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Uzbekistan with a Focus on the Agricultural Sector**

A Technical Documentation

**Abdurashid Bozorov, Arndt Feuerbacher
& Christine Wieck**

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**A 2014 SOCIAL ACCOUNTING MATRIX
(SAM) FOR UZBEKISTAN WITH A FOCUS
ON THE AGRICULTURAL SECTOR**

- TECHNICAL DOCUMENTATION –

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March, 2021

Abstract

Social accounting matrices (SAMs) are the core underlying data for economy-wide simulation models such as computable general equilibrium models. This paper reports the development of a SAM for Uzbekistan for the year 2014. The last SAM developed for Uzbekistan is based on the year 2001 (Müller, 2006) and Uzbekistan is listed among the top ten countries by GDP and population by the Global Trade and Analysis Project for which a recent input-output is missing. The SAM documented in this technical paper is characterized by a detailed representation of the agricultural sector. Generally, data availability in Uzbekistan is a challenge and the development process had to rely on myriad data sources. The final SAM values are estimated using an information-theoretic, cross-entropy approach. Using a Bayesian perspective, the degree of uncertainty of cell entries' prior values reflected the availability and quality of data sources. In total, this SAM consists of 88 accounts. There are 31 commodity accounts and 31 accounts describe economic activities of which 17 activities are part of the agricultural sector. The factor accounts comprise five types of labor, capital, and main natural resources: land and water. There are three household accounts, one government, and five tax accounts. The authors hope that this SAM will allow researchers to investigate research questions that are of high priority for Uzbekistan's future economic development, particularly those related to the future role of agriculture and water.

Table of Contents

Abstract.....	ii
Table of Contents	iii
List of Abbreviations	v
List of Tables	vi
List of figures.....	vii
1 Introduction	1
2 Country context – Uzbekistan.....	3
3 Methodology and data sources.....	6
3.1 A SOCIAL ACCOUNTING MATRICES AND THE CONCEPT OF CIRCULAR FLOW ECONOMY.....	6
3.2 DATA SOURCES	9
4 Prior - 2014 macro SAM for Uzbekistan.....	12
4.1 ECONOMIC STRUCTURE 2010-2015	12
4.2 UNDERLYING DATA SOURCES FOR PRIOR UNBALANCED 2014 MACRO SAM FOR UZBEKISTAN.....	14
4.3 UNBALANCED PRIOR 2014 MACRO SAM.....	16
4.4 BALANCED PRIOR 2014 MACRO SAM	16
5 2014 Micro-SAM development for Uzbekistan	20
5.1 GROSS OUTPUT, ACTIVITY AND COMMODITY ACCOUNTS.....	21
5.2 TRADE AND TRANSPORT MARGINS	23
5.3 PRODUCTION FACTORS	24
5.3.1 <i>Factor income</i>	24
5.3.2 <i>Labor accounts</i>	25
5.3.3 <i>Capital and natural resource accounts</i>	28
6 Households and enterprises.....	32
6.1 CLASSIFICATION OF THE HOUSEHOLD ACCOUNTS	32
6.2 MIXED-INCOME OF THE HOUSEHOLDS	33
6.2.1 <i>The distribution of capital income</i>	36
6.2.2 <i>Transfers</i>	37
6.3 HOUSEHOLD EXPENDITURE PATTERNS	37

6.4	ENTERPRISE ACCOUNT.....	40
7	Government, capital and the rest of the world accounts	40
7.1	GOVERNMENT ACCOUNT	40
7.1.1	<i>Government transfers</i>	42
7.1.2	<i>Government savings</i>	42
7.1.3	<i>Taxes and subsidies account</i>	42
7.1.4	<i>Individual income and resource taxes</i>	43
7.2	CAPITAL ACCOUNT	43
7.3	THE REST OF THE WORLD (ROW) ACCOUNT	44
7.3.1	<i>Foreign trade</i>	47
8	Final 2014 Uzbekistan SAM.....	48
8.1	BALANCING THE MICRO- SAM USING CROSS-ENTROPY APPROACH	48
8.2	FINAL 2014 UZBEKISTAN SAM.....	50
9	Conclusion.....	50
10	Appendixes.....	53
11	References	55

List of Abbreviations

ADB	Asian Development Bank
BoP	Balance of Payments
CBU	Central Bank of Uzbekistan
ERDB	European Bank for Reconstruction and Development
FAO	Food and Agriculture Organization of the United Nations
GAMS	General Algebraic Modelling System
GDP	Gross Domestic Product
GOU	The Government of Uzbekistan
IEA	International Energy Agency
IFPRI	International Food Policy Research Institute
IMF	International Monetary Fund
IOT	Input Output Tables
MAWR	Ministry of Agriculture and Water Resources
MELR	Ministry of Employment and Labor Relations
MF	Ministry of Finance
MFER	Ministry of Foreign Economic Relations
ROW	Rest of the world
SAM	Social Accounting Matrix
SNA	System of National Account
StatUz	The State Committee of the Republic of Uzbekistan on Statistics
SUT	Supply Use Table
UZS	Uzbek Soum (currency)
VAT	Value Added Tax
GTAP	Global Trade Analysis Project

Currency Equivalents: Exchange Rate Effective as of 2014

Currency Unit: US\$1 = 2,311 Uzbekistan Soum (UZS)

List of Tables

Table 1. Schematic representation of a macro-SAM	8
Table 2. Main data sources utilized during the SAM estimation process.	11
Table 3a). Statistics on gross domestic product, gross value added of economic sectors and other national account statistics measured in Billion Soum (current prices)	13
Table 4. Underlying data sources and estimation methods used for unbalanced prior- 2014 macro SAM	15
Table 5. Unbalanced prior 2014 macro SAM for Uzbekistan, in Billion UZS	16
Table 6. Balanced prior 2014 macro SAM for Uzbekistan, in Billion UZS	17
Table 7. The difference in the totals of balanced prior macro SAM and unbalanced prior macro SAM for Uzbekistan, in percentage	18
Table 8. Column shares of balanced prior 2014 macro SAM for Uzbekistan, in percentage	18
Table 9. Row shares of balanced prior 2014 macro SAM for Uzbekistan, in percentage	19
Table 10. GDP calculation methods based on balanced prior macro SAM, in Billion UZS	20
Table 11. Estimation of Gross agricultural output in 2014 based on 2014-15 quantity and prices.	22
Table 12. The shares of factors of production for agricultural commodities, in percentages	25
Table 13. Technical norms of water usage to irrigate the farmlands in Uzbekistan	31
Table 14. Gross value-added and numbers of the workers per types of employment, 2014.....	34
Table 15. Labor endowments of household groups in Uzbekistan	35
Table 16. Income distribution of the household groups in Billion UZS	36
Table 17. Expenditure structure for rural households.....	39
Table 18. Consumption patterns of the households based on the final micro SAM, in %.....	39
Table 19. Shares for government budget revenue and expenditure in GDP	41
Table 20. Indirect taxes and direct subsidies, 2013- 2016, Billion UZS.....	42
Table 21. Calculation of the current account balance for Uzbekistan in 2014	46
Table 22. Export and import goods and services of Uzbekistan in 2014.....	48
Table 23. Difference (in %) between balanced prior and final macro SAM.....	49
Table 24. Final 2014 macro SAM for Uzbekistan	50
Table 25. Data reliability matrix for the 2014 SAM for Uzbekistan with a data quality ranking from A to D .	52

List of figures

Figure 1. Political map of Uzbekistan.....	3
Figure 2. Dynamics of the change in the share of GDP by the sectors of the economy, 2000-2017	5
Figure 3. The circular flow of transactions within an economy.....	7
Figure 4. Disaggregation of labor account in the SAM.	26
Figure 5. Distribution of workers by the types of employment.	27
Figure 6. The share of informal employment in agriculture, industry and services.....	28
Figure 7. Household income sources for urban and rural dwellers, in percentage	35
Figure 8. Household expenditure shares for primary commodities in Uzbekistan, 2013	38
Figure 9. Main investment goods and commodities	44

1 Introduction

A Social Accounting Matrix (SAM) is an economic statistical framework that captures an economy's circular flow, i.e., the entire transactions among agents within an economy. SAMs usually record transactions within one year. Consequently, a SAM can only provide a snapshot of a country's economy (Steven et al., 2005) and in most countries, SAMs are only updated in intervals between five to ten years. The first SAM was built for the economy of Great Britain in 1960 by Sir Richard Stone, who was awarded the Nobel Prize in economics for his pioneering work in the development of the systems of national accounts. SAMs present the underlying database for economy-wide models, such as SAM multiplier models and computable general equilibrium (CGE) models. The latter has become an established method and simulation model tool for the ex-ante assessment of policies and exogenous impacts on economies from the national to the regional and global scale.

This paper reports the development of a (SAM) for Uzbekistan based on the year 2014. The latest SAM developed for Uzbekistan available before the SAM reported herein was constructed for the base year 2001 (Müller, 2006). The need for a more recent SAM for Uzbekistan is also partially owed to the country's economic and environmental transformations. In the Soviet era, the country was subject to a central-planning system. Since the fall of the iron curtain in the 1990s, the country has been gradually shifting towards a market-oriented economy. Yet, particularly in the agricultural sector, free allocation of production factors is still hindered by state-procurement systems. This has also detrimental effects on the natural resources, which became most known to the global public by the vanishing of the Aral Sea.

The impacts of exogenous shocks (e.g., climate change, pandemics, etc.) and changes in policies often affect all sectors within an economy. Analyzing and understanding these impacts before they actually occur is possible through the employment of simulation models. This underlines the importance of empirical policy analysis, for which this SAM may serve as an input. Another objective of this documentation is to subsequently contribute an Input-Output Table (IOT) derived from the newly estimated SAM to the Global Trade Analysis Project (GTAP). Uzbekistan is listed

among the top ten countries by GDP and population for which a more recent IOT is needed within the GTAP database (GTAP, 2020). The 2014 SAM for Uzbekistan focuses on the agricultural sector, which is still employing the highest share of the country's labor force because approximately half of the population living in rural areas is engaged in agricultural activities through semi-subsistence family farming (ADB, 2016). Agriculture is also the main source of income and livelihoods of people living in poverty (ibid). Estimating a SAM for Uzbekistan is accompanied by manifold challenges related to data availability and quality. Yet, in the recent past the situation of data access and collection has been improving.

In total, this SAM consists of 88 accounts. There are 31 commodity accounts and 31 accounts describe economic activities of which 17 activities are part of the agricultural sector. The factor accounts comprise five labor groups, capital, and natural resources: land and water. There are two margin accounts (trade and transportation), three household accounts, one government, five tax accounts as well as one savings and investment including stock changes and rest of the world (ROW) account. Distinct features of the Uzbek agricultural system are reflected in the SAM. Both, agricultural activities and commodities are differentiated by the production system: dehkan and commercial farms. Dehkan farms are semi-subsistence farms of private households operating on small landholdings of less than 0.5 hectares, commercial farmers in contrast are large in size and controlled through the state procurement system. The agricultural sector is subject to various government policies and regulations. Therefore, the distribution of natural resources and supportive measures to the agricultural sector is determined by the state.

2 Country context – Uzbekistan

Uzbekistan is a double landlocked, lower-middle-income country situated in Central Asia bordering with former Soviet Union countries, Kazakhstan in the North, Tajikistan, and Kyrgyzstan in the east and Afghanistan in the south, and Turkmenistan in the southwest (Figure 1). The country has a total area of 447 thousand km², of which arable land and area under permanent crops comprise about 10% (FAO, 2012). 4,301 thousand hectares are either utilized for temporary crops, fallow or meadow land. 350 thousand hectares is used for cultivation of permanent crops.



Figure 1. Political map of Uzbekistan

Source: adapted from King, A and Cole, B, 2008

Approximately 60% of agricultural output value comes from crop production and the remainder through livestock. Uzbekistan consists of 12 regions plus the Autonomous Republic of Karakalpakstan in the western part where the Aral Sea is located. Uzbekistan is the most populous country in Central Asia with a population of 32.4 Million people in 2017, which is almost two times as much as the second most populous Central Asian country, Kazakhstan, with 18.0 Million

people in the same year (World Bank, 2019). The country is rich in natural resources and has a growing young labor force since two-third of the population is less than 24 years old (ADB, 2016) The climate is characterized by relatively dry weather, low rainfall and hot summer followed by mild winters. Due to the exports of vast natural resources such as natural gas and gold, the economy is growing steadily. After the disintegration of the Soviet Union, Uzbekistan gained its independence on 01.09.1991, since then continuous reforms have been taking place in all sectors of the economy moving the country gradually from central planning to a market-based economy. Uzbekistan has also followed a development model based on export promotion and import substitution policies (Trushin and Carneiro, 2013) .

Despite the economic turmoil after the disintegration of the Soviet Union, Uzbekistan started to have positive GDP growth after 1996. The country is a large-scale agricultural producer regionally and globally, yet agriculture's share in GDP has been declining since independence from 34.5% in 2000 to 20.0% in 2017 (Figure 2). Nevertheless, agriculture still provides income to 27% of households and contributes 15% to total export revenues (ADB, 2016). In contrast, between 2000 and 2017, industry and service sectors have become increasingly important for the Uzbek economy (Figure 2).

Most of the structural changes in the Uzbek economy took place between 2005 and 2010 since the shares of agricultural value-added in the economy have declined by ten percentage points from 30% to 20% during the period (Figure 2), followed by a rather stable trend afterwards. Recent economic reforms accompanied by an increase in small scale and medium-sized businesses, government investments across sectors, and remittance income from abroad have led to a doubling of household income in real terms while reducing the poverty level in the country from 28% in 2001 to 14% in 2015 (ADB, 2016).

