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The 2015-16 Social Accounting Matrix for Khyber Pakhtunkhwa, Pakistan: Key Aspects and Impact of Selected Sectors Using Fixed Price Multiplier Analysis

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Abstract
This novel study provides an estimate of provincial accounts and policies on the basis of statistical facts of FY 2015-16 through the construction of Social accounting matrix (SAM) at provincial level, while adopting the bottom up approach. The first of its kinds, this KP-SAM maps 64 production activities, 8 household groups and 12 factors of production. It shows service sector contributes 58%, industrial 25% and agriculture 17% to the Provincial GDP (PGDP).Moreover, it indicates livestock contributes 49% and is the driver of agriculture sector, while construction (16%) emerges as the largest valued add sector of the provincial economy. Likewise, manufactured goods are the largest category of imports (84%) while crude oil is the largest exporting commodity of the province. *Non-resident sources (43.6%) are the largest source of household income* while trade to GDP ratio displays that KP is an open economy. Simulations via fixed price Multiplier indicates that a shock of one billion to livestock raises (PGDP) by 1.3 billion, expands the output by 1.80 billion and demand by 2.29 billion. The construction simulation raises household income by 0.54 billion showing that it is rural income sensitive. The health shock adds 1.59 billion to output and a 2.11 billion to the provincial demand. The output-demand gap (imports) widens with shocks confirming the import dependent nature of the province. The study recommends to the government that increased investment in all the three drivers will unlock sustained economic growth. The findings of the study can be used by the policymakers and implementers to reshape the province socio-economic development landscape.

Keywords: Regional accounts, Social Accounting Matrix, Economic Outlook, Multiplier Analysis

Introduction

A nation's income is the sum of market value of all economic activities taken place at all regions within that nation. Such regions whether small or large are dissimilar in terms of production mix, labor characteristics and growth rates. The fact is that the national level data do not reveal regional variations in resource endowments, development priorities and even in government plans and challenges. *Each region's advancement* play an utmost vital role although their growth trajectory is different and is influenced by national economic patterns (Brace, 1989). State's specific characteristics, geographical positioning and inter-regional disparities impacts job market, trade and industrial advancement. Strengthening governance and financial framework, promotion of private

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investment and productivity with substantial backing from center can accelerate regional development (S. Ahluwalia, 2001). For the prewar period state component was dominant, however post war period analysis indicated a strong and increasing impact on the economic growth of states from exogenous national factors (Rebeca et al. 2002).

The *region of Khyber Pakhtunkhwa (KP)*, the North-West Province of Pakistan, stands as a pivotal federating unit of the nation, encompassing an area of 74 thousand square kilometers. Renowned for its profound cultural heritage, breathtaking tourism landscape, and archaeological marvels, the province serves as the gateway to the Central Asian Republics through its extensive 2225 km border with Afghanistan. The total populace of KP amounts to approximately 40.86 million individuals, exhibiting a growth rate of 2.38 percent annually. A substantial eighty-one percent (81%) of the province's inhabitants reside in rural areas, with an average household size of 7.83 persons. The youth population predominates in the province, underscoring a high dependency ratio (Pakistan Bureau of Statistics (PBS), 2023).

KP's Economy Recent Performance

Traditionally *regional accounts* are not maintained in Pakistan, therefore not much is known about the real size and composition of provincial GDPs (PGDP). Historically the PGDPs has been estimated using top down approach based on which KP is the *third-largest economy* in Pakistan with a share of about 11 pc in national GDP. The economic performance of the province is remarkable despite the insecurity, unrest, burden of refuges and floods in the province (Pasha, 2018). An encouraging recent growth trend (over 5 pc for the years 2021 & 2022) is recorded by the Bureau of Statistics (BOS) KP, 2022). The most important sector of provincial economy is agriculture which plays a vital role in reducing poverty and ensuring food security. One third (i.e. around 32 percent) of the labor force is engaged in agriculture in the province contributed 19 percent to the PGDP in 2021-22 (BOS KP, 2022). Due to agrarian nature of the provincial economy the growth in agriculture sector is both important and encouraging. The provincial government is trying to modernize the sector and is focused on shifting it from traditional subsistence farming to export oriented farming activities. The four sub-sectors of agriculture are Crops, *livestock*, Fisheries and forestry. The highest contribution comes from live-stock and poultry sector, which makes this sub-sector as a driver of the agriculture and provincial economy. For the FY-2021-22 the sub-sector has contributed 15.23 percent to PGDP and about 80 percent to the agriculture sector. The launch of Billion Tree Tsunami project by KP Government has contributed to the forestry sector which has grown at a faster rate of 48 percent for the FY 2021-22 (BOS KP, 2022).

