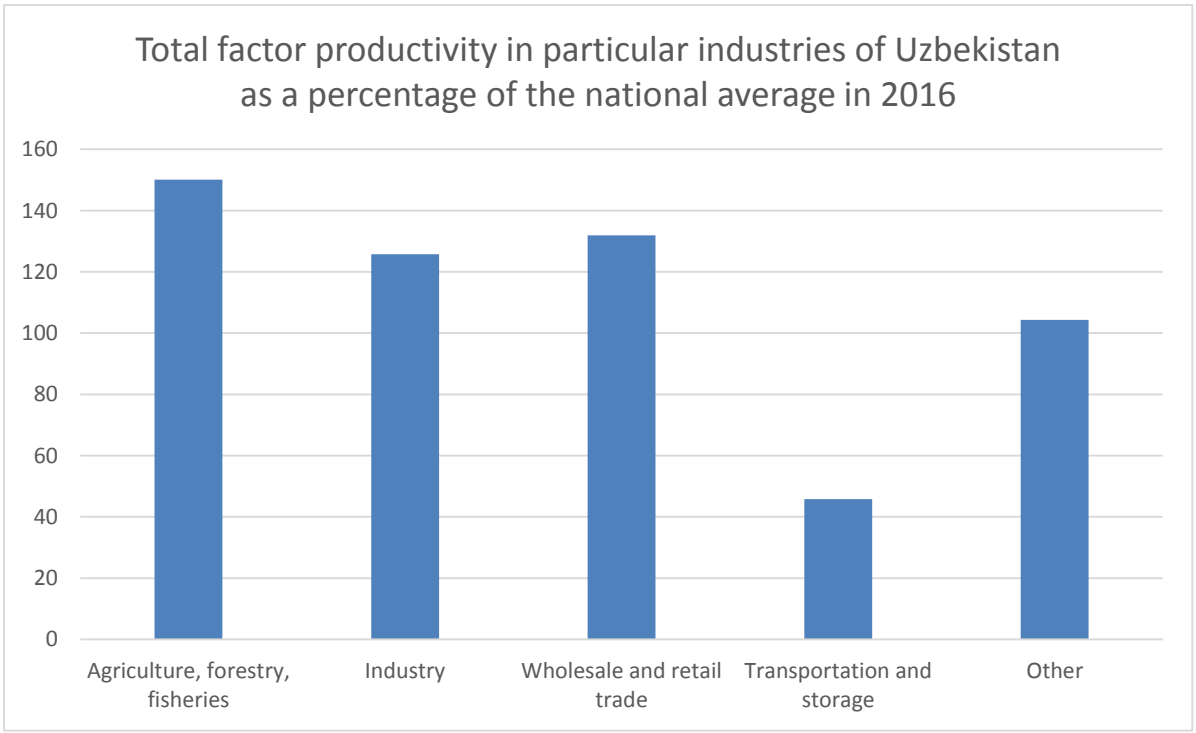

Total factor productivity in particular industries of Uzbekistan as a percentage of the national average in 2016
160
140
120
100
80
60
40
20
0
Agriculture, forestry, fisheries
Industry
Wholesale and retail trade
Transportation and storage
Other

**Table 1A: Share of particular industries in GDP, investment, and output of Uzbekistan in 2016 (percentage), and total factor productivity (TFP) as a percentage of the national average**

| Industries | Investment | Employment | GDP | TFP |
|---|---|---|---|---|
| Agriculture, forestry, fisheries | 3.3 | 27.3 | 17.6 | 150.1 |
| Industry | 37.9 | 13.5 | 25.65 | 125.7 |
| Wholesale and retail trade | 4.9 | 11 | 10.5 | 131.9 |
| Transportation and storage | 9 | 11.6 | 4.8 | 45.8 |
| Other | 44.9 | 36.6 | 41.45 | 104.4 |
| ALL | 100 | 100 | 100 | 100 |

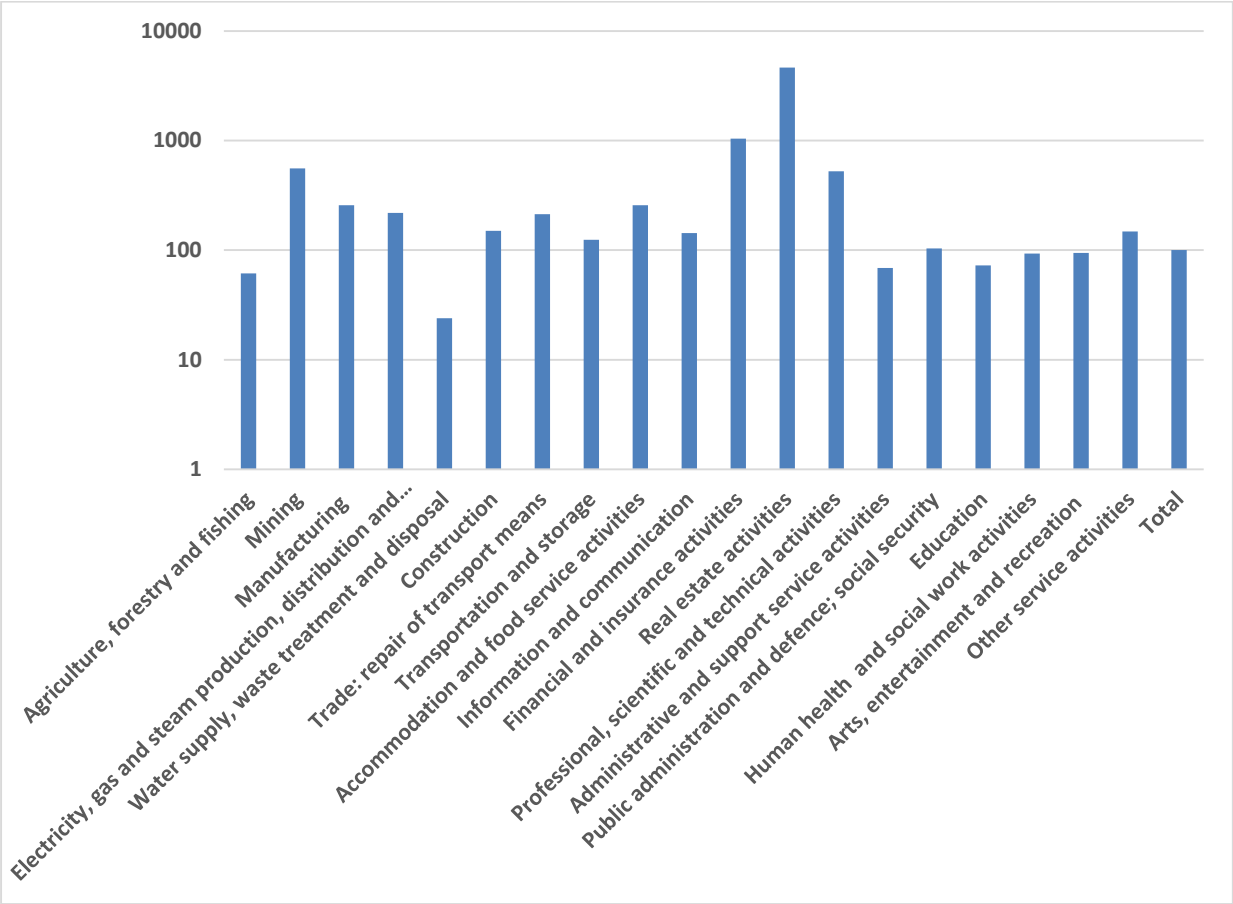
*TFP* – total factor productivity - is computed as
$TFP = GDP/(K^aL^b)$, where *K* – is capital (proxied by investment), *L* – is labor (employment), $a$=0.4, $b$=0.6.
Source: National Statistics of Uzbekistan (https://www.stat.uz/en/).