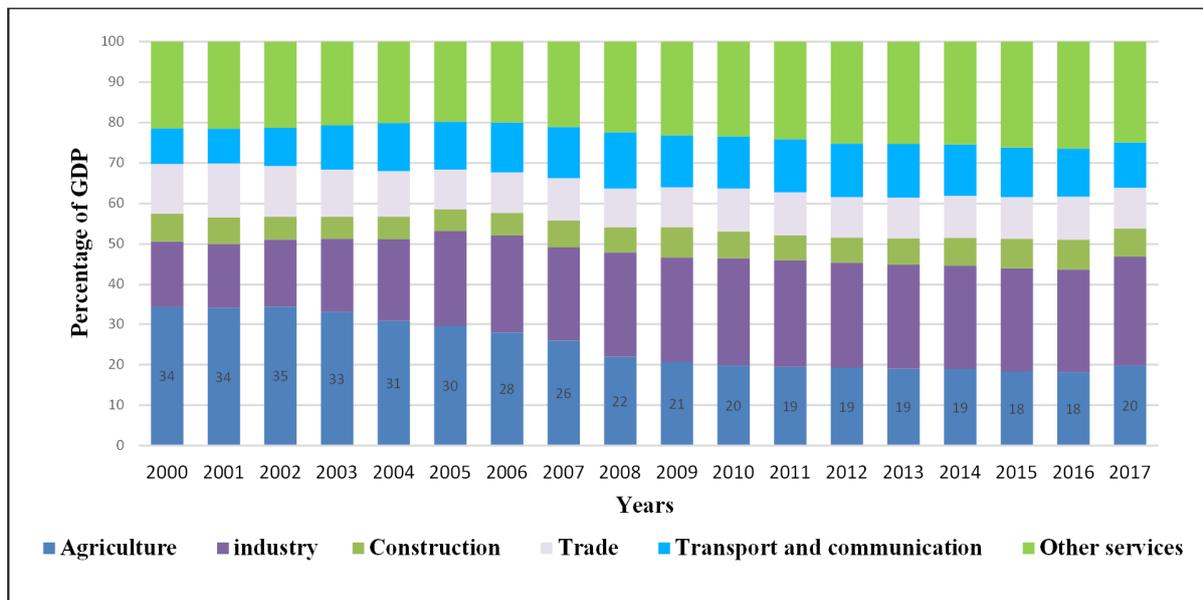


Figure 2. Dynamics of the change in the share of GDP by the sectors of the economy, 2000-2017

Source: own representation based on StatUz (2020a)

In Uzbekistan, despite efforts to become a market economy, the structure of the economy is still highly influenced by the government. This holds especially for industrial manufacturing sectors, to which significant shares of public investments are allocated. Industrial goods also dominate Uzbekistan’s exports, where gold, natural gas, and other ferrous materials make up the highest shares in total exports. Yet, the export base is also diversifying, with the increase in exports of food products and services. The revenues from the sales of natural resources are used to maintain government control over investments in crucial sectors of the economy. Initially, the government promoted industrial development based on an import substitution policy to secure self-sufficiency in critical segments such as food and energy. However, recent policies shifted to new measures promoting exports and liberalizing economic sectors (Trushin and Carneiro, 2013). For instance, the government is encouraging the exports of horticultural goods and reallocated land areas once used for cotton production to horticultural producers to diversify export commodities. Consequently, the share of cotton exports in total agricultural export earnings has declined (Bae & Mah, 2019).

3 Methodology and data sources

3.1 A Social Accounting Matrices and the concept of circular flow economy.

A SAM is a comprehensive, consistent, and complete data system, which captures all the interlinkages within a given economy. It is a snapshot of the economy since all transactions performed by economic agents in the economy are recorded in corresponding rows and columns as incomes and expenditures respectively. Agents are represented by single or joint accounts (Steven et al., 2005).

In contrast to other economic statistical frameworks such as the system of national accounts, IOTs and Supply Use Table (SUT), a SAM includes the complete information of an economic system by capturing transactions between all agents and markets. The representation of the complete circular flow of an economy is one of the main features of the SAM (Round, 1997) as illustrated in Figure 3. A SAM also serves as an essential database for economy-wide models such as multipliers analysis and computable general equilibrium models. Sir Richard Stone (1981, cited in Steven et al., 2005) laid the foundations of the theory underlying SAMs, such as the representation of income flows between all (relevant) economic agents.

The below illustration (Figure 3) of an economy's circular flow shows the relationship between agents' income and expenditures. Factors are owned by institutions (households, government, and enterprises)¹, which may allow economic activities to use the services from these factors in return for a factor income. Institutions use this factor income to finance their current expenditure (consumption of goods and services) as well as savings, payments of taxes, and transfers with other institutions and the rest of the world. Economic activities demand factor services and intermediate inputs. The output of activities, goods and services are demanded by institutions for final consumption, by the rest of the world (exports), and for capital formation by the investment account.

¹ The rest of the world may also own factors, but this is omitted from the illustration for the sake of simplicity.

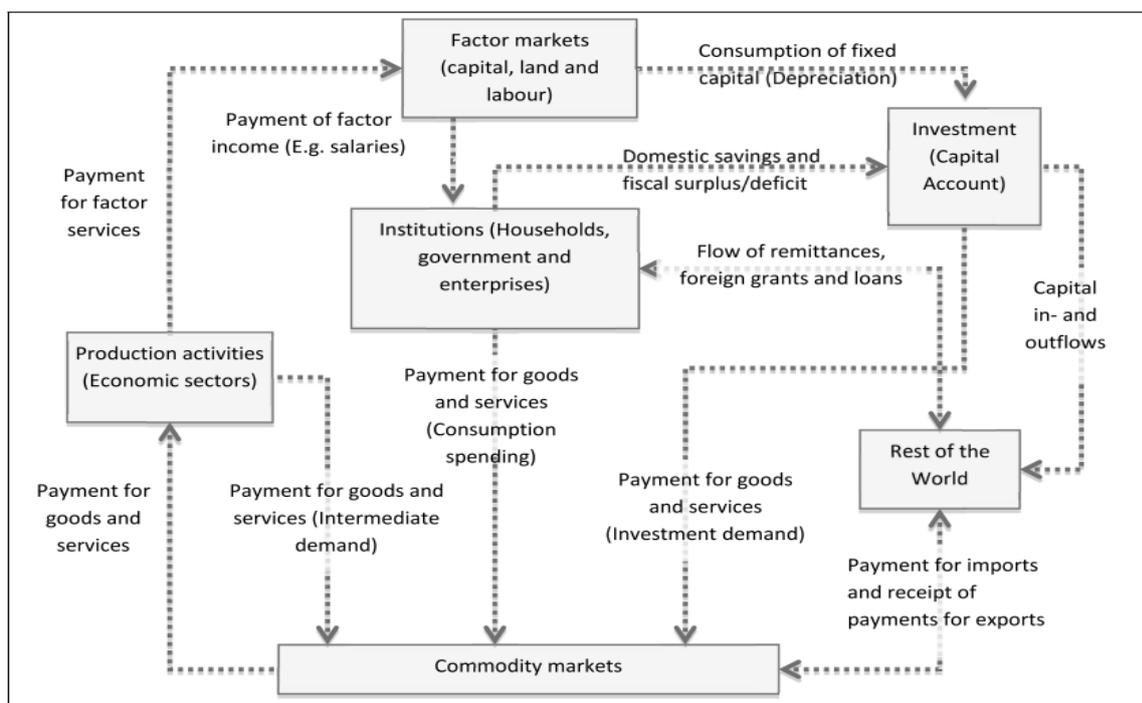


Figure 3. The circular flow of transactions within an economy

Source: adapted from Feuerbacher et al. (2017)

A SAM links macro statistics, e.g., from national account statistics, with microdata from institutions such as household expenditure, factor market information, and the information on sub-sectors of the economy. A double bookkeeping procedure is followed for the SAM construction, as accounts' total income (recorded in the rows) has to equal the total expenditure (recorded in the columns) of corresponding accounts. Moreover, a SAM is estimated in a systematic way which highlights the inconsistencies in different data sources, which can contribute to improving the reliability of statistical data sources (Ferrari, Mainar-Causapé, & McDonald, 2018). Table 1 schematically illustrates a macro SAM, and captures all transactions at a macro level and helps to analyze macroeconomic indicators.

Table 1. Schematic representation of a macro-SAM

	Activities	Commodities	Factors	Households and Enterprises	Government & tax accounts	Savings and Investment	Rest of the world	Total
Activities		Output (Supply-Matrix)						Domestic output
Commodities	Intermediate consumption (Use-Matrix)			HH and ENT Consumption (C)	Gov't consumption (G)	Investment demand (I)	Exports (X)	Total demand
Factors	Payment for factor services						Factor returns from ROW	Total factor income
Households and Enterprises			Factor returns		Gov't transfers to HH		Inward remittances	Total income of HH and ENT
Government and tax accounts	Tax payment or a subsidy	Taxes on products		Direct taxes & transfers from enterprises to the gov		Gov't borrowing	Taxes and transfers from the ROW	Total Government income
Savings and Investment				HH and ENT Savings	Fiscal balance of gov't budget		Current account balance	Total savings
Rest of the world (ROW)		Imports (M)	Factor returns to the ROW	Transfers to the ROW	Gov't transfers to ROW	Balance of transactions with ROW		Total expenditure to the ROW
Total	Cost of domestic production	Total supply	Total factor income	Total HH and ENT expenditure	Total Government Expenditure	Total Investment	Total income to the ROW	

Source: adapted from Feuerbacher, Grethe, and Chencho Dukpa (2017)²

² Gov't = Government; HH= Households; ENT= Enterprises; SI= Savings and investment; ROW = Rest of the world

3.2 Data sources

A SAM is an economic statistical framework that captures a country's economic structure at different levels of aggregation. Developing a reliable and adequately disaggregated SAM requires the availability of various data sources. According to Pyatt and Round (1985, cited in Round (1997)), the following key data sources are needed to estimate a SAM:

- Input-Output Tables (IOT), Supply and Use Tables (SUT)
- Household survey data along with a labor force survey with multiple purposes (household incomes, expenditures, etc.)
- Government budget reports, trade statistics and the balance of payment statistics.
- National Accounts statistics

It should be noted that the availability of data in Uzbekistan is limited. Developing a SAM for Uzbekistan requires data from multiple sources, which needs to be reconciled within the SAM framework. Important databases to estimate a SAM such as an IOT, SUT, or labor force and household surveys are not published or not available or cannot be accessed for recent years. Therefore, available datasets supplied by the State Committee on Statistics of the Republic of Uzbekistan (StatUz) and other supporting information are obtained through recently published works. This information is efficiently incorporated during the SAM estimation process. Information reported by StatUz is utilized for consistency check while filling any missing information in cell entries to ensure the corresponding sum of entries. When estimating this SAM, the authors had to make multiple assumptions (which is generally inevitable when developing a SAM), which are documented within this paper. The authors are aware that gaining access to further data sources could improve the quality of the SAM reported here (see also chapter 11 where we comment on data reliability for each submatrix of the final SAM). However, developing a SAM is never a finite process, but rather a continuous work subject to continuous improvement, and the documented SAM herein will be constantly updated as new and better data becomes available. Moreover, one has to be mindful that even with limited data sources, a SAM can be built by applying several methods and techniques to reconcile available information from various sources to estimate missing cell entries.

The final 2014 micro SAM for Uzbekistan illustrates the economy in a detail for all economic agents. Production, consumption, taxes and other transactions of all economic institutions are captured in the micro SAM. In contrast to the macro SAM, the micro SAM relies on several

estimation methods to utilize available information based on recent literature with similar data challenges.

Table 2 lists the primary data sources used during the estimation process. Most importantly, using a previous SAM for Uzbekistan for the year 2001 (Müller, 2006) and data from ADB (2016), Larson, Khidirov, and Ramniceanu (2012), Rudenko (2008) and the IOT sub-matrix for the 2014 Uzbekistan SAM is estimated. Moreover, data on household income and expenditure structures (see sources in Table 2) is compiled and reconciled in SAM submatrices. Similarly, the BoP (2014) is obtained from the reports of the Central Bank of Uzbekistan (CBU, 2020), ADB (2019) and International Monetary Fund (IMF, 2018). For simplicity, we use abbreviations to refer to the various sources used to estimate the different SAM sub-matrices or components (see Table 2) to avoid repeating multiple citations within this documentation.

Also, some of the cell entries are calculated according to the findings of published works and reports of international agencies, e.g., ADB, JICA, FAO, IMF, and the World Bank who regularly investigate various research topics and publish reports related to Uzbekistan.

Table 2. Main data sources utilized during the SAM estimation process.

Author/ Year	Description	Comment	Abbr.
ADB (2016)	The role of agriculture and natural resources is analyzed in the case of Uzbekistan	These published works are used to estimate the input and output coefficients for the agriculture and processing industries. The 2001 SAM for Uzbekistan is used to estimate the expenditure shares for the remaining sectors of the economy not covered by the other three sources. The result is an IOT style submatrix for the 2014 Uzbekistan SAM, abbreviated IOT (2014) ^a	IOT (2014)
Larson et al. (2012)	Value chain analyses for horticulture production		
Rudenko (2008)	Value Chains for Rural and Regional Development: The Case of Cotton, Wheat, Fruit and Vegetable Value Chains in the Lower Reaches of the Amu Darya River, Uzbekistan		
Müller (2006)	Includes the development and reporting of a 2001 SAM for Uzbekistan		
Abdullaev (2020)	State-Owned Enterprises	The shares of State-Owned Enterprises in the sectors of the economy are used to estimate the approximate value of income through factor ownership to the government	SOE (2014)
ADB (2019)	Key Indicators for Asia and the Pacific 2019	Government Budget report and net factor income from abroad	ADB (2019)
StatUz (2020a)	Macroeconomic indicators annually and quarterly	Used to extract the national account statistics for the year 2014. NA statistics report 2020 includes all information for 2014.	StatUz (2014)
FAO (2006)	Agricultural Production and Trade Data at a constant price (2004-2006)	Agricultural gross output at constant prices	FAO (2014)
EBRD (2013), MF (2015), Yusupov, Z. Lerman, A.S. Chertovitskiy, and Akbarov (2010)	Life in Transition Survey Livestock Production in Uzbekistan: Current State challenges and Prospects, The structure of household expenditure	Sub-matrix on Household expenditure	HE (2014)
Ajwad, Abduloev, and Audy (2014) & StatUz (2020a)	The Skills Road, Skills for Employability in Uzbekistan. Labor market – Employment indicators	Sub-matrix on Employment Structure	ES (2014)
Seitz (2018) & StatUz (2020a)	International migration and household well-being of the population of Uzbekistan	Sub-matrix on Household Income sources	HI (2014)
Japan International Cooperation Agency JICA (2017)	The data collection Survey on the agriculture sector in the Republic of Uzbekistan	Prices for some of the agricultural goods are obtained	JICA (2017)
IMF (2018) & CBU (2020)	Selected economic and monetary indicators	Balance of Payments	BoP (2014)

Source: own representation, sources used are reported above.

^a The reader should note, that the IOT style submatrix for 2014 was estimated for the purpose of estimating input and output shares of activities contained in the final 2014 Social Accounting Matrix. It is an internal, intermediate step of the estimation process and not developed to stand alone as an IOT.

4 Prior - 2014 macro SAM for Uzbekistan

The macro SAM represents the different economic agents and accounts at an aggregate level. At a later stage, it is used as a control totals when estimating the final micro SAM. The SAM framework represented by Breisinger, Thomas, and Thurlow (2009) and Müller (2006) is adopted for the structure of the 2014 – macro SAM for Uzbekistan. The base year 2014 is chosen given the relatively high availability of data for this year and in 2014 the country experienced rather stable socioeconomic and political conditions.