The agro-environment of KP is diverse as more than twenty different vegetables and fruits are grown coupled with existence of immense potential for high value crops such as horticulture and floriculture. Moreover, livestock sector is helping to improve the wellbeing of rural people as dairy products and meat continues to be the leading contributor in terms of incomes. However the sector has faced challenges like tight global food market, high volatility in food prices, increased population with poor purchasing ability of consumers, high input prices and natural disasters in the province (FAO, 2012).

The industrial sector includes production activities of large and small scale

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manufacturing, mining, electricity and gas generation, construction and food processing. The contribution of manufacturing sector to PGDP stood at 24.80 percent, while 11 percent of the labor force is absorbed by this sector for the FY-2021-22 (BOS KP, 2022). The most important sub-sector is the large scale manufacturing which contributes 72 percent to the manufacturing GDP and around 8 percent to the PGDP. Despite power shortages the sector grew at a rate of around 6 percent for the year 2021-22 (Govt. of KP, 2021). Textile spinning plants, pharmaceutical sector and furniture industry are lucrative investment sectors. The availability of wood in the province and potential for exports makes the furniture industry a profitable industry too.

The province of Khyber Pakhtunkhwa is endowed with a great deal of variety of *minerals by nature*. These include precious metals, non-metals and materials required in construction. The key minerals of the province are coal, gypsum, granite, lime stone, marble and shale clay (GOKP, 2021).The minerals department is working with the objective of exploring minerals with least impact on environment, broad based job creation, and reduction in poverty and increasing economic growth in the province. The department has also established model coal mine at district Nowshera for skills development of newly graduated students and mine workers. The key categories of mines existed in KP are marble and decorative stones, gemstones, phosphate and soap stone, gypsum, coal, gold and silver (Govt. of KP, 2022).

For the FY 2021-22 the commodity sector contributed 44 percent while the non-commodity service sector contributed 56 percent to PGDP with an encouraging growth rate of 5.5 percent (BOS KP, 2022). The leading sub sectors of non-commodity sector are listed with respective contribution in the following table.

Table 1: Service Sub-Sectors

Sub sector	Contribution to service sector	Contribution to PGDP	Growth rate for the year 2021-22
Whole sale and retail trade Hotel and restaurants	43.9 percent	24.61 percent	10 percent
Private services, Transport , storage and communication	16.4 percent	15.6 percent	0.8

Source: Khyber Pakhtunkhwa Development statistics. 2022

Trade of Wholesale & retail, services of hotel & restaurants, insurance, housing and government services are the key sub-sectors of KP Service sector. The service sector is proved to be both dynamic and shock absorbing during the period of pandemic like COVID-19 and others. This sector plays an increasingly important role in economic activity, provision of jobs and absorbing labor from other sectors.

The contribution of agriculture, industry and services to the provincial economy is depicted in the following figure.

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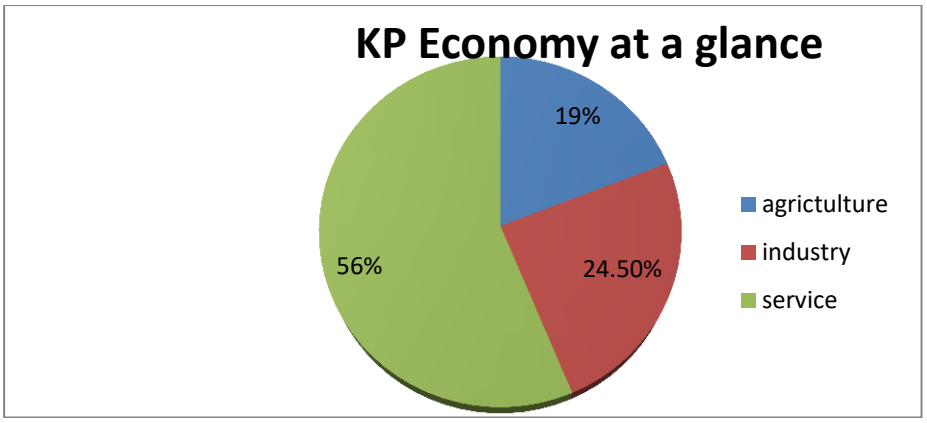