**Azerbaijan**

The pattern of comparative efficiency of particular industries in Azerbaijan is very different from Uzbekistan: agriculture is the least efficient of national industries, whereas the champions of efficiency are the FIRE sector (finance, insurance, and real estate), professional consulting, and mining (oil); see figure 2A and table 2A. This is most likely the consequence of the Dutch disease, when resource revenues are not used to boost productivity in non-oil sectors.

However, Azerbaijan managed to improve its normalised trade balance in agricultural trade from the period of the 1990s – it is still worse than in 1994, but much better than in the second half of the 1990s (figure 13). And NTB in meat products has actually improved (fig. 16) – one of the few cases of an improved competitiveness indicator in a sub-industry of agriculture in the post-Soviet space.

**Figure 2A: Total Factor Productivity in particular industries in Azerbaijan in 2016, national economy level = 100%, log scale**




Source: National Statistics of Azerbaijan (Vilayat Valiyev).

**Table 2A: Total Factor Productivity in particular industries in Azerbaijan in 2016, national economy level = 100%**

| Industry | Output | Employment | Investment | Labour productivity | Capital productivity | TFP |
|---|---|---|---|---|---|---|
| Agriculture, forestry and fishing | 7.1 | 36.3 | 2.1 | 19.6 | 344.3 | 61.5 |
| Mining | 24.2 | 0.8 | 54.4 | 3018.3 | 44.4 | 558.4 |
| Manufacturing | 10.1 | 5.1 | 2.7 | 199.3 | 376.8 | 257.1 |
| Electricity, gas and steam production, distribution and supply | 2.2 | 0.6 | 2.3 | 385.2 | 94.1 | 219.2 |
| Water supply, waste treatment and disposal | 0.3 | 0.6 | 3.7 | 48.1 | 8.4 | 24.0 |
| Construction | 15.6 | 7.2 | 18.0 | 216.2 | 87.0 | 150.2 |
| Trade: repair of transport means | 11.1 | 14.7 | 1.1 | 75.3 | 1020.0 | 213.6 |
| Transportation and storage | 7.0 | 4.2 | 8.8 | 167.4 | 79.1 | 124.0 |
| Accommodation and food service activities | 2.5 | 1.4 | 0.5 | 174.4 | 457.2 | 256.4 |
| Information and communication | 1.8 | 1.3 | 1.3 | 142.2 | 144.6 | 143.2 |
| Financial and insurance activities | 2.2 | 0.6 | 0.0 | 378.4 | 4806.5 | 1045.9 |
| Real estate activities | 2.7 | 1.8 | 0.0 | 145.5 | 838371.8 | 4645.7 |
| Professional, scientific and technical activities | 2.0 | 1.4 | 0.0 | 136.1 | 3962.7 | 524.2 |
| Administrative and support service activities | 0.7 | 1.2 | 0.7 | 55.3 | 95.1 | 68.6 |
| Public administration and defense; social security | 3.8 | 6.0 | 1.8 | 63.6 | 215.7 | 103.7 |
| Education | 2.7 | 7.9 | 1.3 | 34.8 | 218.7 | 72.6 |
| Human health and social work activities | 2.0 | 3.9 | 0.8 | 50.1 | 237.2 | 93.3 |
| Arts, entertainment and recreation | 0.9 | 1.6 | 0.4 | 55.9 | 206.9 | 94.3 |
| Other service activities | 1.2 | 3.3 | 0.1 | 36.6 | 1204.6 | 148.2 |
| **Total** | 100.0 | 100.0 | 100.0 | 100 | 100 | 100 |

Source: National Statistics of Azerbaijan (Vilayat Valiyev).

But the story of Azerbaijani agriculture seems to be more complicated. Since 2007 and until 2012 agriculture was obtaining a much increased share of national investment – up to 4% (fig. 3A); it later decreased to 2% in 2014-16, but was still higher than in 1998-2006, when it fluctuated around 1% (fig. 3A). Before 2006, the TFP in agriculture (as measured with investment data) was way higher than in many other industries: in 2005, it was over 260% of the national average (table 3A).

**Figure 3A: Share of agriculture, fisheries and forestry in total investment in Azerbaijan in 1998-2016 (percentage)**

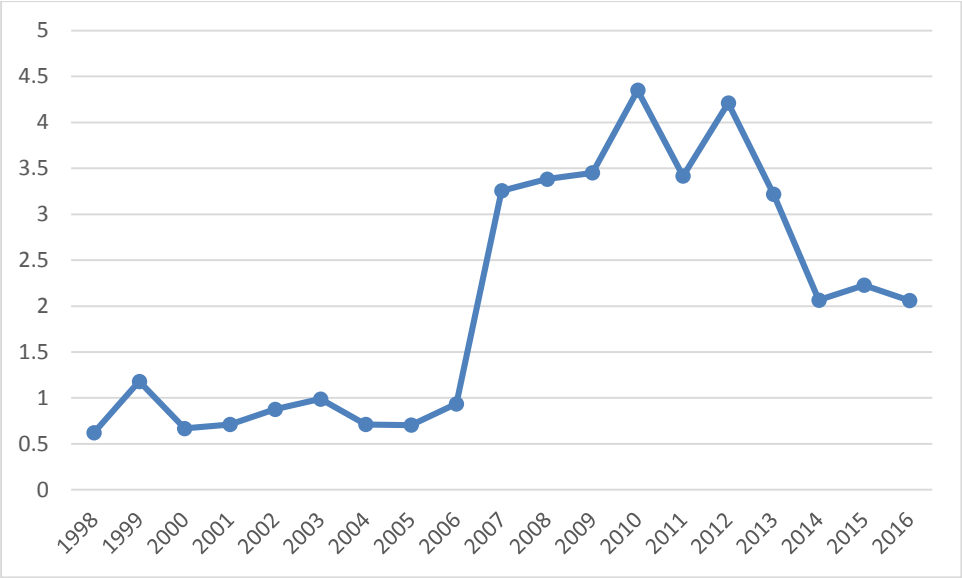



**Table 3A: Share of agriculture in total output, employment and investment (percentage) and Total Factor Productivity in agriculture as a percentage of the national average in 2005**

| | |
|---|---|
| Output | 9.3 |
| Employment | 38.7 |
| Investment | 0.7 |
| TFP as a % of the national average | 265.8 |