Generally, a macro SAM can be developed using two methods:

- A “Top Down” estimation method that relies on the macroeconomic totals reported by national account statistics.
- A “Bottom-Up” approach which is based on microeconomic calculations such as farm-level information is utilized.

A top-down estimation method is used at first to calculate the cell entries in the 2014 macro SAM for Uzbekistan, as most of the relevant macro totals are reported by StatUz annually. StatUz delivers information on gross production output, net taxes, trade balance, and gross value added in the sectors of the economy. The value of gross output and value-added in the sectors of the economy allow estimating total demand for intermediate commodities by all types of activities in each sector. The macro SAM is estimated by applying the top-down approach which does not result in substantial deviations in the account balances. However, the bottom-up method is utilized to estimate the micro SAM, which requires information from different sources at a production level. Therefore, these two methods do not produce the same macro SAM. Generally, the scope of home consumption by semi-subsistence rural households is not indicated in the 2014 annual reports of the national account statistics. Moreover, the data on savings from households and enterprises is not available and therefore calculated as a residual value during the estimation process.

4.1 Economic structure 2010-2015

Table 3 represents the structure of the economy in terms of gross value-added for all sectors of the economy and total consumption by households and other institutions. The information in Table 3 is based on the report from the StatUz (2020a), nevertheless, detailed information for the calculation of these reported values is not provided. The total value added in the main economic sectors and net taxes on production and gross output during the one year is presented. This information is reported in current prices from both the production and use side. CBU (2020)

reported slightly different trade information due to deviations when imputing annual averages based on quarterly data.

Table 3a). Statistics on gross domestic product, gross value added of economic sectors and other national account statistics measured in Billion Soum (current prices)

Descriptor	2010	2011	2012	2013	2014	2015
GDP at current prices, (production approach)	74,042	96,950	120,242	144,548	177,154	210,183
Gross value added of economic sectors	64,578	85,322	105,925	128,620	158,774	190,036
Agriculture, forestry and fishing	21,251	30,659	36,955	42,637	53,613	64,680
Industry	12,997	15,952	20,463	25,389	32,137	38,467
Construction	3,761	4,466	5,601	7,258	9,098	11,383
Trade, accommodation and food services	5,983	7,620	8,956	11,218	13,836	16,145
Transportation and storage, information and communication	7,338	9,432	11,911	14,609	17,004	19,158
Other branches of services	13,249	17,194	22,039	27,509	33,085	40,203
Net taxes on products	9,464	11,628	14,317	15,928	18,380	20,147
GDP at current prices (expenditure approach)	74,042	96,950	120,242	144,548	177,154	210,183
Final consumption expenditures	52,100	66,665	85,073	107,042	131,171	159,146
Households	41,530	53,461	68,299	85,485	104,930	127,249
Public authorities	9,871	12,355	15,776	20,422	24,746	30,141
Non-profit institutions serving households	699	848	998	1,135	1,495	1,756
Gross formation	15,892	24,027	33,645	36,647	46,840	50,568
Export and import balance of goods and services	6,050	6,258	1,524	860	-857	469
Export of goods and services	20,668	25,717	25,717	30,099	31,414	32,225
Import of goods and services	14,618	19,458	24,193	29,240	32,271	31,757

Source: StatUz (2020a). Note: In 2014, US\$1 = 2,311 Uzbekistan Soum (UZS).

Table 3b). Percentage shares in GDP of economic sectors and net taxes on products

Descriptor	2010	2011	2012	2013	2014	2015
GDP at current prices, (production approach)	100	100	100	100	100	100
Gross value added of economic sectors	87	88	88	89	90	90
Agriculture, forestry and fishing	29	32	31	29	30	31
Industry	18	16	17	18	18	18
Construction	5	5	5	5	5	5
Trade, accommodation and food services	8	8	7	8	8	8
Transportation and storage, information and communication	10	10	10	10	10	9
Other branches of services	18	18	18	19	19	19
Net taxes on products	13	12	12	11	10	10

Source: StatUz (2020a). Note: In 2014, US\$1 = 2,311 Uzbekistan Soum (UZS).

4.2 Underlying data sources for prior unbalanced 2014 macro SAM for Uzbekistan

Table 4 provides relevant data sources that are used to obtain the information for macro SAM entries. Since the macro SAM relies on the aggregate data supplied by national account statistics a top-down reconciliation method is utilized. All steps of the data compilation process via various sources and their relation to the respective cell entries are documented in the following.

The amount of gross production across sectors of the economy is reported by national account statistics annually. The value of gross intermediate consumption in the economy is calculated according to the shares of total value added over the gross production output value. Some of the SAM entries rely on the data that are gathered from other sources; for example, IMF (2018) and ADB (2019) report the interest payments of the enterprises to the ROW, net factor income, and net income transfers to the households in Uzbekistan in 2014.

Table 4. Underlying data sources and estimation methods used for unbalanced prior- 2014 macro SAM

Cell entry	Estimation methods / Data sources	Billion UZS
Gross output by activities	Gross production in basic prices ^a .	267,238
Trade and transport margins	Estimated using StatUz reports ^a .	38,189
Taxes fewer subsidies on production	Reported as a net- tax ^a . ADB (2019) and StatUz (2020a)	18,380
Direct subsidies	Calculated based on the reports of ADB (2019)	-5,641
Taxes on products (excl. subsidies)	Based on above data from ADB (2019) and StatUz (2020a)	24,021
Imported goods and services	Reported by ADB (2019) and StatUz (2020a)	32,271
Intermediate consumption (use matrix)	Calculated based on the gross output and total value added in the economy	114,106
Factor incomes	Reported at an aggregate level ^a	158,774
Factor income paid to entrepreneurship	65% of the capital income (assumption)	35,544
Consumption of fixed capital	Capital accumulation ^a	46,840
Household consumption	Household expenditure for final goods in 2014 ^a	115,005
Direct income taxes	Gov't budget reports, see MF (2015)	3,815
Direct taxes by enterprises (profit tax)	Gov't budget reports, see MF (2015)	4,278
Property and resource taxes	Paid by the enterprises. Government reports, see MF (2015)	4,312
Household savings	Calculated as a residual value	29,864
Dividends paid for households	Assumed to be 60% of enterprise expenditure	19,889
Retained earnings (savings) of enterprises	Calculated as a residual value	7,036
Dividends paid to the government	Shares of state-owned enterprises in each sector are used, ADB (2019)	4,045
Government transfers to the households	Gov't budget reports, MF (2015)	2,173
Government consumption for final goods	National account statistic ^a	22,137
Government savings	Gov't budget reports, gov.t budget balance, see MF (2015)	9,940
Tax revenues	Gov't budget reports for 2014, MF (2015) and StatUz (2020a)	30,814
Foreign trade	National account statistic ^a	31,414
Capital outflows	Estimated based on the value of the Current account balance in 2014, ADB (2019) and CBU (2020).	5,971
Transfers from the ROW to the households	Based on IMF (2018) and ADB (2019)	7,328

Source: Authors' representation based on sources mentioned in the table.

^a Source: National account statistics reported by StatUz (2020a)

The amount of trade and transport margins is accessed through the reports of StatUz (2020a) for the year 2014 before data revision which is used for SAM entries earlier. However, after revision of the data sources by StatUz there is a slight difference in the newly reported and former trade and transport margins.

4.3 Unbalanced prior 2014 macro SAM

Table 5 shows the unbalanced prior to 2014 macro SAM for Uzbekistan. This macro SAM entry is filled relying on a few data sources that are mentioned above (see Table 4). Even though a limited number of sources of the data are utilized to estimate the macro SAM, there are still misbalances in the totals of households, factors, savings-investment, and the rest of the world accounts. The highest deviations are observed in the factors and the rest of the world account.

Table 5. Unbalanced prior 2014 macro SAM for Uzbekistan, in Billion UZS

	Activities	Commodities	Margins	Taxes	Factors	Enterprises	Households	Gov't	SI	ROW	Total
Activities	-	267,238	-	-	-	-	-	-	-	-	267,238
Commodities	114,106	-	38,189	-	-	-	115,005	22,137	40,869	31,414	361,720
Margins	-	38,189	-	-	-	-	-	-	-	-	38,189
Taxes	-5,641	24,021	-	-	-	8,619	3,815	-	-	-	30,814
Factors	158,774	-	-	-	-	-	-	-	-	-	158,774
Enterprises	-	-	-	-	35,544	-	-	-	-	-	35,544
Households	-	-	-	-	119,759	19,889	-	2,173	-	7,328	149,149
Gov't	-	-	-	30,814	4,045	-	-	-	-	-	34,859
SI	-	-	-	-	-	7,036	29,864	9,940	-	-	46,840
ROW	-	32,271	-	-	3,554	-	-	-	5,971	-	41,797
Total	267,238	361,720	38,189	30,814	162,902	35,544	148,684	34,250	46,840	38,742	

Source: own estimation

4.4 Balanced prior 2014 macro SAM

Table 6 shows the balanced prior Macro SAM for the Uzbek economy in 2014, which is balanced manually resulting in slight changes of cell entries. For instance, factor income received by the households is reduced while government income through factor ownership is increased. Besides, the remittances received by the households in Uzbekistan are increased significantly. In this SAM, savings for households, government, and enterprises are calculated as a residual. The reader may be reminded that a SAM captures economic transactions between agents in the following manner: the row accounts record income of an agent, while expenditures of the agent

are shown in the columns. Households, for example, spent 115,005 Billion UZS on final consumption goods, and 3,815 Billion UZS on direct income taxes while saving the remaining income in 2014. Households receive income primarily from factors, transfers and enterprises.

Table 6. Balanced prior 2014 macro SAM for Uzbekistan, in Billion UZS

	Activities	Commodities	Margins	Taxes	Factors	Enter-prises	House-holds	Gov't	SI	ROW	Total
Activities	-	267,238	-	-	-	-	-	-	-	-	267,238
Commodities	114,106	-	38,189	-	-	-	115,005	22,137	40,869	31,414	361,720
Margins	-	38,189	-	-	-	-	-	-	-	-	38,189
Taxes	-5,641	24,021	-	-	-	8,619	3,815	-	-	-	30,814
Factors	158,774	-	-	-	-	-	-	-	-	-	158,774
Enterprises	-	-	-	-	35,544	-	-	-	-	-	35,544
Households	-	-	-	-	115,241	19,889	-	2,173	-	10,382	147,685
Gov't	-	-	-	30,814	4,435	-	-	-	-	-	35,249
SI	-	-	-	-	-	7,036	28,865	10,939	-	-	46,840
ROW	-	32,271	-	-	3,554	-	-	-	5,971	-	41,796
Total	267,238	361,720	38,189	30,814	158,773	35,544	147,685	35,249	46,840	41,796	

Source: own estimation

Table 7 shows the percentage of differences in prior unbalanced and balanced prior SAM for Uzbekistan. After balancing the SAM, few but non-trivial changes are observed in account totals of the rest of the world, government, and factor account by 8%, 3% and 3% respectively. The highest change overall had to be made to households' income from ROW, i.e., remittances (or transfers) received from abroad.

Table 7. The difference in the totals of balanced prior macro SAM and unbalanced prior macro SAM for Uzbekistan, in percentage

	Activities	Commodities	Margins	Taxes	Factors	Enterprises	Households	Gov't	SI	ROW	Total
Activities	-	-	-	-	-	-	-	-	-	-	-
Commodities	-	-	-	-	-	-	-	-	-	-	-
Margins	-	-	-	-	-	-	-	-	-	-	-
Taxes	-	-	-	-	-	-	-	-	-	-	-
Factors	-	-	-	-	-	-	-	-	-	-	-
Enterprises	-	-	-	-	-	-	-	-	-	-	-
Households	-	-	-	-	-4	-	-	-	-	42	-1
Gov't	-	-	-	-	10	-	-	-	-	-	1
SI	-	-	-	-	-	-	-3	10	-	-	-
ROW	-	-	-	-	-	-	-	-	-	-	-
Total	-	-	-	-	-3	-	-1	3	-	8	-

Source: own representation

The structure of the economy can be better analyzed by looking at the expenditure in the column and income shares of the economic actors at the macro level in the rows. According to Table 8, factors of production or value-added in the economy accounted for about 60% of the total costs of the activities account. Intermediate demand for final goods and commodities constitutes 43% of overall production costs, meaning that changes in wages or prices of the capital resources would have a higher impact than the changes in the prices of the final intermediate products on the gross production.

Table 8. Column shares of balanced prior 2014 macro SAM for Uzbekistan, in percentage

	Activities	Commodities	Margins	Taxes	Factors	Enterprises	Households	Gov't	SI	ROW
Activities	-	74	-	-	-	-	-	-	-	-
Commodities	43	-	100	-	-	-	78	63	87	75
Margins	-	11	-	-	-	-	-	-	-	-
Taxes	-2	7	-	-	-	24	3	-	-	-
Factors	59	-	-	-	-	-	-	-	-	-
Enterprises	-	-	-	-	22	-	-	-	-	-
Households	-	-	-	-	73	56	-	6	-	25
Gov't	-	-	-	100	3	-	-	-	-	-
SI	-	-	-	-	-	20	20	31	-	-
ROW	-	9	-	-	2	-	-	-	13	-
Total	100	100	100	100	100	100	100	100	100	100

Source: own representation

Most of the commodities are produced locally and only 9% of the total supply of goods and services is imported in 2014. Households spend their income mostly on consumption goods and services which comprised 78% of the total expenditure. Similarly, some of the production

activities are subsidized by the government and trade and transport margins added up to 11% of total gross output in the commodity market.

Table 9 reports the shares of income sources for the accounts of the SAM in rows. 78% of household income is received through wages and salaries (which depends on households' factor endowment), while 13% is received through the revenues by entrepreneurship activities and slightly more than 1% and 7% of total income is received through the transactions from the public administration and the rest of the world, respectively. Most of the goods and commodities produced by production activities are consumed domestically and only 9% of domestic output is exported. The row shares in this SAM helps to understand the structure of the economy by looking at the flows of income. In particular, subsidies account for more than 18% of tax revenue. The positive transfer from the savings and investment account to the rest of world indicates a positive current account balance for that year.