Figure 1: Sectorial Contribution to KP GDP, Source: KP Bureau of Statistics 2022

A comparison of the composition of sectoral contribution of the provincial economy for the study period (FY 2015-16) is presented in figure 1.2. The data from the stated period shows that the composition has not changed much from 2015 to 2022. Non commodity sector continues to contribute the most followed by industrial and agriculture sectors. The growth rate recorded were 4.36% while the remittances was the leading source of household income.

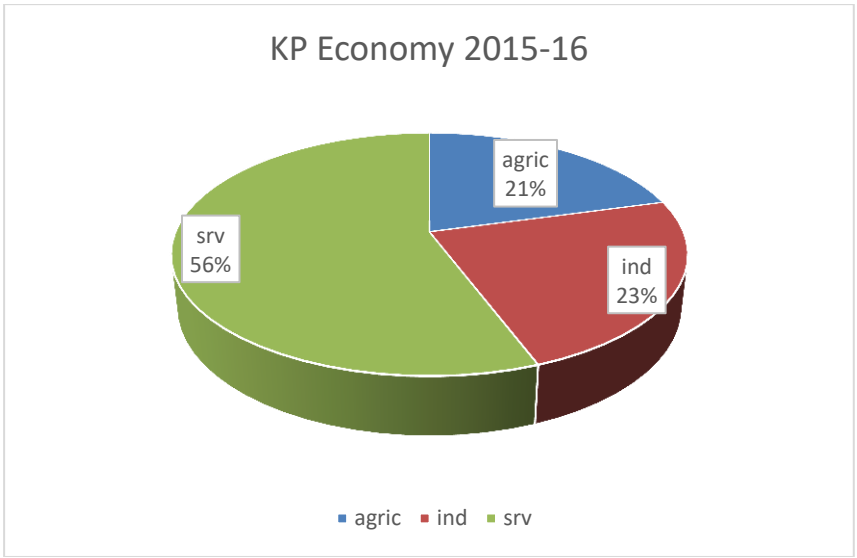

Figure 2: Sectorial Contribution to KP GDP, Source: KP Bureau of Statistics 2016

The contribution of agriculture has declined from 21% to 19% from the year 2015 to 2022, while the services and industry has witnessed a minor change only.
KP economy has grown at a constant growth rate of 5 percent per annum from 2000 to 2015. The key to this is the increased remittances from abroad (every 4th KP resident is abroad), afghan transit trade and NATO supply's boost to transport sector (pasha, 2015). The growth inhibitors may be many but the growth drivers if identified and harnessed will propel the economy to much higher trajectory. Livestock, manufacturing and construction and health alongside other indicators can play a vital role (CDPR, 2015).

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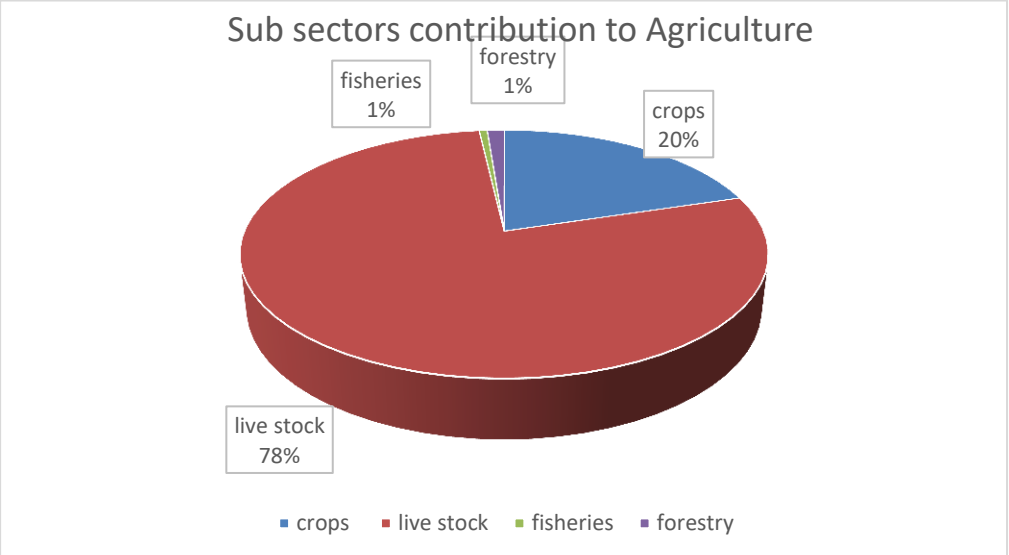
Objectives of the study