*Note: TFP* – total factor productivity – is computed as
$TFP = GDP/(K^aL^b)$, where $K$ – is capital (proxied by investment), $L$ – is labor (employment), $a$=0.4, $b$=0.6.
Source: National Statistics of Azerbaijan (Vilayat Valiyev).

## Kazakhstan

Kazakhstan has a similar story to Azerbaijan. The TPF in agriculture was probably high in the 1990s, when the share of agriculture in total investment was low, but it had fallen by 2017 because the growth of investment outweighed the reduction in employment.

**Table 4A: Share of agriculture in total output, employment and investment (percentage) and Total Factor Productivity in agriculture as a percentage of the national average (Kazakhstan)**

| Year | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Share of agriculture in GDP, % | 7.8 | 7.0 | 6.3 | 5.4 | 5.6 | 5.2 | 6.1 | 4.5 | 5.0 | 4.3 | 4.5 | 4.3 | 4.7 | 4.6 | 4.4 |
| Share of agriculture in employment, % | 35.3 | 33.5 | 32.4 | 31.3 | 31.0 | 29.9 | 29.2 | 28.3 | 26.5 | 25.5 | 24.2 | 18.9 | 16.2 | 16.2 | 15.4 |
| Share of agriculture in total investment, % | 1.9 | 2.6 | 2.0 | 1.6 | 1.6 | 1.7 | 1.7 | 1.8 | 2.2 | 2.4 | 2.3 | 2.6 | 2.3 | 3.3 | 4.0 |
| TFP as a % of national average | 70.9 | 58.4 | 58.8 | 57.5 | 59.6 | 54.5 | 65.1 | 48.0 | 51.1 | 42.9 | 47.7 | 50.5 | 63.2 | 53.4 | 49.3 |

*Note: TFP* – total factor productivity – is computed as
$TFP = GDP/(K^aL^b)$, where $K$ – is capital (proxied by investment), $L$ – is labor (employment), $a$=0.4, $b$=0.6.

Source: National Statistics of Kazakhstan (provided by Dauren Oshakbayev).

## Turkmenistan

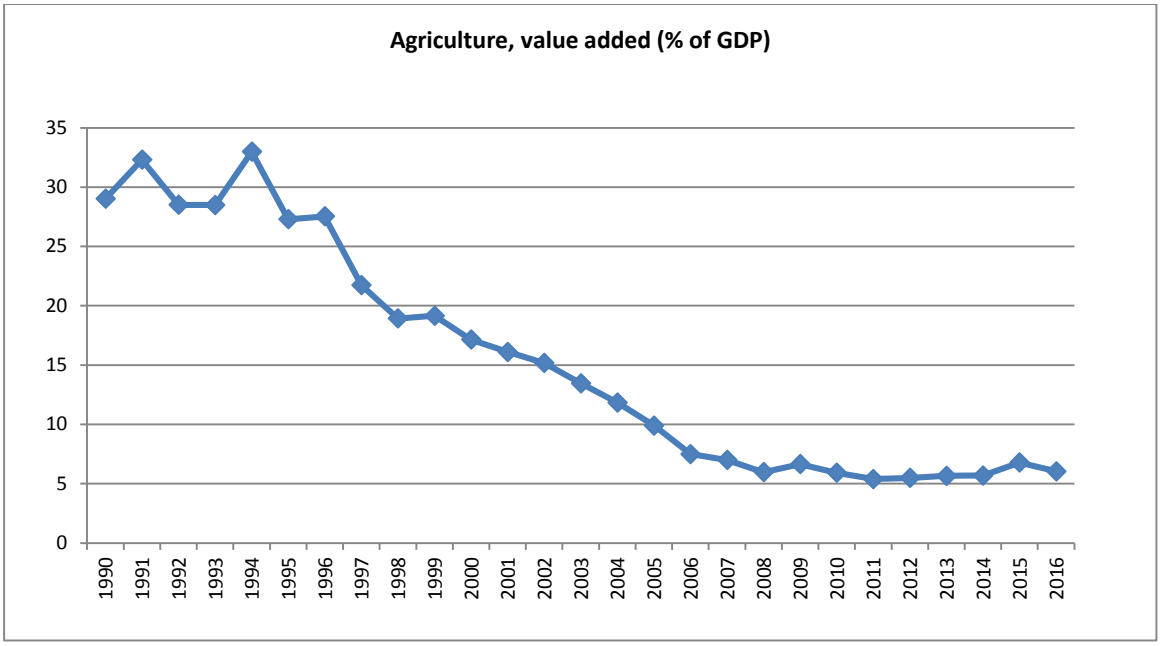
**Table 5A: Share of agriculture in total output, employment and investment (percentage) and Total Factor Productivity in agriculture as a percentage of the national average in Turkmenistan**