Table 9. Row shares of balanced prior 2014 macro SAM for Uzbekistan, in percentage

	Activities	Commodities	Margins	Taxes	Factors	Enterprises	Households	Gov't	SI	ROW	Total
Activities	-	100	-	-	-	-	-	-	-	-	100
Commodities	32	-	11	-	-	-	32	6	11	9	100
Margins	-	100	-	-	-	-	-	-	-	-	100
Taxes	-18	78	-	-	-	28	12	-	-	-	100
Factors	100	-	-	-	-	-	-	-	-	-	100
Enterprises	-	-	-	-	100	-	-	-	-	-	100
Households	-	-	-	-	78	13	-	1	-	7	100
Gov't	-	-	-	87	13	-	-	-	-	-	100
SI	-	-	-	-	-	15	62	23	-	-	100
ROW	-	77	-	-	9	-	-	-	14	-	100

Source: own representation

Table 10 shows the calculation of GDP consistent with two methods: The production and expenditure and the expenditure approach. The former considers all payments for final goods and services including net trade and investments. The latter approach calculates GDP based on the difference between total gross output and the totals of intermediate demand plus the taxes on products minus subsidies. Both approaches yield the same GDP estimate. Total subsidies in the economy are determined according to the information provided by ADB (2019). Total value

added in primary sub-sectors of the economy and taxes paid on products in 2014 is depicted in Table 3.

Table 10. GDP calculation methods based on balanced prior macro SAM, in Billion UZS

Expenditure Approach		Production Approach	
Items	Macro SAM	Items	Macro SAM
Consumption	115,005	Gross output of activities	267,238
Gov. expenditure	22,137	Intermediate Inputs	114,106
Net exports	-857	Taxes on products	24,021
Investments	40,869		
GPD in Billion UZS	177,154	GPD in Billion UZS	177,153

Source: based on prior, balanced macro-SAM shown in Table 8

5 2014 Micro-SAM development for Uzbekistan

The micro SAM is similar to the macro SAM in structure. However, it consists of comprehensive information. For example, major sub-sectors in agriculture, industries, and services are depicted in a detail. The structure of production, consumption, factor ownership, household income and expenditure, and other socio-economic information is represented in a matrix format. Various sources of datasets are utilized for micro SAM entries; therefore, totals of the final macro SAM and prior macro SAM are not equal. During the balancing process the account totals of the prior macro SAM are used as a control. The classification of accounts is based on the 2001 SAM for Uzbekistan (Müller, 2006) disaggregation level except for some changes in the agriculture sector and agricultural processing industries. In total, there are 88 accounts and out of these 31 activity accounts are chosen to demonstrate the structure of the economy. Among them, 17 activity accounts correspond exclusively to agricultural production. The final SAM furthermore consists of three household, five labor, four capital, one government, and five tax accounts. Marketed goods and commodities are depicted through 31 commodity account.

The SAM design chosen allows for different activities to produce the same commodity and for multi-output activities. For example, in Uzbekistan two types of agricultural producers: farm enterprises (large commercial farmers) and dehkans (small-scale family farmers) produce overlapping crop and livestock commodities. These farmers represent different cost structures and production methods, which is potential relevance for future research based on this SAM.

5.1 Gross output, activity and commodity accounts

The supply matrix records the total output produced by each of the activity at basic prices. Each activity account is assumed to produce one type of commodity in this SAM. Three major sectors of the economy: agriculture, industrial manufacturing and services are depicted through the accounts at different levels of disaggregation. Entries for the supply matrix rely on a top-down approach in which the value of gross output in all activities are distributed according to the expenditure shares of each production activity in the column.

The following order of steps was used to disaggregate the accounts:

1. National account statistics information is used to report total production output and gross value added in the sectors of the economy. Gross production output in some of the sub-sectors of the economy is, however, estimated separately, which is explained below in this chapter.
2. Information from the estimated IOT-style sub-matrix (2014) is utilized for all sub-sectors of the economy to calculate intermediate demand and other missing information.
3. Total value added in each sub-sector of the economy is used as a control variable to ensure consistencies with information that is obtained from StatUz regarding the shares of value-added in gross production. For example, the shares of value-added in gross output in agriculture is used for activities with limited or no information. The value of factor income in agricultural production is scaled up to achieve the same level of sectoral GDP by this sector as reported by national account statistics.

In contrast to the agricultural sub-sector, gross production output in other areas of the economy is reported by StatUz annually and quarterly. Nevertheless, these reports lack information on the calculation methods of gross output, for example it is not known whether purchaser prices or basic prices are used. Consistent with the definition of gross output, we assume that the total production outputs are calculated based on the basic (farm gate) prices.

Two farm-types are supplying the vast majority of agricultural commodities in Uzbekistan. They are represented in the 2014 SAM using **ac** as a prefix for commercial farm enterprises and **ad** for smallholder dehkan farmers, and **cc** stands for the commodities produced by commercial farm enterprises, **dc** refers to the commodities supplied by dehkan smallholder farmers. Intermediate demand for final goods such as seeds, fertilizers, and pesticides by the commercial farmers are higher for all agricultural commodities compared to the dehkan farmers. Intermediate demand for livestock is assumed to be the same for dehkans and private commercial farmers since no information is available for both farmers separately. In Uzbekistan, dehkan farmers supply a

significant amount of agricultural commodities which is over 63 percent of all agricultural commodities in 2014 (StatUz, 2017a) .

Even though the role of smallholder farmers in the economy is substantial, they are not entitled to receive any support measures from the state. In contrast, farm enterprises are controlled by the state procurement system and they are given several privileges such as production subsidies and provision of fertilizers, pesticide, water, and other essential inputs for production.

StatUz nor the Ministry of Agriculture and Water Resources (MAWR) provide detailed information on farm gate prices for agricultural commodities and gross output values for farm production. Instead, we rely on the price information from the reports of FAO (2006), which report constant prices for agricultural commodities for 2006-2008. In annual reports, information on livestock and crop production are given separately but on an aggregate level. However, total production level per hectare and total production quantities as well as cultivated agricultural land areas are reported annually by MAWR of Uzbekistan and by FAO for primary agricultural commodities. Therefore, the gross output is calculated in the SAM by multiplying $Q \times P$ i.e., total output level Q of agricultural goods based on selected classifications are multiplied by the respective farmgate prices P of farm products and commodities. Table 11 illustrates primary agricultural crop production and livestock supply in 2014. The value of total output is calculated based on the prices and quantities of harvest and the values are given in national currency.

Table 11. Estimation of Gross agricultural output in 2014 based on 2014-15 quantity and prices.

	Quantity of harvest, 1000 tons	Farmgate prices, in UZS/kg	Gross output, in Billion UZS	Shares in the total output, %
Cotton	3,400	1,890	6,428	7.9
Grains	7,973	1,045	8,331	10.3
Tomatoes	2,285	1,573	3,595	4.4
Vegetables	8,719	1,192	10,395	12.8
Fruits	2,563	2,147	5,503	6.8
Grapes	1,441	2,246	3,236	4.0
Potatoes	2,452	2,013	4,936	6.1
Other crops	93	1,643	152	0.2
Livestock			38,600	47.5
Total			81,181	100.0

Source: own estimation based on FAO (2018), JICA (2017), MAWR (2015), StatUz (2017a).

The prices for agricultural goods are a challenging task to derive mainly because some commodity groups such as vegetables and fruits include many other varieties with different price levels. Therefore, we rely on the information from MAWR (2015), which provides data on the

prices for selected groups of crops such as cotton, wheat, potatoes, fruits, and vegetables (see appendix B). The prices for other agricultural commodities are reported based on the average costs of production plus the estimated gross margin for the farmers. These price reports do not contain any information on regional price variance nor price difference on the output supplied by different farmers. Price information for the rest of the agricultural commodities are obtained from reports such as JICA (2017) and ADB (2016) . For missing information, relative price ratios are calculated based on the constant prices for the period 2006-2008 from FAO (2018).

The shares of main agricultural crop production in our estimation are also consistent with the crop production shares in 2014 reported by the ADB (2016). In 2014, 47.5% of all gross agricultural output is created in livestock farming. In crop production, the supply of vegetables is the highest in terms of production volume and the gross production among the other crops. Recently, in 2019, StatUz has revised the datasets for the past years. According to new calculation methods, the values of agricultural services are calculated as parts of agricultural gross output. Thus, the revised data reveals almost a doubled agricultural production output for 2014 in value terms. To be in a line with StatUz reports, shares of agricultural commodities in total agricultural production according to the previous calculation are taken as a control to re-estimate crop output values. According to relative shares crop production in agricultural output value, vegetable supply is the highest with about 13.0%, followed by grains and cotton 10.3% and 7.9% respectively (see in Table 12). Gross output for the rest of the economic sectors is obtained from the reports of StatUz (2017a).

5.2 Trade and transport margins

Activity and commodity accounts are distinguished to capture the difference in producer and market (purchaser) prices. Including activity and commodity accounts in the SAM allows to account for the role of the various taxes, trade, and transport margins on the prices of the commodities supplied at farm gate and market level.

The trade and transport margins are the costs incurred due to transporting and marketing the commodities from the sellers to the consumers. Gross trade and transport margins are reported by national account statistics annually. The estimation of trade and transport margins in this SAM entries across commodities is similar to the distribution of indirect taxes in this SAM which is based on the gross output level. The same method is used during SAM development by Müller (2006). This method implies that the activities with higher total output are imposed with higher trade and transport margins. The average shares of trade and transport margins are estimated by the calculation of the margins over gross production output.

Relative to the value of total gross output, trade and transport margins account for 10.3% and 6.0% respectively. Therefore, the difference in the underlying commodity prices and purchaser prices in this SAM are demonstrated by the amount of indirect taxes, trade, and transport margins. Imported goods and commodities are reported in the foreign trade chapter in detail.

5.3 Production factors

5.3.1 Factor income

Production activities require intermediate inputs, employ production factors, and pay taxes or receive subsidies. Factors of production such as labor and capital are the most essential production inputs for all activities. The sum of remunerations to the production factors are defined as total value added or GDP at factor cost.

Gross value-added is calculated by the value of total production output less the value of expenditure on the intermediate inputs and taxes plus subsidies. This element is a measurement for GDP contribution from each of the industry or any other activities in the economy (OECD, 2001). The value-added in the economy represents the total value of the remuneration for each production factor to create new goods and services. The concept of value-added refers to the growth in wealth due to the increase in the value of a production during the course of the production process or value chain (Rudenko, 2008). In this SAM, labor, capital, and land and water resources are included as factors of production. Factor information for other sectors of the economy is reported by or estimated based on value of gross output.

The StatUz (2020a) reports gross value-added and the value-added in different sub-sectors in the economy. In 2014, the GDP at factor cost was estimated at 158,773 Billion (StatUz, 2020a). However, there is a lack of information on the compensation paid to the factors of the production at the micro-level.

The estimation of gross output level for agricultural sub-sectors was reported in the previous chapters. The expenditure shares for agricultural activities are based on the IOT style sub-matrix (2014). In Uzbekistan, the production input (labor and capital) shares in most of the sectors with the exception to industrial manufacturing have been relatively constant since independence. The shares of labor input in total factor demand make up on average 61% and this proportion is the same in most of the sectors of the economy with the exception to the energy and mining industry, which are considered as strategic sectors for the Government of Uzbekistan (GoU) and given a substantial amount of public investment to accelerate mechanization process (World Bank, 2018).

Although Uzbekistan's demographic results in a very young labor force, the GoU has prioritized capital-intensive sectors by promoting them through direct subsidies and other supportive

measures (World Bank, 2018). Uzbekistan promoted the imports of sectors such as energy, mining, and other industrial manufacturing sectors that are mostly capital intensive. Therefore, the share of capital in total production factors have increased significantly after independence.

Table 12 illustrates the shares of labor and capital in the total factor demand in agricultural sub-sectors. Cotton and wheat are the only commodities that are capital intensive, 59% and 71% of the value-added respectively.

Table 12. The shares of factors of production for agricultural commodities, in percentages

	Cotton	Wheat	Potatoes	Carrots	Tomatoes	Cabbage	Grapes	Plums	Vegetables
Labor	41%	29%	86%	84%	86%	93%	74%	78%	83%
Capital	59%	71%	14%	16%	14%	7%	26%	22%	17%

Source: Adopted from Petrick and Djanibekov (2016).

As noted previously, the SAM differentiates between agricultural commodities supplied by commercial farmers and the dehkan smallholders. Commercial farm enterprises are characterized by high land and capital endowment as they have better access to machinery and credit (Muradov & Ilkhamov, 2014). Since these commodities are controlled through the procurement system and receive much state attention in terms of agricultural machinery, leasing and renting from agricultural techno parks throughout the country. Other agricultural commodities, especially horticultural goods are very labor-intensive.

5.3.2 Labor accounts

The total number of employed persons in 2014 was 12.8 Million according to the Ministry of Employment and Labor Relations (MELR, 2019) including formally and informally employed individuals. The labor market in Uzbekistan is characterized by a large share of the young working population entering the job market every year and high shares of unemployment. Labor categories and their respective number in each category are reported by the MELR (2019) annually based on the data supplied by StatUz and the results of survey about labor market..

There is no labor force survey or other types of reports that are publicly available to provide detailed information on the labor market. General information is reported each year on the shares of employment for the main sectors of the economy (e.g. employment shares in agriculture, industries, and services).

The structure of labor market is represented in Figure 4. Due to significant shares of informal employment, the types of informal employment are also included in a separate account. In this

SAM, two types of formal employment and three types of informal employment are identified to analyze the structure of the labor market in the economy.

Formal employment

Formal employment accounts for all workers who are registered legally and protected in terms of social benefits and worker’s rights. Formal employment is divided into formal salaried wageworkers, and formal self-employed individuals.

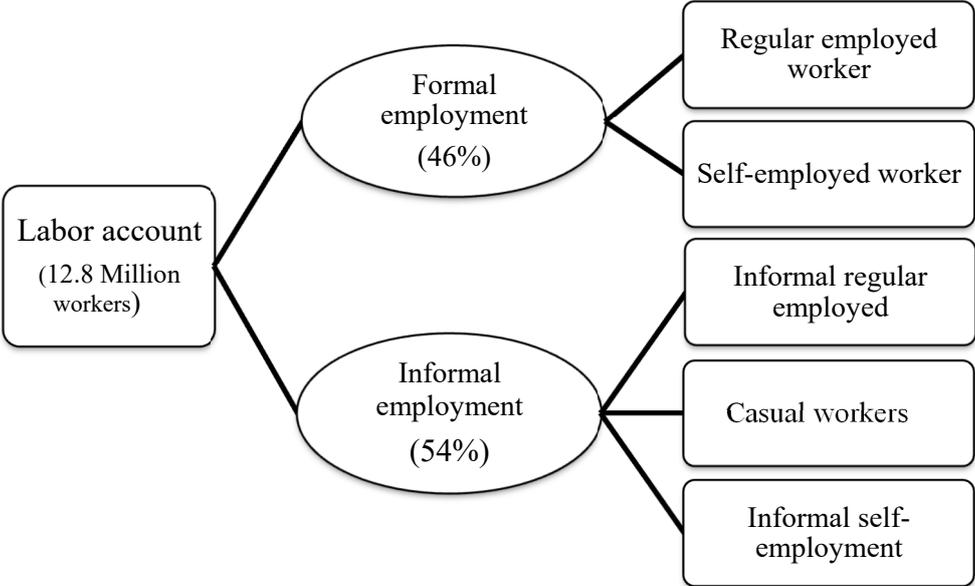


Figure 4. Disaggregation of labor account in the SAM.