This research has been undertaken with the aim of identifying and magnifying key aspects of KP Economy. Further to estimate the impact of growth drivers like livestock, Health and construction sectors on PGDP, Household income and demand and how will it enhance the living standard of the people of the province. Further to provide an economic data base of the economy to stakeholders for upgrading the provincial status.

Livestock

Livestock has emerged as a largest sub sector of agriculture both at national and provincial level. It provides food, is a mean of transportation and a source of organic fertilizer to agriculture farms. The fundamental role of livestock sector is to ensure food security, reduce poverty and provide jobs to rural people. At national level more than 8 million people are engaged in the sector and originate around 40 percent of their income from the sector. Milk is the largest agriculture commodity produced by the sector having production of 63 metric tons per annum (GOP, 2020-21). The production of milk, eggs and mutton has a positive significant relationship with agriculture GDP while beef, poultry meat and wool has found to have a negative insignificant relationship (Rehman, A. et al., 2017). The *animal populations* for Khyber Pakhtunkhwa are estimated as 8.84 million cattles, 3.4 million buffalos, 10.4 million goats and 4.22 million sheep (Base line, 2021). Milk and meat are the leading livestock products and are important elements of our daily diet. (Seale et al., 2003) estimated that around 27 percent of the total household expenses are made on dairy products. The provincial production of milk is , of this 46% is marketed domestically while 14% is imported from Punjab and other provinces (Baseline, 2021). The livestock sector lacks reliable information, policy formulation and research (Jalil et al., 2009). However the development of the sector will play a key role in reducing poverty and uplifting the socioeconomic situation of the rural people of the province.

Figure 3



Source: BOS KP 2016.

The provincial breakup of subsectors of agriculture suggests that the Livestock sector is the dominant sub-sector with a contribution of 78 percent to

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agriculture. Crops contributes 20 percent, fisheries and forestry 1perecnt each for the year 2015-16. The growth rate of the livestock was positive (5 percent) while all other subsectors have negative growth rate for the study period (GDP Estimates, BOS KP, 2016-17).

Health indicators at National and Provincial level

Human capital in the shape of good health and skillful human resources are key to economic development worldwide. Governments around the world subsidizes health facilities and make spending in order to generate positive externality for poor segments and achieve sustainable development goal (SDG) 3. The magnitude and type of these transfers vary from country to country, in Pakistan the health expenditure is low (0.5 percent of GNP) as in comparison to the international standard (5 percent) due to which improvement in health indicators of life expectancy, infant mortality and others is slow (Ali, 2000). The prioritization of the health sector by the government is reflected in increase's BHU's, RHC's, training for LHW's, critical workforce and stagnant prevalence rate. The government of Pakistan and World health organization (WHO) jointly working for improvement of public health with focus on five areas: Control of communicable disease (CD) & non communicable disease (NCD), promoting health through life course, health system strengthening and emergency responses. The federal government's public sector development program PSDP allocated funds to 71 projects including Sehat Sahulat program, EPI and polio eradication.

Disease profile suggests that NCD share is 50 percent while CD stands at 40 percent with injuries account for 10 percent in the year 2012. High out of pocket expenditure (55 percent of the total) and low existence of physicians (only 8.3 physicians per ten thousand) indicates the worse health condition in Pakistan (WHO, 2016).