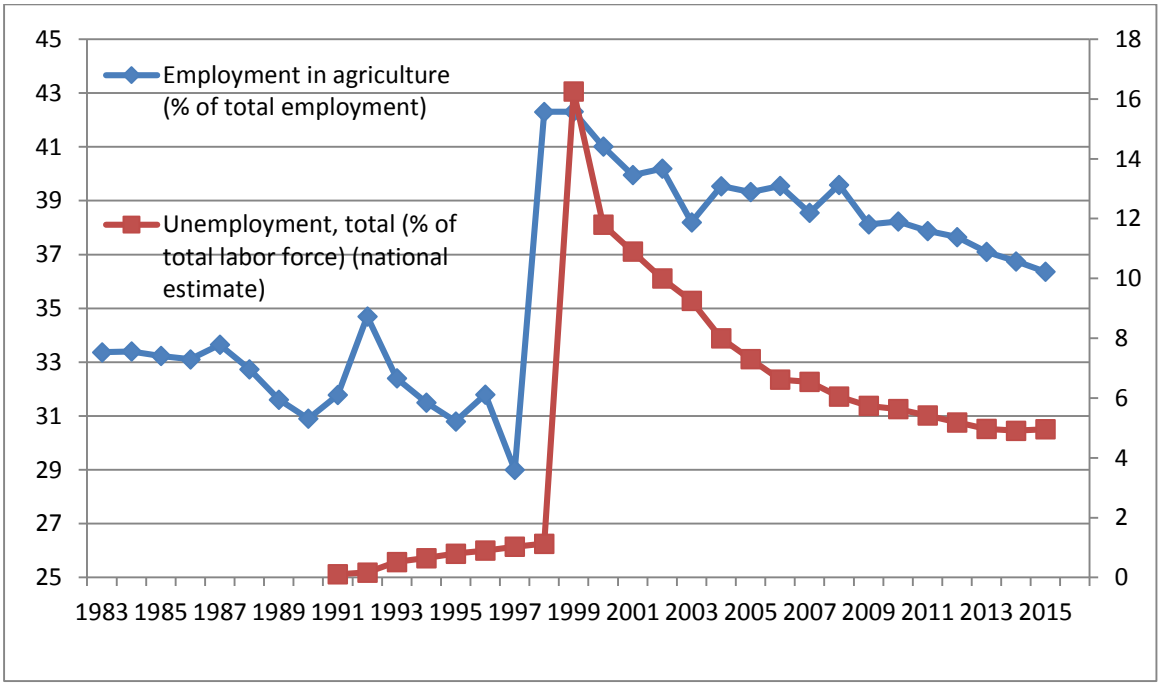
| Share of agriculture in | 2000 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|
| Output | 23 | 19 | 13 | 13 | 15 | 13 |
| Employment | 47.6 | 48.4 | 47.5 | 46.3 | 46.7 | 46.6 |
| Investment | 8.8 | 6.7 | 4.1 | 3.2 | 2.9 | 2.2 |
| TFP as a % of national average | 95.0 | 86.6 | 73.3 | 81.3 | 97.0 | 94.1 |

*Note: TFP* – total factor productivity – is computed as
$TFP = GDP/(K^aL^b)$, where $K$ – is capital (proxied by investment), $L$ – is labor (employment), $a$=0.4, $b$=0.6.
Source: National Statistics of Turkmenistan (provided by Murad Nepesov).

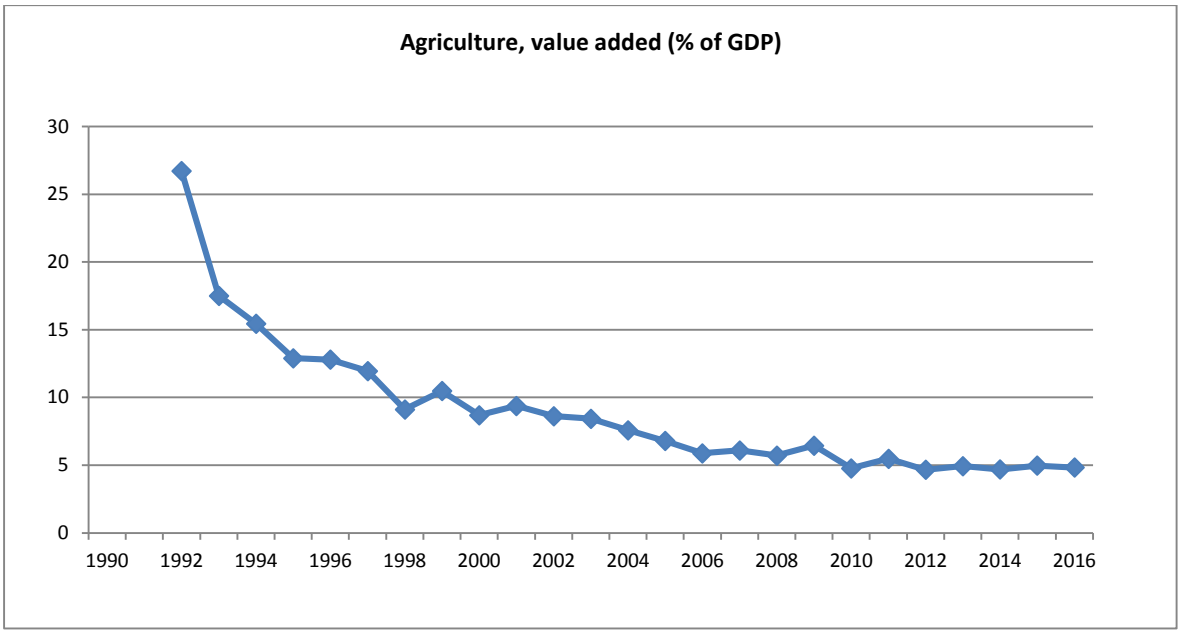
## Appendix B. Share of agriculture in GDP and total employment