Source: own representation based on MELR (2019)

Formal employment according to the classification of labor groups provided by MELR (2019), includes labor forces that are hired by legal entities. e.g., companies and organizations and by other enterprises operating without establishing a legal entity but instead working with a license or state permit.

Moreover, another sub-group of formal employment is self-employed individuals which includes legally registered workers that are employed by dehqan farmers and self-employed entrepreneurs. Formal employment on average accounts for 46% of total employment in labor market (Ajwad et al., 2014) .

Informal employment

Similar to many other developing countries, informal employment is widespread in Uzbekistan. It is significant in all sectors of the economy. The first type of informal employment in this SAM refers to the group of labor forces that are not legally registered and employed regularly across sectors of the economy They are mostly hired by family businesses and private enterprises

without establishing any formal contracts. Moreover, this subgroup also includes labor forces that leave the country for a short term to seek a job abroad. The last report provides information on the labor market for the last two years 2018-2019. Therefore, for the year 2014, we have used the relative shares of workers in each subcategory based on the data reported for 2018-19 to estimate approximate distribution of workers per each labor category.

Informal casual employment applies to the group of hired labor forces for one-time temporary works and seasonal jobs. In 2019, around 1.7 Million workers are reported to have had one-time interim jobs or seasonal employment (MELR, 2019).

Informal self-employment plays a considerable role in the labor market in Uzbekistan. This labor account includes operating private enterprises that have not registered nor hold any permit to engage in any activities. Such as enterprises in domestic services: Merchandising, craftsmanship, and other types of enterprises e.g., taxi drivers. Moreover, large numbers of dehkan farmers and unpaid family workers are also part of informal self-employment. In 2018, 1.7 Million workers are estimated to be involved in farming activities as dehkan farmers (MELR, 2019).

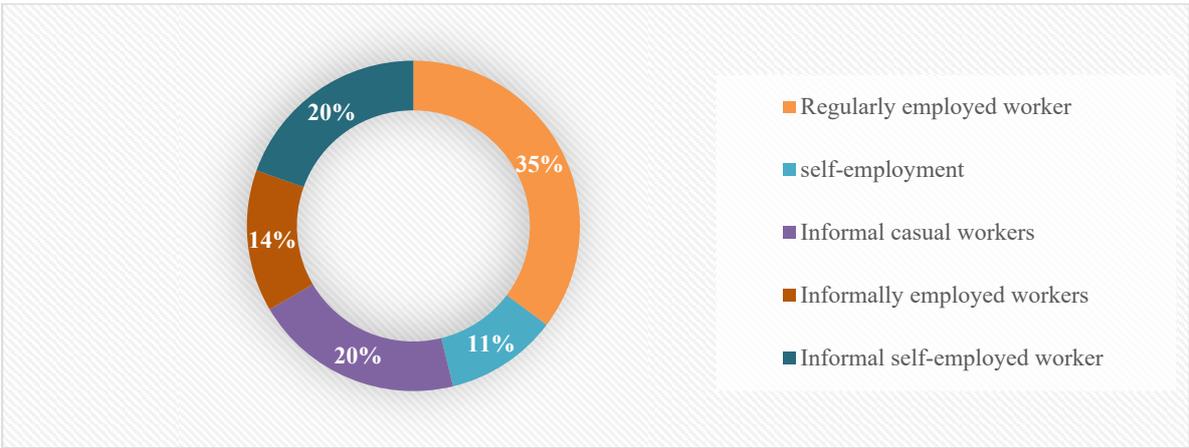


Figure 5. Distribution of workers by the types of employment.

Source: Own representation calculation based on MELR (2019).

These informal employment types are particularly important since numerous rural women are employed informally (FAO, 2019). Except for hiring workers during peak seasons, dehkans and other small-scale enterprises almost never hire any labor from outside the family. Approximately 70% of informal self-employed entities do not hire any extra labor besides family members (Ajwad et al., 2014).

In total employment, according to Figure 5 the shares of regular salaried workers make up 35% while only 11% of the workers are registered as self-employed. Informal employment accounts for the highest share in total employment with 54%. Informal regular workers and informal self-

employment accounts for 20% of employment each and followed by casual workers by 14% of hired labor forces in the informal sector (Figure 5).

StatUz reports a low level of unemployment, around 5.8% because many young people entering the labor force are discouraged to look for a job and are not registered themselves as unemployed as a result of the inadequate performance of responsible agencies (World Bank, 2018).

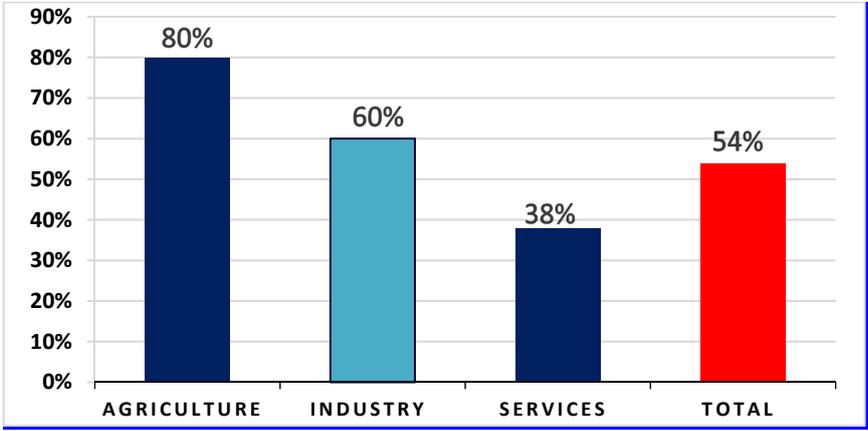


Figure 6. The share of informal employment in agriculture, industry and services

Source: adapted from Ajwad et al. (2014, p.13).

According to Ajwad et al. (2014), the prevalence of informal employment is the highest in agricultural activities. About 80% of agricultural works are reported as informal (Figure 6). Most of them are unpaid, seasonal workers, and self-employed individuals without registration. The payments are based on the mutual agreement e.g., bartering harvest goods against working hours. With these types of employment, there is no sick leave, maternity payment or any other social protections.

Based on the findings of Ajwad et al. (2014), 54% of workers in Uzbekistan are informally employed in 2013 (Figure 6). In contrast, the World Bank reports in 2013 official statistics for Uzbekistan with a lower share of informal employment 38% (World Bank, 2018). The National Scientific Centre for Employment under the Ministry of Employment of Uzbekistan reports informal employment in Uzbekistan to account for 59% in 2018 (MELR, 2019). However, in this SAM the shares of labor employment are obtained based on the reports from (Ajwad et al., 2014).

5.3.3 Capital and natural resource accounts

Returns to capital are generated by the use of productive assets in economic activities. The capital income is separated into the public, private capitals and for agricultural activities land and water factor returns are estimated.

Public capital is distributed based on the shares of state-owned enterprises in Uzbekistan. For each sector the shares are used from the report by ADB on state-owned enterprises in Uzbekistan (Abdullaev, 2020). According to this report, the distribution of state-owned enterprises is the

highest in professional, scientific, technical activities and in construction. The shares of public enterprises in the sectors of the economy are assumed to be the same for all the sub-sectors of the economy unless it is identified for some sub-sectors in the report.

Private capital is calculated as a net residual. Net residual is calculated by extracting the amount of public capital compensation and land and water return from the total capital compensation in each of the activities account.

5.3.3.1 Land

Land resources are one of the essential production factors in the agricultural sector, and the compensation for land resources are included in the capital income. As a rule, return to the land factor (land rent) is calculated based on the land rent value multiplied by the number of land areas used for certain production and service activities.

The lease price for land is not reported in any source since most of the land areas belong to the state and can be only leased upon a certain agreement for farmers for a limited timeframe. Thus, making it a difficult task to estimate. Land rent depends highly on the quality and location of the land resources to be priced. For example, the returns to land resources are usually high where the land areas are located near to canals or have good soil quality. In contrast, the leasing rent is very low for rain-fed land.

Individual farm enterprises are required to pay land use taxes, which is a rather small amount and is not representing the land lease value. In the case of dehkan farmers, small-sized household plots are owned by the households and possibly rented, but there is no mention in the literature of the prices for land lease or opportunity costs for land resources.

Information from Djanibekov (2008) used to estimate the compensation to land and water capital that are used in agricultural activities. Since there is no land market in Uzbekistan, the rent prices for land and water resources are chosen based on the observations on the informal sector and depending on related studies in other countries with similar conditions. The shadow prices for land and water were taken from the year 2003-2004 reported in USD currency by Djanibekov (2008) and adjusted with the inflation rate of USD to the SAM's base year 2014. Doing so, the estimated land rents range between 100 USD and 350 USD. Moreover, the land rent is different at each season and in different locations. If the land areas are located nearby the river or any other water resources, the shadow price of the land is the highest due to high productivity but the shadow price for water is the lowest (as at this location water is abundant).

The land return for livestock production activities is not calculated as this sector is not occupying the productive arable land, especially in irrigated areas. Rather rain-fed land areas in which there is less productivity and areas near to the mountains are used for livestock grazing. Therefore,

land resources are not considered as the main capital factor for this sector. In contrast, the land areas where the rainwater is the only source of irrigation and the leasing rent is also low accordingly. Compensation for land and water resources is smaller in the case of dehqan farmers since the size of the land owned by these farmers is limited to less than 0.5 hectares.

5.3.3.2 Water

In Uzbekistan, more than 85% of agricultural land is irrigated which is about 4.3 Million hectares. The country is already experiencing reduced water availability for its agricultural production due to reduced water flows from the rivers of upstream countries to generate mostly hydropower especially during winter times while there is a high water demand in the summertime from downstream countries (Bekchanov & Lamers, 2016). Moreover, a rise in global temperature as a result of climate change and an increase in the size of the population are major causes of reduced water resources. Studying the changes that are associated with water use management and increasing water use efficiency is very essential for this county.

Considering the importance of water resources for the agriculture sector in Uzbekistan, average water rent values are estimated in this SAM. However, no water pricing mechanism has been yet developed. Thus, the practice of water pricing mechanisms from other countries with similar socio-economic conditions is adopted per 1000 cubic meters of water. The price of the water is estimated in the range between 15 USD to 50 USD per 1000 cubic meters depending on the location and other characteristics of the land areas that are used for agricultural purposes such as soil quality and location of land areas (Djanibekov, 2008).

The shadow price of the water is the best indication to represent the value of the water resources as a production factor. Water prices can be estimated based on the difference in land rent in dry rain-fed land areas and in irrigated land areas. However, shadow prices of water resources can be varying depending on the location of the land areas and the season of the year. Additionally, the shadow price of water varies by water usage by the types of production activities, the prices of the water are given per 1000 meter cubic and the usage of water for different crops are illustrated in Table 13. During the early plantation, the demand for water resources is relatively high compared to other seasons of the year. Rice, vegetables, potatoes, fodder, and cotton are the most water-intensive crops according to Table 13, rice plantation requires 21,000 m³ water per hectare while grains require around 4,000 m³ per hectare.

Table 13. Technical norms of water usage to irrigate the farmlands in Uzbekistan

Crops	Water use, m3/ha
Wheat	4,200
Rice	21,000
Corn	5,500
Other grains	4,000
Cotton	6,300
Other technical crops	5,000
Potatoes	11,000
Vegetables	11,500
Melons	4,100
Fodder/feed	8,700
Orchards/Fruits	4,400
Grapes	4,200

Source: Zorya et al. (2019).

In this SAM, water compensation is calculated based on average water prices multiplied by the water usage per hectare, and this value is further multiplied by the amount of land used in each agricultural production. Moreover, the water and land returns are calculated only for agricultural activities since the rest of the activities consume a very insignificant amount of water and land resources available in the country. 90% of all water resources are used in the agricultural sector.

6 Households and enterprises

6.1 Classification of the household accounts

Households are part of the institutions where a group of people shares similar living conditions, levels of income, and wealth, and expenditure patterns (Siddig et al., 2011). The household account in the SAM is the core part of any analysis since they are connected to the production activities through the supply of production factors and to the commodity market via consumption and savings.

Around 6.4 Million households are residing in Uzbekistan in 2019 (Seitz, 2019). The total population of the country made up 33.9 Million for the same year (StatUz, 2020b). Average household sizes are 4 persons in urban areas and 6 persons in rural areas (Yusupov et al., 2010). The 2014 Uzbekistan SAM distinguishes between three household types based on special characteristics of the population. For instance, income level, main employment activities, and location of the households are the main factors to categorize them into the groups. At first, households are divided into urban and rural dwellers and then rural households are further separated into rural non-dehkan and rural dehkan households (semi-subsistent family farmers).

Urban households

Urban households are only classified based on their location of residence. In general, income and consumption level per capita is higher for the population in urban areas; however, there are many common activities shared by an urban and rural household. The groups of people living in urban areas make up 51% of the total population and 60% of the households in 2014 (StatUz, 2020b).

Rural households

Rural households are groups of the population who are living in rural areas of the country. They are engaged in different activities. Rural households are employed by farm enterprises, small-scale family businesses, and other off-farm activities. The numbers of rural and urban households are reported by StatUz (2020b). The main criteria for rural households are the location of their current residential area. However, it is very challenging to distinguish between rural households and dehkan households since they share many common characteristics. The criteria that StatUz uses to distinguish rural and urban households is just based on the size of the population at a certain location. The level of development, infrastructure, and all other indicators are usually ignored. Since not every rural household is engaged in dehkan farming, we decided to include dehkan households in a separate account.

Rural dehkan households

Dehkans are smallholder semi-subsistent farmers and they are given less than 0.5 hectares of land areas for farming activities. They represent the poorest household group in this SAM. They live in rural areas, also work for seasonal agricultural works, off-farm activities but their main income comes from selling the surplus of home production. Classification of rural households in this SAM allows us to better monitor the income and expenditure structure of the poorest households in the country. In addition to this, home production and home consumption should not be neglected as it is a part of rural life in Uzbekistan. More than half of the rural households are engaged in agricultural activities as dehkan and commercial farmers. These farmers in rural areas produce 97% of the agricultural goods (Yusupov et al., 2010).