Health was managed both at center as well as at provinces *before the 18th amendment*, however decentralization in powers from center to provinces is a step towards empowering the units in terms of health system and policies. The province of Khyber Pakhtunkhwa after merger with erstwhile FATA has over a hundred rural health centers, around nine hundred basic health units, nine teaching hospitals, thirty districts headquarter hospitals and twenty-two Tehsil headquarter hospitals. Several BHU's has been upgraded to RHC's by the provincial government in addition, under tribal decade strategy, accelerated implementation program (AIP) 2019-2022 were executed in merged districts for filling the developmental gaps in the said area. The provincial ADP allocation for FY2020-21 stands at 8.3 billion with a target of extending the program to hundred percent of population of the province (GO KP, 2020)

To help achieve health vision 2016-2025 and universal health coverage a landmark initiative *Sehat Sahulat Program* was undertaken by PTI government. The fundamental feature of the program is provision of necessary health services to all irrespective of their financial position. Thus, the poor masses can get treatment in a dignified manner free from financial worries. The key challenge to health care system from the household perspective is out of pocket expenditure a comparison of which for KP, Pakistan and some other countries are shown in table 2.

Table 2. Out-Of-Pocket Expenditure on Health (% Of Current Health

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Expenditure) for selected Regions

KPK	Pakistan	LMICs	OECD
72.4	56.2	38.7	19.1

Source: OECD.org/Health, 2019

To counter high out of pocket expenditure coupled with lower per capita spending alongside high poverty levels particularly in rural areas of the province a universal health Coverage (UHC) was initiated by KP government under Sehat Sahalut Program in 2015 (Hassan, et al., 2022). An increased attention and research focus is therefore needed to estimate the impact of increased health spending on the sector and economy.

Construction

The other key industry that is present in every developmental activity is construction which includes creation and repair of fixed assets such as buildings, roads and dams etc. It has a considerable contribution to the economy in terms of output, employment and income generation. The production of shelter, infrastructure and large number of consumer goods are also attributed to this sector. Both rural and urban people are involved as the skills required are generally informally learned and the work nature is laborious.

The development and pace of construction sector has direct link with country's development (Baig & Hussain, 2011). A growing construction sector has synergy effects and economic gains of poverty reduction, consumer savings and increased investment (Nenova, 2010). The importance of the sector is witnessed with the fact that around 40 industries run side by side with construction industry of which the mention able are brick, cement, sand, timber, iron, steel, marbles and stones, plastics, sanitary works, interior decoration, transport and many others (Rana, 2003). The sector also contributes to the real estate, finance and overall service sector.

Infrastructure development has been found to have both direct and indirect contribution in the economic growth of Pakistan (Haider et. al., 2012). The share of this sector stands at 2.56 percent of GDP, 13.4 percent of industrial sector value added and an employment of 6.4 million labor force growing at a rate of 9.8 percent for FY 2021 (GOP, 2023).

However rapid population growth in the country has created high demand for construction and labor force to construction industry. Construction is capital intensive business and requires continuous and high magnitude long term debit. A landmark low cost housing finance ' Mera Pakistan Mera Ghar' Scheme was initiated by the federal government in order to fulfill the rising need for housing in Pakistan. Commercial Banks of the country provided the loans for financing of construction and purchase of houses at subsidized rates for low to middle income segments of the population. As a result domestic private sector advances increased to 367 billion which is 5 percent of the housing and construction portfolio (GOP, 2022). Despite difficulties the construction sector is expected to flourish based on government backing coupled with increased demand for housing.

The construction sector is mainly driven by the Public Sector development Program (PSDP) and private sector investment in Pakistan. The role of China Pakistan Economic Corridor (CPEC) is also vital as approximately $26 billion worth projects are completed while its worth will increase to $62 billion. The

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building of transportation network, ports like Gwadar and industrial zones has two fold contribution of jobs creation and construction activities. The activities will modernize the infrastructure and economy of Pakistan (Irshad, 2015). The new projects under taken in Khyber Pakhtunkhwa are D-I Khan-Peshawar Motorway, Swat Express way Phase II and Dir Express Way. The provincial construction sector employs *15 percent* of the labor force and contributes 2.38 percent to PGDP while 12.87 percent to provincial industrial GDP (Development statistics KP, 2022-23).The construction sector in KP has dual importance in the form of absorbing large and un-skilled labor. The sector can contribute in reducing unemployment and poverty and hence can contribute to peace and development. A through research on the sector's role and contribution is of utmost importance.