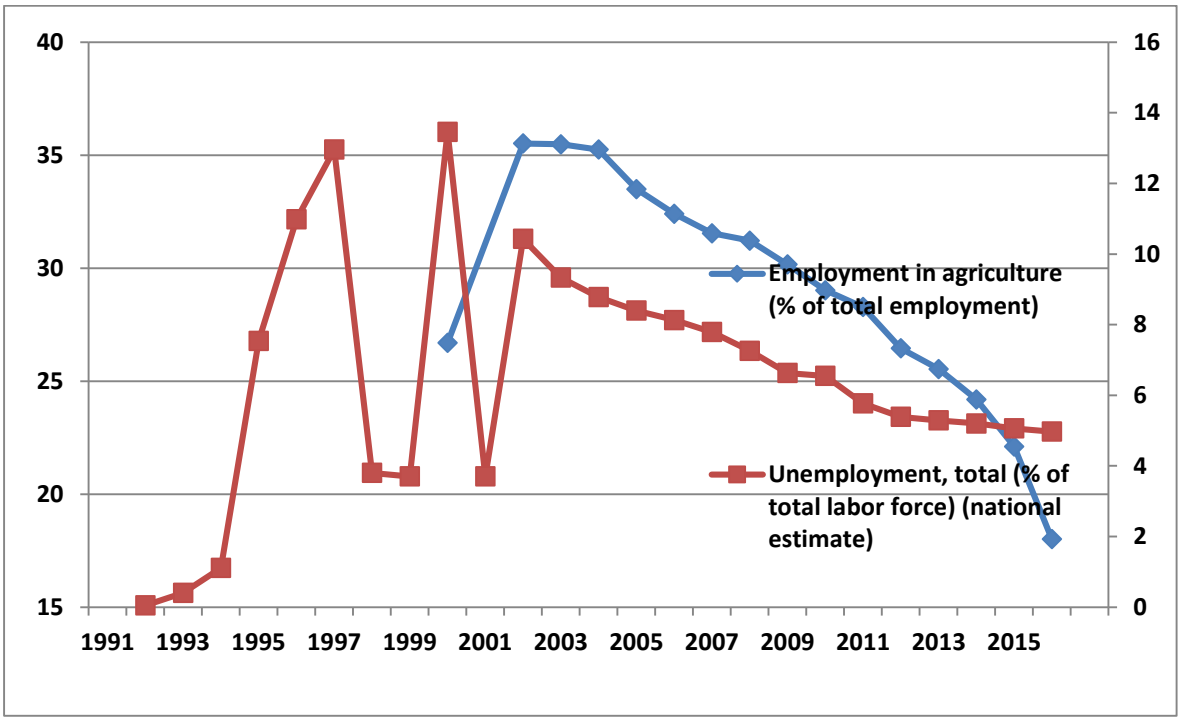
### Azerbaijan



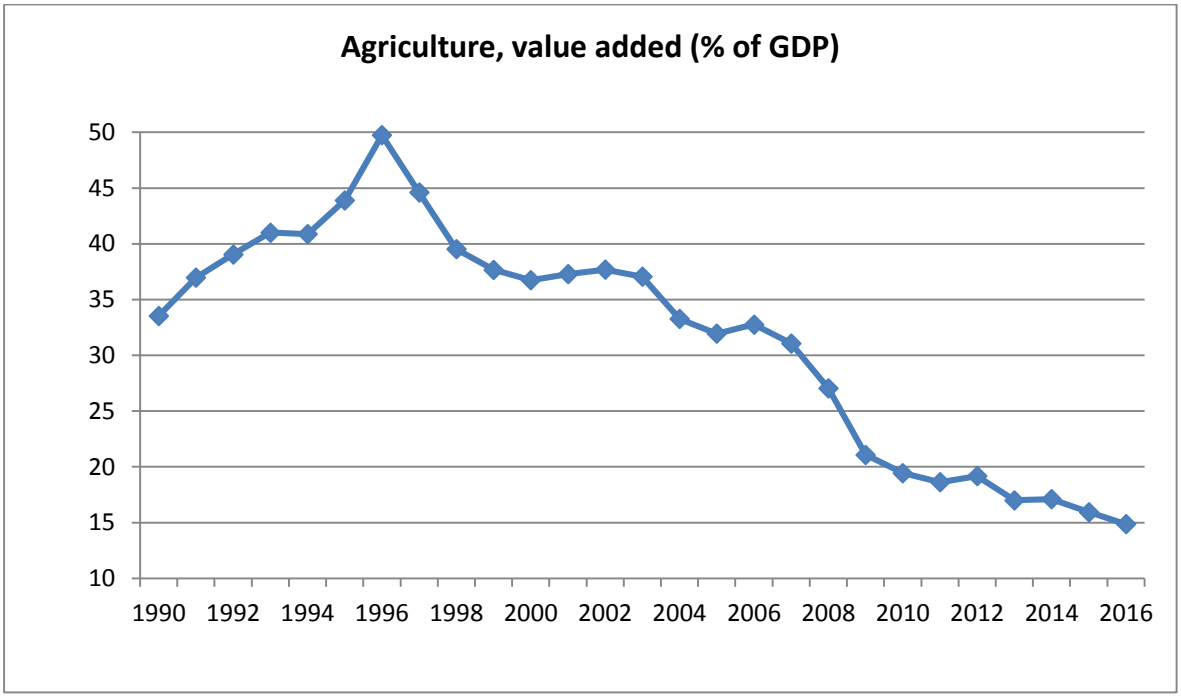



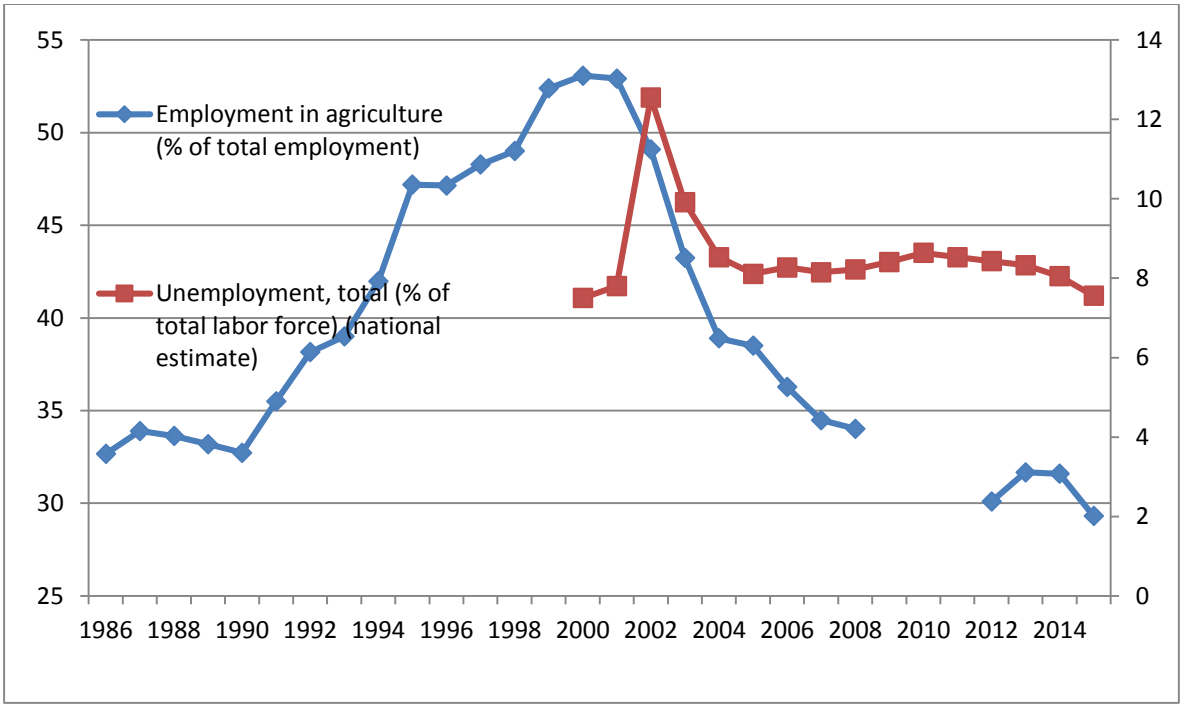
## Kazakhstan


Agriculture, value added (% of GDP)
30
25
20
15
10
5
0
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016


40
35
30
25
20
15
16
14
12
10
8
6
4
2
0
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
2013
2015
Employment in agriculture (% of total employment)
Unemployment, total (% of total labor force) (national estimate)