6.2 Mixed-income of the households

Primary sources of income for households comes from wages and salaries according to the ownership of production factors, such as labor and capital. Capital compensation represents income from the property and entrepreneurial activities. Thus, the profit for the dividends is transferred to the households through the enterprise account. Labor remuneration is a significant component of household income as they receive the most wages through regular employment and self-employment. StatUz reported total disposable income for the households in 2014, which is equal to 117,038 Billion UZS. This income consists of the following sources (StatUz, 2017b):

1. Primary income 75.6%, of which:
 - Income from the production activities as wages and salaries 73.2%
 - Income from property 2.4%;
2. Income from transfers 24.4%;

The income sources vary across households and geographic location of the population. Additionally, private enterprises transfer payments as a return to dividends to households according to their ownership. Based on the available information and authors' knowledge the following assumptions are made: urban households receive 50% of the net income of the enterprises; Income from self-employment makes up 30.0% of all household income in 2014; The income from properties can be further separated into various sources, for instance, 25.6% of the property income comes from dividends, 11.5% come from interests from bond (StatUz, 2017b).

Moreover, households in rural areas are considered low-level income groups, and therefore, they receive transfers from the government and other organizations as parts of supportive measures.

In this SAM, rural households are receiving income from agricultural activities and 60% of the total remittances from abroad are received by the rural households (Seitz, 2018).

Table 14. Gross value-added and numbers of the workers per types of employment, 2014

	Regularly employed worker	Self-employed worker	Informally employed worker	Informal casual workers	Informal self-employed workers
Total Value Added, in Billion UZS	26,216	9,761	14,151	9,449	28,944
Total workers	4,515,300	1,402,000	2,616,085	1,780,871	2,505,644
Annual wage per worker, UZS	5,805,984	6,961,858	5,409,179	5,305,664	1,1551,536
Monthly wage per workers, UZS	483,832	580,155	450,765	442,139	962,628

Source: Own calculation based on the reports of StatUz (2020a) and MELR (2019).

In this SAM, the aggregate income of the households is calculated based on factor endowments of the households. The distribution of the workers to workers' category is recorded by MELR (2019) for the period after 2018. Therefore, these distribution shares are used to calculate the number of workers in each category for the year 2014 (Table 14). According to this calculation average monthly wages and the numbers of workers in each group are estimated and examined for consistency with other reliable data sources.

The highest income shares are recorded in urban areas of the country. Annual wages are calculated based on the total value added per workers group and the value added is divided by the numbers of the workers to check average monthly salaries per worker's group. According to the calculated wages, self-employed individuals received the highest salaries in the case of formal and informal working groups (Table 14).

Dehkan households are the poorest as they are mostly dependent on agriculture and seasonal jobs. The size of dehkan plots is too small to provide full-time employment. Therefore, dehkans have to rely on off-farm incomes and as a result of limited employment opportunities within Uzbekistan they tend to work in foreign countries, especially Russia and Kazakhstan are the main destination for thousands of Uzbek migrants. Dehkan farmers use family labor and do not declare officially that they are employed. The majority of the dehkan farmers have secondary employment, 38% have more than one job, 13% of the dehkan households receive income from non-agricultural activities such as working in public organizations, 42% of the family members of dehkan households have an extra job. In the case of dehkan households, 33% of income is

generated in agricultural activities while 73% for private commercial farmers. Less than 30% of dehkans sell their products on the market (ADB, 2016).

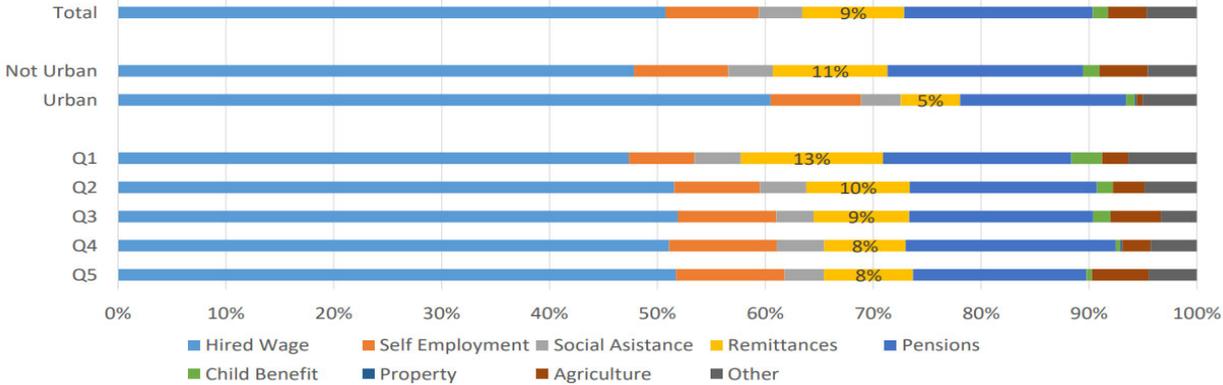


Figure 7. Household income sources for urban and rural dwellers, in percentage

Source: adapted from Seitz (2018).

According to Seitz (2018), a large part of household incomes in urban areas is received through regular wages and salaries and from self-employment (Figure 7). In contrast, rural households received a significant amount of income through the remittances from the ROW and agricultural activities. HI (2014) is extensively used to estimate the distribution of labor factors for the groups of households. Moreover, household size in rural and urban areas are used to calculate the average number of working persons per household.

Table 15 provides information on labor endowments of households in rural and urban areas. This table shows the numbers of labor factors in each labor category and their distribution to the household groups. Similar to the population distribution in rural and urban areas, labor forces also belong to rural-urban households at almost equal shares.

Table 15. Labor endowments of household groups in Uzbekistan

	Regularly employed worker	Self-employed worker	Informally employed worker	Informal casual workers	Informal self-employed workers	Total
Urban HH	2,618,874	701,000	784,826	712,348	1,177,653	5,994,701
Rural HH	903,060	364,520	627,860	391,792	501,129	2,788,361
Dehkan HH	993,366	336,480	1,203,399	676,731	826,862	4,036,839

Source: own compilation based on MELR (2019) & Ajwad et al. (2014)

Factor endowments of the households do not precisely capture the income distribution for selected households since the salaries and payments differ according to education, experience,

and other special characteristics of individuals. Moreover, people tend to receive lower payments from agricultural works compared to industrial or service-oriented jobs.

The rural household receives a significant amount of income from the rest of the world as a remittance. According to the survey by Lerman and Sedik (2009), rural household families receive about 25.5% of their total income from farming activities (home consumption is not included), wages from the other sectors of the economy account for the highest share 37.8% of the income from abroad to these households makes up about 7.5% of their family income.

Table 16 shows the income distribution of households according to various employment activities. 58% of the total income is received by urban households. Dehkan farmers receive 25% of total income while 17% of income is received by rural non-dehkan households (Table 16). However, the income per capita is the lowest for dehkan households. Value added is allocated in line with labor distribution into each of the employment types for different households. Various assumptions by the authors were necessary to adjust the income distribution patterns aligned with generally known features of labor markets, e.g., the existence wage differentials between high- and low-skilled workers.

Table 16. Income distribution of the household groups in Billion UZS

	Regularly employed worker	Self-employed worker	Informally employed worker	Informal casual workers	Informal self-employed workers	Income shares of HH
Urban HH	15,954	6,284	9,151	5,796	15,245	58%
Rural HH	4,520	1,418	2,614	1,964	4,397	17%
Dehkan HH	6,115	2,435	2,759	2,063	9,675	25%

Sources: Own estimation based on Yusupov et al. (2010) & MELR (2019)

6.2.1 The distribution of capital income

The expenditure of capital income is reallocated based on capital ownership. No literature in the case of Uzbekistan reports upon the ownership of the capital factor of households. However, a recent report from (Abdullaev, 2020) sheds light on the shares of state-owned enterprises or the shares of the state capital in selected industries in the main sub-sectors of the economy. These shares are used to calculate the remuneration for public capital. The rest of the capital factor income is allocated to the households and enterprises accounts based on the factor endowment shares. According to the study conducted by Yusupov et al. (2010), we roughly estimated the shares of capital ownership for households and enterprises. Urban households received 20 percent

of capital income while rural households received 10 percent and dehkans received 6 percent of capital income and the rest is allocated for enterprises' accounts. Land and water factor income is distributed to rural and rural dehkan households at 80 percent to 20 percent, respectively.

6.2.2 Transfers

Transfers are another relevant income source for households, especially in rural areas of Uzbekistan. Transfers refer to the support measure in terms of monetary flows from the government to the household or income transfers from the ROW to the households as a remittance income as well as transactions between households. Transfers from the government act as a social protection mechanism of the government to support low-income level household groups, such as older adults with no family members and unemployed individuals. Therefore, we assume that rural households receive 97% of government transfers; 55% of these government transfers are received by the dehkan households and 45% are spent on rural non-dehkan households.

6.3 Household expenditure patterns

The distribution of household income for various goods and services at an aggregate level is recorded by national accounts statistics and some other publications including survey results. These reports provide information on the structure of the household expenditure patterns on main consumption goods and services, such as the monthly expenditure on transport, education, health-related services and total expenditure shares on food items.

Home-production and consumption patterns of dehkan households are estimated by using available information from the results of the surveys and other published sources. Survey results from (StatUz, 2015a), the finding of Word Bank (2015) and the consumption shares reported in the 2001 Uzbekistan SAM (Müller, 2006) are adopted to estimate the shares of the consumption for rural and urban households in Uzbekistan.

We rely on the results of life in transition III survey by EBRD (2013) to obtain information about household expenditure structure for main goods and commodities. This survey data includes 1506 observations and 1290 variables. This survey is not primarily designed to analyze the household consumption patterns on specific commodities, but nevertheless valuable information is obtained.

The results of this survey are used to identify gross expenditure shares of the households for essential goods and commodities in 2014. The expenditure shares for specific products, commodities and services are not detailed in this survey. To disaggregate household expenditure on each commodity, all available information such as annual reports from the National Statistics, ADB, World Bank and other published works which discuss at least partially the structure of

household expenditure in Uzbekistan are utilized. Thus, this information helps to explain the scope of household expenditure for commodity groups.

Additionally, StatUz also provides annual information on the household consumption patterns for main commodity groups, which are also defined very broadly. In there, individual commodities are not identified and information about the structure and number of participants of the survey is not reported. Missing cell entries are estimated based on the shares from the 2001 Uzbekistan SAM and the results of the living standards measurement survey by the World Bank in 2005 (Parpiev & Yusupov, 2011). This survey interviewed three thousand households in three different regions.

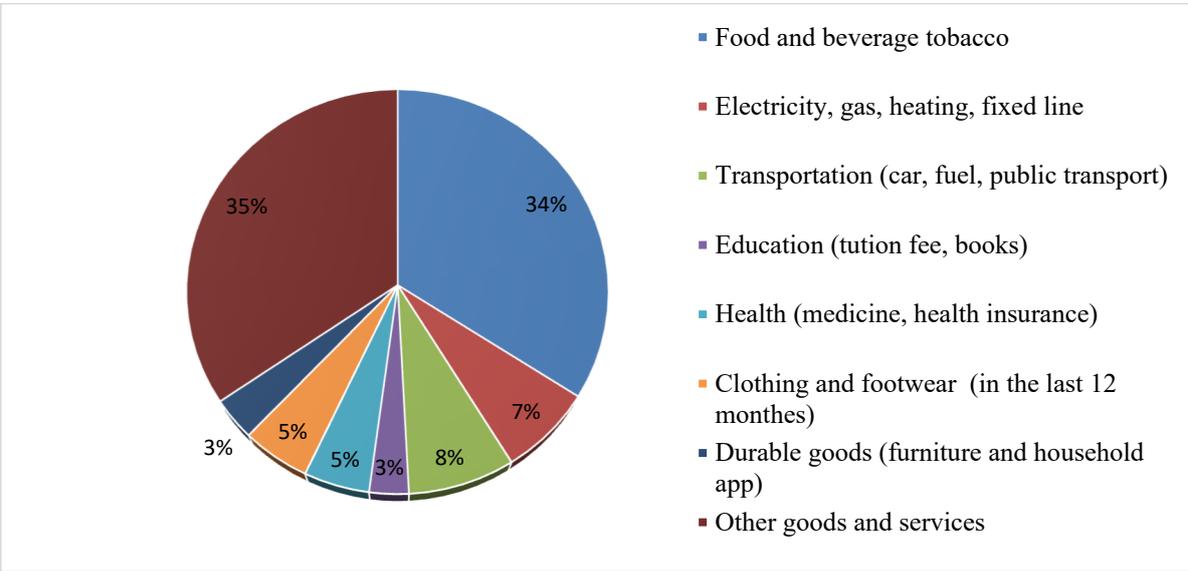


Figure 8. Household expenditure shares for primary commodities in Uzbekistan, 2013

Source: own representation based on the result from Life transition survey III (EBRD, 2013).

Based on the survey results, household consumption shares are estimated as following: food, beverages, and tobacco represent 34% of all consumption expenditures, transportation (car, fuel, and public transport) account for about 8% of the household total spending while the costs for health and education make up for only 5% and 3% respectively (Figure 8). In 2013, the expense of the households for clothes and other durable goods were slightly less than 9% of the whole expenditure, except for the difference in the shares of expenditure for main goods and commodities indicated in Table 17. Consumption shares for all other items are assumed to be the same for rural dehkan and non-dehkan households.

Table 17. Expenditure structure for rural households

Main Household Expenditure Structure	Rural households. in percentages	
	Dehkans	Farmers
Foodstuff	35.5	31.7
Clothing and footwear	18.4	18.3
Livestock procurement	0.4	0.8
Repair and house construction #	8.8	12.7
Transport costs	5.8	6.5
Medications and healthcare costs	4.3	3.7
Family events	9.9	9.4
Other expanses	3.1	4.7

Source: adapted from Yusupov et al. (2010).

According to the information from Table 18, the structure of aggregate expenditure for rural dehkan and non-dehkan households are similar, except for higher shares of food items for rural dehkans and relatively higher shares of consumption goods and services for rural non-dehkan households such as transportation costs and construction and purchase of construction goods.

Table 18. Consumption patterns of the households based on the final micro SAM, in %

	Urban HH	Rural HH	Dehkans
Home consumption of home-produced food	-	25.4	27.1
Food stuff	47.9	36.9	36.8
Clothing	8.4	6.4	6.3
Manufacture commodities	11.7	7.1	6.9
Construction	9.2	6.6	5.6
Transportation costs	5.3	4.2	4.3
Medications and other services	10.9	8.1	7.9
Other expenses	6.3	4.9	4.8

Source: Own representation based on HE sub-matrix (2014)

Table 18 represents the final structure of household expenditure for main goods and commodities in Uzbekistan for three different household groups. The structure of the expenditure is estimated through household expenditure surveys for various groups of the population. In Uzbekistan, households pay direct taxes based on their income. Their net income is distributed between on

commodities, transfers and savings. The information about household expenditure on taxes, final commodity consumption, and savings are represented in balanced prior and balanced final macro SAM.