KPs economy being the third largest of the country and given the shocks over time, the development of the province underscores its people and institutions resilience. The current pace of development is also not compatible with increasing food and jobs demand. An inclusive and balanced growth is how ever mandatory and needed in order to reduce poverty and Unemployment and promote sustainable development. The principal step is to understand the complex socioeconomic structure and interrelations among key economic activities existing in provincial economy. Thus *a social Accounting Matrix (SAM)* is essential to provide detail information on macro level for the province and micro level for selected sectors in order to guide for informed decision making.

Social Accounting Matrix

The current study will use the social Accounting Matrix (SAM) which is a frame work that captures the inter linkages within socioeconomic system. SAM can be used to explore the impact of exogenous changes on the endogenous sections of the framework, thus it is a base for multiplier and general equilibrium analysis. The criteria for dis-aggregation of accounts in SAM are the focused sectors, data availability and the range of impacts of policy change that the researcher is interested in. To explore in depth the issues related to the income distribution in an economy, household categories are dis-aggregated. If the concern is the inter-sector linkages, detailed dis-aggregation of sectors is carried out (Thorbeck, 2000).

A SAM is a table showing transactions and transfers among economic agents in an economy during an accounting period generally one year (Pyatt and Round, 1985). In a SAM table, accounts are listed in columns (Expenditure) and Rows (Incomes) in square shape. Furthermore SAM is comprehensive and encompasses all economic activities i.e. Production, consumption and others with a range of flexibility in dis-aggregation of accounts. Household accounts are at the heart of SAM and hence a base for analysis on income distribution.

The origins of such matrix based representation of the economy are usually traced back to Sir Richard Stones work in 1960's. Pyatt and Thorbeck developed the idea further in 1970's which is followed by Round (1982), Defourny (1984), Powell (2000) and Ronal Hoist and Rand (2002). Construction of SAM requires substantial effort and data often dispersed and inconsistent in nature. SAM is helpful in understanding the national or regional economy and the inter relationships existing among the various sectors. Thus such structures serve as the basis for policy decisions and resource allocation.

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Numerous SAM's has been developed for Pakistan in different times with different focus but mainly for national economy. The 1985 Pakistan Institute of Development Economics (PIDE)'s SAM for the FY-1979 was the first formal attempt for the country followed by federal bureau of statistics (FBS) SAM in 1984-85. The Siddique and Iqbal (1999) SAM was another attempt for the country with a dis aggregation of household sector into eight categories for assessing the distributional effects. Dorosh et al. (2004) formed the SAM with the striking feature of larger dis aggregation for household and production and having regional approach with focus on Sindh-Pakistan. Relying on the I-O matrix of siddiqui, Waheed and Ezaki (2008) created a Financial SAM for the year 1999-2000. A detailed SAM for Pakistan was formulated by Debowicz et al., (2013-14) with 51 production activity sectors, 27 factor of production and 18 household groups.

Trade, industry and agriculture have strong relationship with GDP Growth; therefore reliable policy measures should be used to bring positive changes in agriculture and other sectors (Anwar, 2015).The main theme of this study is to suggest policy changes based on SAM multiplier analysis using the most recently available micro evidence. Recently two regional SAMS one each for Baluchistan and KP has been formulated to come up with regional analysis. The purpose of this study is to highlight the key aspects of KP economy using first provincial Social accounting matrix (SAM) 2015-16. Further to study how livestock contributes towards employment, income of the households and PGDP. The other objectives include the study of the impact of construction and health sectors towards incomes, employment and savings of the households. The SAM tool is helpful in recommending policy changes.

Research GAP

The present study is intended to fill the *analytical and policy Gap in existing literature by examining* key economic sectors of KP economy. The study contributes in laying the base for informed decision making and evidence based policy analysis.

Methodology

Data & Materials

One of the modern tool of economic planning and policy analysis today is SAM which is a counter part of Leontief Input output analysis (Pyatt and Thorbeck, 1976). Moreover the SAM system is an expansion of input-output (I-O) model by providing details on the allocation of income and final demand while describing the economic structure of an economy (Cicowiez and Sánchez, 2012). The SAM provides information on the allocation of income including government transfers and remittances and on direct taxes rather than indirect taxes (Pyatt and Round, 1985). In addition, this framework can serve as base for linear multiplier analysis and Computable general equilibrium analysis (CGEA) measuring the effects of shocks on a wider range of economic variables (Hertel, 1990).