## Kyrgyzstan


Agriculture, value added (% of GDP)
50
45
40
35
30
25
20
15
10
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016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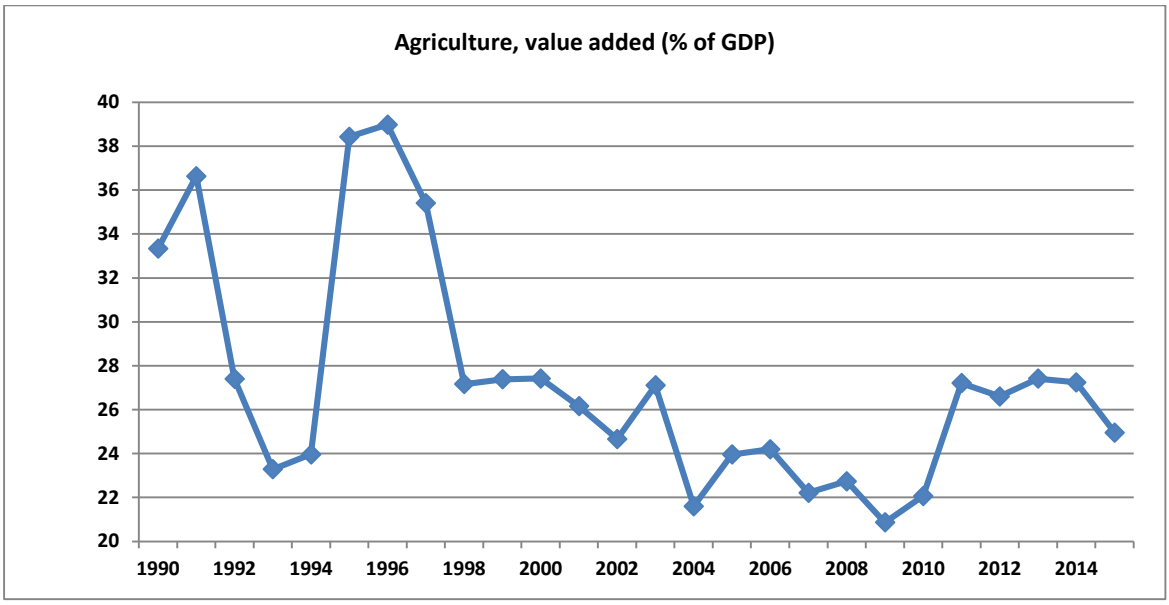
50
45
40
35
30
25
14
12
10
8
6
4
2
0
Employment in agriculture (% of total employment)
Unemployment, total (% of total labor force) (national estimate)
1986 1988 1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014