6.4 Enterprise account

In Uzbekistan, the role of small-scale enterprises and family businesses is increasing and they account for more than 56% of the GDP in the economy and 27% of exports, 36% of all industrial activities and 70% of all construction goods and commodities are supplied by small business and private enterprises (StatUz, 2017a). 65% of the capital income is received by the enterprises while the rest of the capital income is directly allocated to households. The enterprise account spends its income on paying corporate taxes, distributing dividends to its national and foreign shareholders and retaining a certain share in profits in form of savings. The income and expenditure structure of the enterprises are represented in the 2014 macro SAM in earlier sections.

7 Government, capital and the rest of the world accounts

7.1 Government account

All government activities are represented in one account to depict the government budget. Additionally, direct and indirect taxes are recorded in separate accounts. The government collects its revenue basically from tax and other non-tax income sources such as payments to dividends of the state-owned enterprises. The government expenditure is made up by current expenditure on public services, such as public administration, education and health, transfers to households and government savings, which includes the government's capital expenditure (i.e., public investments).

Government savings are calculated as a residual after subtracting current expenditure and transfers to households. In the case of Uzbekistan, the government budget is used to execute a set of plans that the government has for the following years.

Table 19 shows the size of the government budget and its income and expenditure in relation to the GDP level. The government budget reported a profit only in 2014 amongst other selected years. In 2014, the share of the government revenue in GDP accounted for 22% (Table 19). The highest percentage of the revenue in government budget is generated through the collection of value-added tax and excise taxes which account for 30% and 16% of the gross income respectively followed by 14% the resource taxes such as land, property, and water taxes.

Table 19. Shares for government budget revenue and expenditure in GDP

Relations to the GDP	2013	2014	2015	2016
GDP in current prices. Billion UZS	120,862	177,154	171,808	199,993
Budget revenues as % of GDP	21.7	21.8	21.2	20.3
Expenditures in % of GDP	21.7	21.6	21.9	21.3
Budget deficit in % of GDP	-0.04	0.14	-0.70	-1.00

Sources: MF (2015), ADB (2019), IMF (2018)

Furthermore, there are extra-budgetary funds that operate independently and they are directed to specific sectors to finance accordingly such as road fund, pension fund and a fund for education. The extra-budgetary funds are also recorded in the government budget reports but they are not controlled or distributed by the government. On the expenditure side, one-third of the government budget revenue is spent on the education system and 14% on health

Moreover, government expenditures as a direct subsidy payment to the sectors of the economy are also high. Nevertheless, the budget report provided by the Uzbek government authority does not include or identify any subsidies and support measures in monetary terms. There is no detailed information on the receivers of the subsidies in Uzbekistan. However, several studies reveal that cotton and the energy sector are the primary beneficiaries of the direct support (Bae & Mah, 2019; Golub & Kestelman, 2015; Macdonald, 2012; Muradov & Ilkhamov, 2014). For example, the World Bank (2018) and the International Energy Association (2019) estimated an approximate value of subsidies for the energy sector which is equal to 10% of GDP annually.

In this SAM, the subsidy value is calculated based on the report from the Asian Development Bank (2019). Total direct subsidy payments for 2014 represented in Table 20 are 5,641 Billion UZS of which 1,864 Billion UZS is allocated to cotton production and 431 Billion UZS is allocated to wheat production, while 1,189 and 2,154 Billion UZS are spent on the power and fuel industry respectively (Table 20). However, here in Table 20 only direct subsidies that is direct transfers to the production activities in Uzbekistan are shown. Indirect support measures, however, such as subsidized credits or subsidized fuel for the farmers are not included due to the scarcity of information in the macro SAM, subsidies are shown as negative taxes in the expenditure column for the activities.

Table 20. Indirect taxes and direct subsidies, 2013- 2016, Billion UZS

	2013	2014	2015	2016
Total indirect taxes	13,399	24,021	19,194	22,298
Taxes less subsidies on production and imports	9,921	18,330	15,077	22,431
Subsidies	3,478	5,641	4,117	-133

Source: own representation based on MF (2015) and ADB (2019).

7.1.1 Government transfers

There are several social safety net programs in Uzbekistan to support the lower-income groups of households, especially in rural areas. The social protection system includes social security and house construction in rural areas and support measures for families with many children (IMF, 2018). Total transfer between the government and the household was 2,173 Billion UZS in 2014 (MF, 2015). In the micro SAM, about 8% of the government transfers are received by urban households while the rest of the transfers are targeted to the two rural household accounts as part of the social safety net program.

7.1.2 Government savings

The savings for the government was calculated as a residual based on the difference in government revenue and expenditure. As indicated in the government budget reports, the Uzbek government had a positive surplus in 2014. However, in this SAM government savings also includes the government's capital expenditure (i.e., public investment) (MF, 2015).

7.1.3 Taxes and subsidies account

StatUz and MF publish annual government budget reports in Uzbekistan. In this SAM, the taxes are recorded under five tax accounts and one subsidy account. Among the tax accounts, three of them are indirect taxes and one direct income tax along with one resource taxes. Direct taxes are paid by households and enterprises, while indirect taxes are imposed on the prices of the goods. Indirect taxes refer to the taxes that are collected from the production activities in the supply chain and make up the highest share in the government budget. Since indirect taxes are included in the purchaser prices of the commodities, the buyers of these commodities are charged with these taxes ultimately.

The government budget reports revenues from indirect taxes in Uzbekistan for every year which includes value-added taxes, excise taxes, custom duties, petrol consumption taxes, and other taxes (MF, 2015). The sum of indirect tax payments makes up about 6.7% of total gross output, and this relative share is used to calculate the amount of indirect taxes for each commodity in this

SAM according to the value of the commodities. For instance, the gross production value of cotton was 3,152 Billion UZS, and indirect taxes are calculated as 6.7% of gross production. This method was also applied as in the case of the SAM of Müller (2006). Furthermore, indirect taxes are divided into three major categories in the SAM: import tax, export tax and sales taxes on the products that are supplied in the domestic market and export market. The same share of indirect taxes is used to calculate the import and export taxes, which is levied on the value of imported or exported goods and commodities. There are no tax payments recorded for the activities of rural dehkan farmers in Uzbekistan since dehkan farmers are not registered as a legal operating entity.

7.1.4 Individual income and resource taxes

Direct income taxes are collected from the individuals and the enterprises based on the level of income received regardless of the type of activity, except for the staff members of certain organizations that are financed by the government budget directly, such as military and health care workers.

Direct income taxes are imposed on the income of the households and the profit of enterprises regardless of their activity. The households pay income taxes based on their monthly salary according to the rates of the taxes, which increases along with the size of the income. Total individual income taxes are 3,262 Billion UZS in 2014 (MF, 2015).

The enterprises are obliged to pay enterprise profit taxes and unified taxes for simplification for small-scale businesses, which takes higher shares of the business entities (StatUz, 2017a). In 2014,, the property and resource taxes amounted to 4,312 Billion UZS (MF, 2015). The property and resource taxes according to the taxation system in this country include land taxes, mining tax, water use taxes and the taxes for the use of the properties.

7.2 Capital account

The capital account represents total investments in the column and total savings in the row. Gross investments for each country are calculated by summing up gross capital formation, changes in the stock, and the net valuables (OECD, 2020). Total investments need to be equal to the sum of savings. The savings account (recorded in the row) represents net savings by the households, government, enterprises as well as the ROW. The demand for investment commodities is represented in the column of this account. The shares of major investment commodities are specified in Figure 9. Building facilities, machinery equipment and vehicles received more than 70% of total investments in the country in 2014.

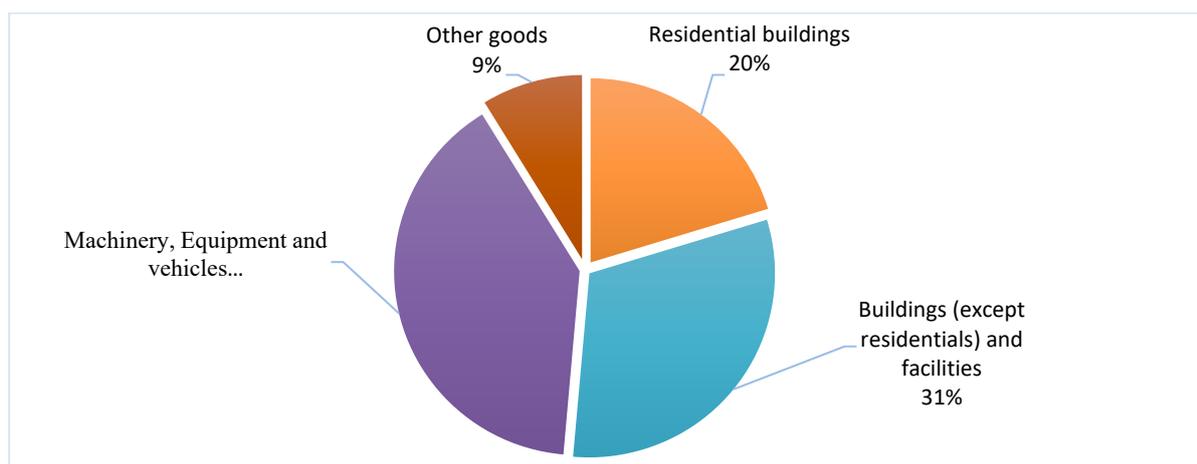


Figure 9. Main investment goods and commodities

Source: CER (2016).

Gross capital formation is reported by the StatUz and ADB annually. In 2014, the gross capital formation in Uzbekistan is equal to 46,840 Billion, which includes changes in inventories and statistical discrepancy. Stock changes are parts of savings and investment account. However, the stock changes are only represented in the micro SAM. Savings from the government account is calculated based on the government budget surplus as well as the surplus in extra-budgetary funds plus central government investment. The savings of the enterprises are assumed to be 18% of the income left after paying the profit and resource taxes. The savings for the households is calculated as a residual since there is limited information on household savings. CER (2016) reports primary investment goods and products for Uzbekistan in 2014. According to this report, significant investment capital is spent on construction and installation works for the sectors of the economy (Figure 9).

7.3 The rest of the world (ROW) account

The ROW account captures all transactions in monetary units with foreign countries as one account. Corresponding values of this account in the row and column represent imported and exported goods and services, factor income received, sent, and direct transfers between the households and other institutions, intergovernmental transfers and balance of payments respectively. Detailed information on trade with the rest of the world is provided in Table 22.

The ROW account represents the economic relations of the country with other countries in terms of flows of payments. Summarized transactions between the residents and non-residents are reported in the balance of payments for 2014. The balance of payments consists of the current account, the capital account, and the financial account. Since the capital account and financial

account cover capital transactions e.g., transfer of assets, , in the ROW account only the current account balance is included (CBU, 2019).

When a country's current account balance is positive, a country is lending funds to other countries of the world. Conversely, a current account deficit means that the state is a net borrower of funds.

According to the definitions of the IMF, transactions between residents and non-residents are recorded under primary income and secondary income (IMF, 2014a). The total amount of outflows and inflows are recorded in a line with the double booking system as debit and credit, there should be a balanced transaction at the end of the calculation (CBU, 2019).

Primary income refers to the factor income (IMF, 2014a):

- Remuneration of the workers in terms of salaries, wages and other kinds of payments from the employers to the employees. It also includes the income taxes paid by non-residents in a host country.
- Investment income covers the income receivable through properties and other financial assets associated with residents' liabilities to non-residents. Investment income includes earnings from dividends, reinvested earnings and interest payments.

Secondary income indicates current transfers between residents and non-residents including current unrequited transfer such as most common types are foreign aids, grants and other types of technical assistance (IMF, 2014b) . The transactions with the ROW account are reported by various organizations, see Table 21 for an overview. Although they have used the information mostly from the same sources, the calculation methods and definitions are varying. During this SAM estimation process, the information provided by ADB (2019) is selected. The same value for the trade balance and current account balance is reported by CBU (2020).

Table 21. Calculation of the current account balance for Uzbekistan in 2014

Year of the reported data	2014	2014	2015
Sources:	CBU (2020) in Billion UZS	ADB (2016) in Billion UZS	IMF (2018) in Billion UZS
Current account balance (I+II+III)	5,820	5,953	1,086
I. Balance on goods and services	-8,055	-857	-2,829
Goods credit (exports)	24,395	24,392	23,103
Services credit (exports)	5,456	7,022	7,074
Goods debit (imports)	31,231	29,674	24,945
Services debit (imports)	6,675	2,597	8,061
II. Balance on primary income	2,574	6,787	3,374
Primary income credit (incl. interests)	3,751		3,554
Primary income. Debit	1,177		180
III. Balance on secondary income	11,301	23	541
Secondary income. credit	12,104	23	541
Secondary income. debit	803		

Source: Own representation based on CBU (2020), ADB (2019) and IMF (2018)

In Table 21, values reported by IMF (2018) are converted into UZS from USD based on the exchange rate for the year 2015. In this table, the current account balance is calculated based on three different information sources:

- i. Current account balance = I. Trade balance on goods and services + II. The balance on primary income + III. The balance on secondary income

The current account surplus is reported as an expenditure to the ROW from the savings and investment account. According to World Bank (2016), the shares of remittance income from the ROW is significant and make up about 5.6% of the GDP in 2014 for Uzbekistan. Remuneration for labor and capital is not explicitly reported in any of the sources available. However, CBU (2020) represents the value of primary and secondary income transactions between residents and non-residents. The negative trade balance is overcompensated by the flows of remittance income from the rest of the world. As Table 21 shows, there are deviations in how different institutions report the estimates for the trade balance.

Under the system of National Accounts, only short-term employment which is less than one year is recorded as the factor income from the rest of the world (IMF, 2014a). According to the calculation of Gross National Product, the workers who are working already longer than one year are counted as a subject of the foreign country and their transfers are reported as unrequited

transfers (IMF, 2014a). Net factor income includes all the income earned by the participation of factors of production such as labor and capital in the other countries during less than one-year time consecutively minus purchased factors of production by the rest of the world. More precisely, the remittances sent to the households in a home country by the workers who have already been living and working in the hosting country for more than one year are recorded as transfers from the rest of the world (IMF, 2014a).

7.3.1 Foreign trade

Data on international trade relies on the StatUz (2020a) which provides two relevant reports on imports and exports of Uzbekistan. The former (StatUz, 2020a) is in detail while the latter (StatUz, 2015b) is at an aggregated level. The detailed trade data is preferred as it provides information about the trades of single commodities and goods. For simplicity, trade data are grouped based on the Harmonized Commodity Description Coding system or the so-called Harmonized System (HS) from United Nations Comtrade Commodity Classifications. This information is further aggregated to make them consistent with SAM classification.

There is some noticeable deviation between the aggregated trade report and a detailed version due to different grouping methods. For example, the exports of ferrous and non-ferrous metals are not reported directly but instead are included in other industrial commodity groups.