## Tajikistan


Agriculture, value added (% of GDP)
40
38
36
34
32
30
28
26
24
22
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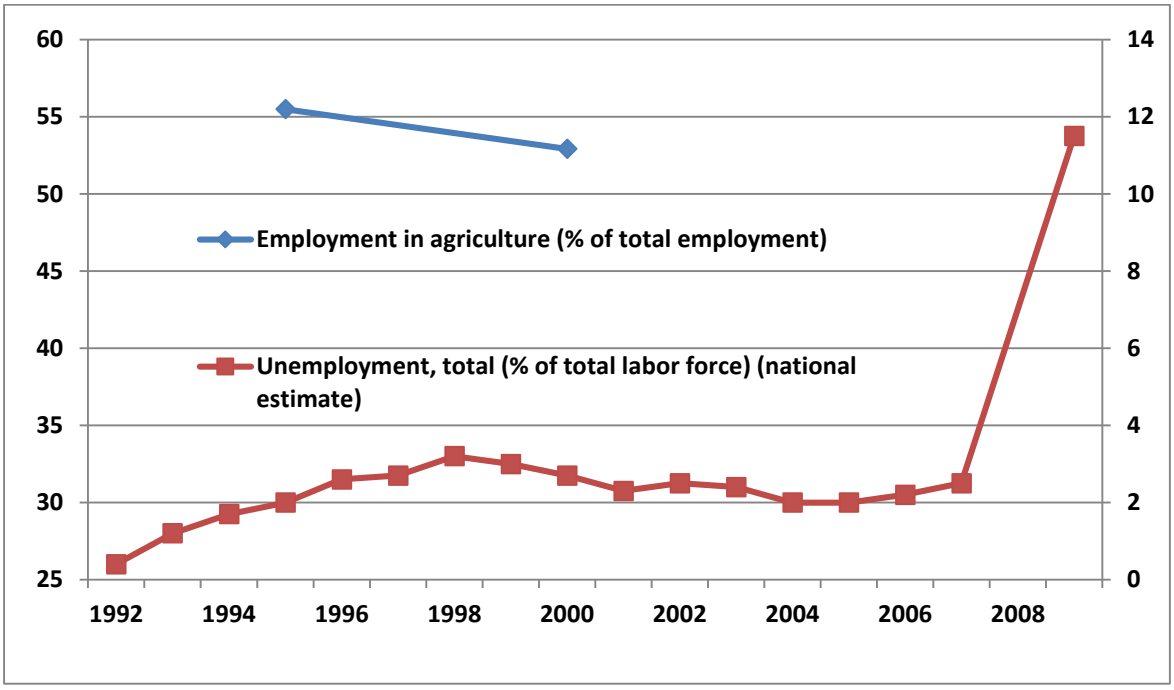
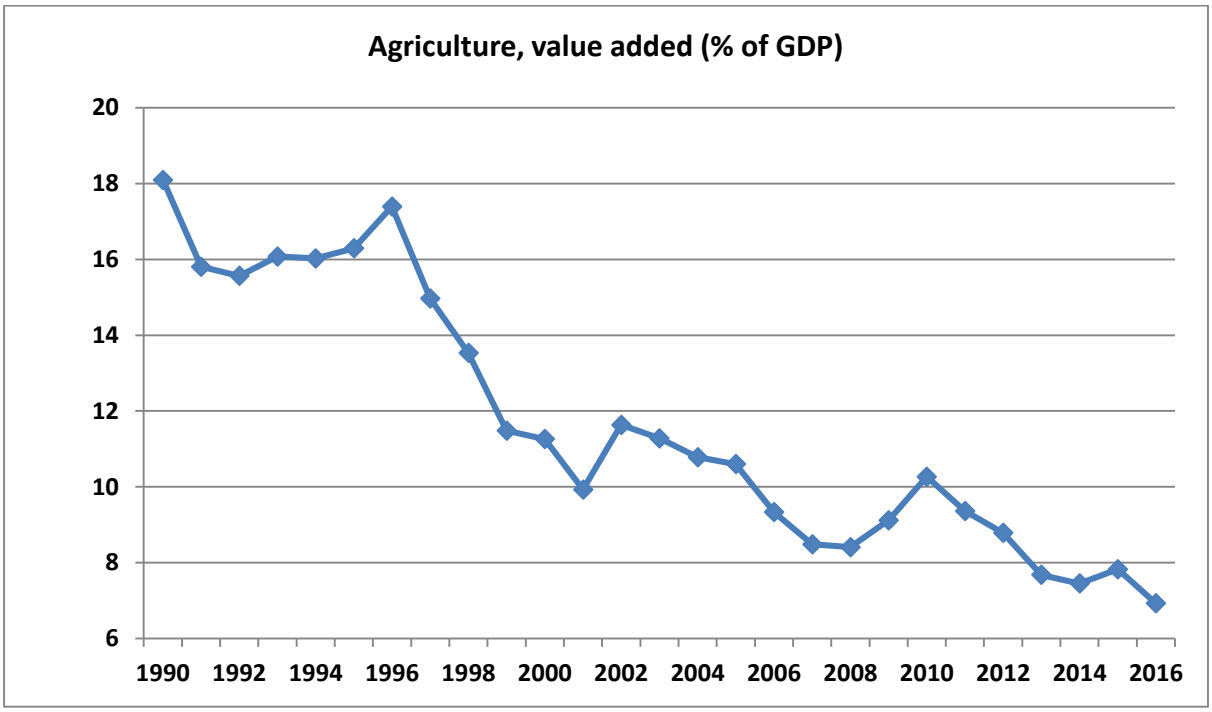
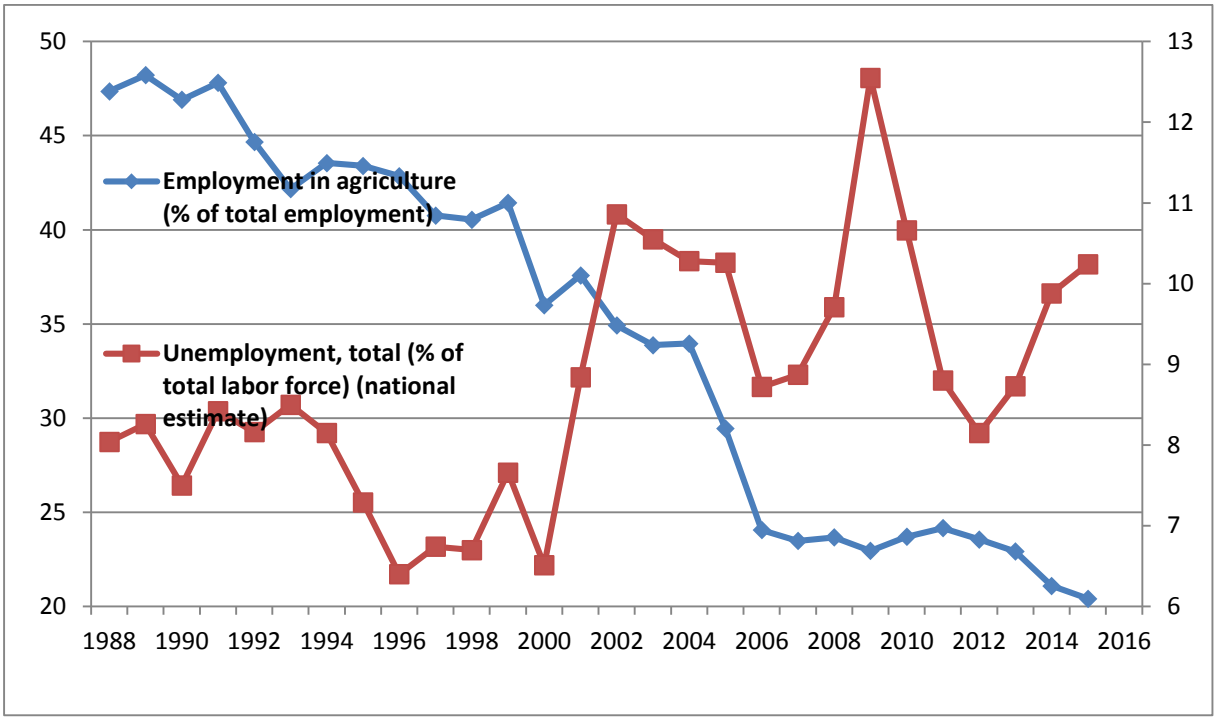
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014

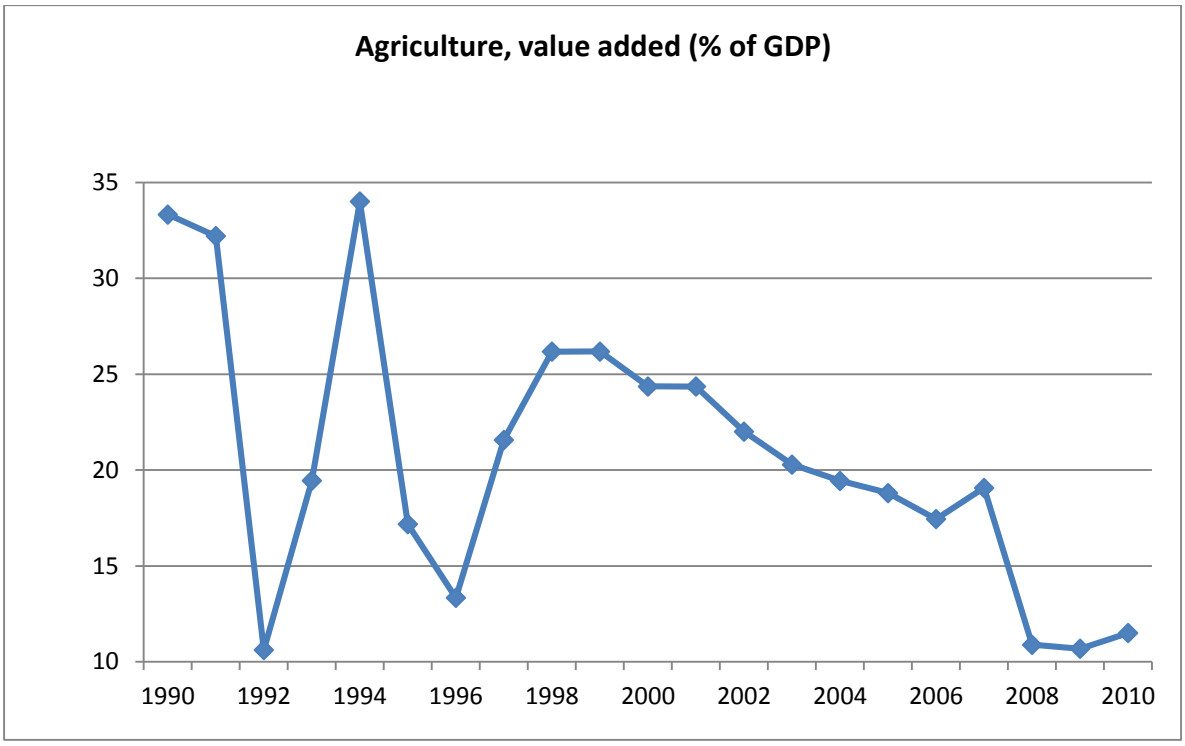

60
55
50
45
40
35
30
25
14
12
10
8
6
4
2
0
Employment in agriculture (% of total employment)
Unemployment, total (% of total labor force) (national estimate)
1992
1994
1996
1998
2000
2002
2004
2006
2008

## Turkey

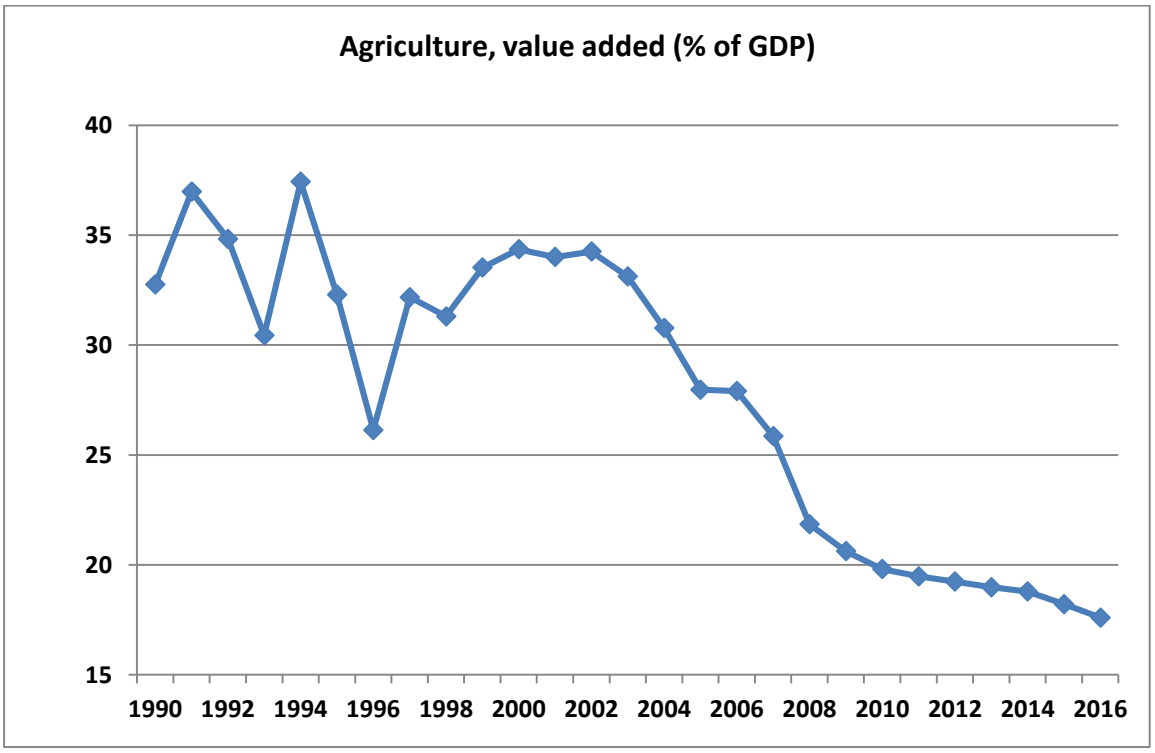

Agriculture, value added (% of GDP)
20
18
16
14
12
10
8
6
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016

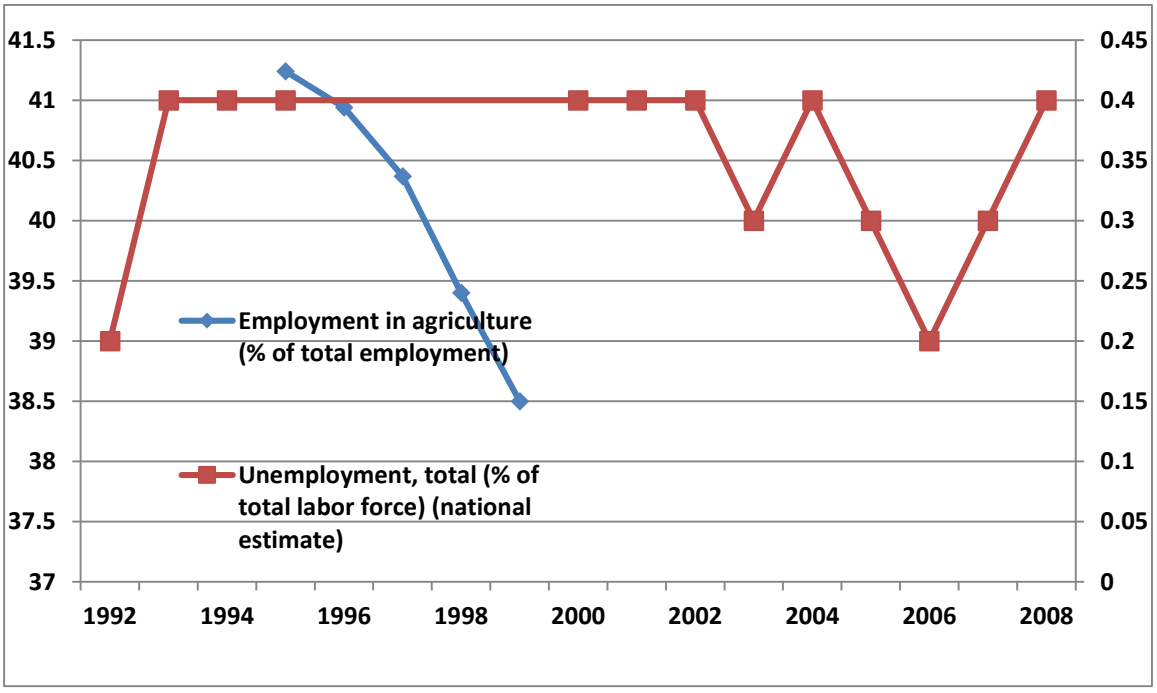

50
45
40
35
30
25
20
13
12
11
10
9
8
7
6
Employment in agriculture (% of total employment)
Unemployment, total (% of total labor force) (national estimate)
1988 1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016

## Turkmenistan



## Uzbekistan




Source: Data from the World Development Indicators.