In the 2014 SAM, agricultural commodities are differentiated by market supply and subsistence consumption (i.e., home production and home consumption). Moreover, the essential agricultural production activities is displayed in a separate account while the rest of the products are reported at an aggregate level according to the classification of StatUz and further aggregated based on the SAM accounts.

There is a slight change in the totals of trade data after the revision of statistics by the national statistics committee. Table 22 provides relevant information on the quantities and values of imported and exported commodities during 2014 in Uzbekistan.

Table 22. Export and import goods and services of Uzbekistan in 2014

Commodities	HS codes		Exports. Billion UZS	Export shares. %	Imports Billion UZS	Import shares. %
Grains	1001-08		143	0.5	369	1.1
Tomatoes	0702		145	0.5	0	-
Vegetables	0701-13		1,140	3.7	13	0.0
Fruits	0801-13		1,469	4.7	35	0.1
Grapes	0806		722	2.3	0	0.0
Potatoes	0701		0	0.0	32	0.1
Animals	0101-0511		15	0.0	362	1.1
Other crops	0600 &0900		25	0.1	146	0.5
Power	2.716		255	0.8	33	0.1
Energy and oil products	2701-15		6,930	22.2	1,966	6.1
Metals	7112-8311	2601- 2621	5,803	18.6	3,655	11.3
Chemical products	2801-3825		735	2.4	3,340	10.3
Rubber	4001-4017		2	0.0	590	1.8
Plastics	3901-3926		0	0.0	1,166	3.6
Minerals	2501-2621		109	0.3	165	0.5
Machinery and Equipment	8402-9701		1,283	4.1	12,017	37.2
Cotton lint	5.201		2,420	7.8	0	0.0
Light industry	5002-6507		776	2.5	436	1.3
Cotton light	5202-12		1,399	4.5	3	0.0
Food products	1101-2403		229	0.7	2,665	8.2
Construction materials	6801-7106		290	0.9	425	1.3
Other industrial goods	6601-6704 4102-1302	9001- 9701	214	0.7	8	0.0
Wood and paper	4401-4911		46	0.1	2,289	7.1
Transport	9.903		3,475	11.2	952	2.9
Other services	9.910		3,525	11.3	1,636	5.1
Totals			31,150	100.0	32,303	100.0

Source: own compilation StatUz (2020a) & StatUz (2015b)

8 Final 2014 Uzbekistan SAM

8.1 Balancing the micro- SAM using cross-entropy approach

The micro 2014 SAM for Uzbekistan is constructed by incorporating various information sources. Therefore, some misbalances in the totals of the accounts are observed. Due to the existence of informal markets (informal incomes and employment), it is likely to encounter inconsistencies in the sums of accounts (Debowicz, Dorosh, Robinson, & Haider, 2012). Additionally, incomplete information on the household income and expenditure structure and estimated input-output matrix (2014) to represent cost structure for main economic activities

caused deviations in the account totals. These imbalances require the use of estimation techniques to correct discrepancies in the account totals without harming the entries with high accuracy.

A cross-entropy estimation programmed in GAMS and developed by Robinson and McDonald (2006) is applied to balance the prior 2014 SAM for Uzbekistan.. The advantages of this method are the possibility to determine a prior standard error for cell-entries and macro controls. This implies that the SAM developers can incorporate their expert knowledge on individual sub-matrices and cell entries as an information in the estimation process.

Table 23 compares two balanced macro SAMs: the balanced prior macro SAM which is estimated based on a top-down approach (see section 4.4) and the final balanced macro SAM based on a bottom-up approach in which calculation relies on the entries from the final, estimated and balanced micro SAM.

Table 23. Difference (in %) between balanced prior and final macro SAM

	Activities	Commodities	Margins	Taxes	Factor	Enterprises	Households	Gov't	SI	ROW	Total
Activities	-	-0.20	-	-	-	-	-	-	-	-	-0.20
Commodities	-0.25	-	0.01	-	-	-	3.13	5.81	-11.62	-0.53	-0.09
Margins	-	0.01	-	-	-	-	-	-	-	-	0.01
Taxes	-	0.89	-	-	-	-2.30	-0.90	-	-	-	-0.18
Factor	-0.13	-	-	-	-	-	-	-	-	-	-0.13
Enterprises	-	-	-	-	1.08	-	-	-	-	-	1.08
Households	-	-	-	-	-1.21	-1.22	-	0.87	-	1.39	-1.00
Gov't	-	-	-	-0.18	18.60	-	-	-	-	-	2.18
SI	-	-	-	-	-	11.70	-17.45	-4.90	-	-	2.41
ROW	-	-0.00	-	-	-0.65	-	-	-	0.01	-	-0.06
Total	-0.20	-0.09	0.01	-0.18	-0.13	1.08	-1.00	2.18	2.41	-0.06	-

Source: own compilation

8.2 Final 2014 Uzbekistan SAM

The final 2014 micro SAM cannot be illustrated because of its large size. Nevertheless, the final 2014 macro SAM for Uzbekistan is represented in Table 24. This final 2014 macro SAM is the aggregate values of the balanced final micro SAM.

Table 24. Final 2014 macro SAM for Uzbekistan

	Activities	Commodities	Margins	taxes	Factor	Enter-prises	House-holds	Gov.t	SI	ROW	Total
Activities	-	266,709	-	-	-	-	-	-	-	-	266,709
Commodities	113,824	-	38,191	-	-	-	118,604	23,422	36,120	31,247	361,407
Margins	-	38,191	-	-	-	-	-	-	-	-	38,191
taxes	-5,680	24,236	-	-	-	8,420	3,781	-	-	-	30,757
Factor	158,565	-	-	-	-	-	-	-	-	-	158,565
Enterprises	-	-	-	-	35,927	-	-	-	-	-	35,927
Households	-	-	-	-	113,848	19,647	-	2,192	-	10,526	146,214
Gov.t	-	-	-	30,757	5,260	-	-	-	-	-	36,017
SI	-	-	-	-	-	7,859	23,829	10,403	5,878	-	47,970
ROW	-	32,271	-	-	3,531	-	-	-	5,972	-	41,773
Total	266,709	361,407	38,191	30,757	158,565	35,927	146,214	36,017	47,970	41,773	

Source: own estimation

Many entries in the final SAM are not changed after applying balancing techniques since these entries are used as a control variable to yield results that are compatible with national account statistics. Therefore, the calculation of the GDP based on the final macro and prior balanced macro do not differ much.

9 Conclusion

A 2014 SAM for Uzbekistan is estimated with a focus on the agricultural sector. Limitations in data availability made this work very challenging. To rectify data gaps and missing information, various estimation methods such as residual calculations and cross-entropy estimation techniques are applied along with several assumptions based on the judgments of authors. This is the first SAM after more than a decade which is built to update the 2001 SAM for Uzbekistan developed by Müller (2006).

The disaggregation level is also based on the 2001 SAM however, natural resources: land and water are also included in the SAM as the main factors of production. Furthermore, primary agricultural activities, production factors and households with varying socio-economic status are depicted within this SAM framework. Most of the recently published reports and other

information are incorporated during this SAM estimation process. Particular attention is given to the agricultural sector considering the importance of this sector in the economy. Moreover, agricultural processing industries are also illustrated in separate accounts. Such as food processing, milling and ginning (cotton processing) industries.

This SAM can be further extended and improved whenever more information became available. To highlight and show the readers the strength and weaknesses of this SAM we have used the data elaboration method used by Siddig et.al., (2016). This method labels the SAM sub-matrices (Table 25) with grades reflecting the data availability and quality. The grading is done based on four different scales to represent the quality of the information in each cell entry. Grade A refers to the best reliable data and availability while grade D refers to entries with the lowest quality and reliability. Table 25 should be read with respective numbers in the column and letters in the rows.

Grade [A]: Data with the highest data reliability and availability

The data is obtained from the StatUz and official web sites of ministries. Therefore, this information is not based on our estimation and consistent with the calculation of GDP. In Table 25, this grade applies for example to sub-matrix 5A (Total factor income in the sectors of the economy), 4H (Direct income taxes paid by households) and 2RW (Total exports).

Grade [B]:

This grade of data includes information from external sources such as reports of ADB, IMF, World Bank and other organizations, which still required adjustments and additional imputations by the authors. Grade “B” for instance applies to 2H (Household consumption) 2G (Government consumption), 2A (Intermediate commodities which is obtained through the results of surveys) and 5RW (Factor income from the rest of the world)

Grade[C]:

This grade comprises estimated values and incomplete data sources. Examples are the submatrix 7E (income received by the households through the entrepreneurship activities and dividends), 8F (the shares of factor ownership owned by the government) and 10SI (transactions from the savings and investment account to the rest of the world). Moreover, 4A and 4C. which comprises taxes and subsidies on products, are reported by many sources, however there is no information at sector level, and commodity-wise taxes and subsidies are neither reported in a sufficient complete manner.

Grade[D]: Data with the lowest data reliability and availability

This grade includes information that is either largely incomplete or estimated based on several assumptions and residual calculations. Grade D indicates the areas where missing information or incomplete data sources are used to fill the cell entries. The “D” grade category is helpful to see the weakness of the SAM to improve the quality at later stages once more information becomes available. Grade D applies for instance to 6F (Factor income received by the enterprises), 7F (Factor income received by the households and thus factor endowments of the households), 9H (Savings of households), 9G (The government savings) and 9E (The savings of the enterprises), which are reported based on residual calculations or assumptions of the authors.

Table 25. Data reliability matrix for the 2014 SAM for Uzbekistan with a data quality ranking from A to D

Expenditure/ Income		A	C	M	T	F	E	H	G	SI	RW	
		Activities	Commodities	Margins	Taxes	Factor	Enter- prises	House- holds	Gov't	SI	ROW	Total
1	Activities	-	B	-	-	-	-	-	-	-	-	B
2	Commodities	B	-	B	-	-	-	B	B	A	A	A
3	Margins	-	B	-	-	-	-	-	-	-	-	B
4	Taxes	C	C	-	-	-	A	A	-	-	-	B
5	Factor	A	-	-	-	-	-	-	-	-	B	A
6	Enterprises	-	-	-	-	D	-	-	-	-	-	D
7	Households	-	-	-	-	D	C	-	A	-	B	B
8	Gov't	-	-	-	A	C	-	-	-	-	-	B
9	SI	-	-	-	-	-	D	D	D	-	-	D
10	ROW	-	A	-	-	B	-	-	-	C	-	B

Source: Own elaboration based on Siddig et al. (2016).

10 Appendixes

Appendix A. Description of the 2014 Uzbekistan micro SAM accounts

Activity accounts		Commodity account		Remaining accounts	
Ac_cotton	Production of cotton	Cd_grain	Commodity grain by dehkans	Fregular	Formal Salaried Workers
Ad_grain	Production of grain by dehkans	Cd_tomat	Commodity tomatoe by dehkans	Fselfemp	Formal Self employment
Ac_grain	Production of grain by farmers	Cd_vegat	Commodity vegetable by dehkans	Finregular	Inforaml regular workers
Ad_tomat	Production of tomatoe by dehkans	Cd_fruit	Commodity fruits by dehkans	Finfeasuall	Informal casualworkers
Ac_tomat	Production tomatoe by farmers	Cd_grape	Commodity grapes by dehkans	Finselfemp	Informal self-employment
Ad_vegat	Production of vegetables by dehkans	Cd_potat	Commodity potatoe by dehkans	Fpubcap	Public Capital
Ac_vegat	Production of vegetables by farmers	Cd_othA	Commodity other agriculture by dehkans	Fprivcap	Private Capital
Ad_fruit	Production of fruits by dehkans	Cd_Anim	Commodity animals by dehkans	Fland	Land return
Ac_fruit	Production of fruits by farmers	Cc_cotton	Commodity cotton by farmers	Fwater	Water return
Ad_grape	Production of grape by dehkans	Cc_grain	Commodity grain by farmers	Mtrade	Trade margin
Ac_grape	Production of grape by farmers	Cc_tomat	Commodity tomatoe by farmers	Mtrans	Transport margin
Ad_potat	production of potatoe by dehkans	Cc_vegat	Commodity vegetable by dehkans	Hurban	Urban households
Ac_potat	Production of potatoe by farmers	Cc_fruit	Commodity fruits by farmers	Hrural	Rural households
Ad_othA	Production of other agricultural goods by dehkans	Cc_grape	Commodity grapes by farmers	Hdehkan	Dehkan households
Ac_othA	Production of other agricultural goods by farmers	Cc_potat	Commodity potatoe by farmers	Entpr	Enterprises
Ad_anim	Production of animals by dehkans	Cc_othA	Commodity other agriculture by farmers	Govt.	Government
Ac_anim	Production of animals by farmers	Cc_anim	Commodity animals by farmers	Tindirect	Indirect taxes

Apower	Power generation	Cpower	Commodity power	Timports	Import taxes
Afuel	Fuel	Cfuel	Commodity Fuel	Texports	Export taxes
Ametal	Metal industry	Cmetal	Commodity Metal	Tdirect	Direct taxes
Achem	Chemical industry	Cchem	Commodity of Chemical	Tfactor	Factor taxes
Amach	Machinery and equipment	Cmach	Commodity Machinery	Subsidy	Subsidy
Aginning	Ginning industry	Cginning	Commodity Ginning	i_s	Savings and investment
Atextile	Textile industry	Ctextile	Commodity Textile	Dstock	Change in stock
Amilling	Milling industry	Cmilling	Commodity Milling	ROW	The rest of the world
Afood	Food industry	Cfood	Commodity Food Industry		
AothI	Other industries	CothI	Commodity Other Industries		
Acons	Construction	Cconst	Commodity Construction		
Atrad	Trade	Ctrad	Commodity Trade		
Atrans	Transport	Ctrans	Commodity Transport		
Aots	Other services	Coths	Commodity Other Services		

Source: own representation

Appendix B . Agricultural statistics of Uzbekistan. 2014

	Harvested area in thousand hectares	Quantity in 1000 tons	Total prod cost in Billion UZS	Gross revenue in Billion UZS	Gross margin, in Billion UZS	Costs per hectare, thousand UZS	Gross revenue per hectare, thousand UZS	Average selling price in UZS per 1 kg	Production cost in UZS per kg
Cotton	1,280	3,398	2,991	3,266	275	2,336	2,552	962	880
Wheat	1,283	6,314	2,463	3,045	582	1,920	2,373	482	390
Vegetable	205	5,172	2,122	2,851	728	10,371	13,934	551	410
Potatoes	52	1,096	846	1,120	274	16,306	21,588	1,022	772
Fruits	177	1,914	1,410	1,887	477	7,972	10,674	986	737
Grapes	88	909	797	1,072	274	9,036	12,149	1,180	878

Source: MAWR (2015).

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