The KP SAM has been developed using 2013-14 Pakistan SAM framework & input output tables. The steps to construct SAM is enlisted below following Breisinger et al. (2010).

Step1 Schematic SAM for three sectors was constructed.

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Step 2 Detail Disaggregation of sectors (Based on objectives of the study and according to requirements were made). The final disaggregated SAM is available on request.
Table 3 manifests the simplified SAM for three sectors, consisting of endogenous and exogenous accounts. The activities, commodities, factors and household are endogenous accounts while Government, Exports are exogenous accounts.

Table 3 Simplified Three Sectors SAM

	Activities			Commodities			Factors	House hold	Exogenous Demand	Total
	Ac_1	Ac_2	Ac_3	Co_1	Co_2	Co_3	$F_{K,L,O}$	H_{Ho}	E_D	
Ac_1				X_1						X_1
Ac_2					X_2					X_2
Ac_3						X_3				X_3
Co_1	Z_{11}	Z_{12}	Z_{13}						E_1	Z_1
Co_2	Z_{21}	Z_{22}	Z_{23}						E_2	Z_2
Co_3	Z_{31}	Z_{32}	Z_{33}						E_3	Z_3
$F_{K,L,O}$	V_1	V_2	V_3							V
H_{Ho}							$V_{1+} V_{2+}V_3$			Y
E_D				L_1	L_2			Sh		ED
Total	X_1	X_2	X_3	Z_1	Z_2	Z_3	V	Y	E_D	

Source: Adopted from Bresinger et, al. 2010
Values

X Total output of activities (i.e., X1, X2 and X_3)
Z Total demand of commodities (i.e., Z1 and Z2)
V Gross factor income (household income)
Y Gross household income (factor income)
E Exogenous elements of demand (i.e., G, I, & EX (exports))
Ce Household Consumption expenditure
S_h Household Savings

Step 3 Data collection was made from various disperse sources, the data on different sectors comes from the following listed sources.

Items	**Source**

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Agriculture Products	Agriculture Statistics of Pakistan (2015-16), Fruits and vegetable statistics of Khyber Pakhtunkhwa (2015-16)
Crude Oil, Natural Gas and Petroleum products	OGDCL Pakistan
Other Minerals	Pakistan Statistical Year Book 2015-2016
Meat	Ministry of National Food Security and Research
Textiles and related products	Textile Commissioner's Organization, Karachi, Government of Pakistan
Industrial Data	Pakistan Bureau of Statistics
Intermediate consumption	Provincial accounts, gross provincial product at current factor cost 2015-2016 for each sector multiplied by ratio of intermediate consumption and value added in those activities in IO matrix (FBS 1991)
Household consumption expenditures	Households Integrated Economic Survey (HIES) 2015-16
Government saving, investment, Direct and Indirect taxes	Khyber Pakhtunkhwa Budget White Paper 2015-16, KPK Budget estimates

Step 4 First unbalanced SAM was prepared.
Step 5 The first unbalanced SAM was balanced using cross entropy method.
It is necessary to make the SAM balanced to ensure consistency of the income and expenditure accounts, and observing the outlook of the economy. For this purpose, cross-entropy technique is used, which equates the sum of rows equal to the sum of a columns by minimizing the entropy distance between the prior unbalanced SAM and final SAM. Cross-entropy is the algorithm technique that removes the inconsistency in the data. Several accounts can be cleared by hand.

Step 6 Second unbalanced SAM was developed.
Step 7 Arrived at Second balanced SAM (Final version)

A micro consistent (Balanced) and largely dis-aggregated SAM captures the country's economic structure and sectoral information in an updated way which can be utilized for policy change analysis.
Table 3 Simplified SAM table manifests a system of linear equations that are used to describe the relationship between economic sectors where total output produced by a sector is consumed as input or as output by other sectors or internally by the sector itself or both.
The total demand for each sector is $Z_1= \alpha_{11}X_1+ \alpha_{12}X_2+\alpha_{13}X_3+\gamma_1Y+E_1$,

$$Z_2= \alpha_{21}X_1+ \alpha_{22}X_2+ \alpha_{23}X_3+ \gamma_2Y+E_2.$$
$$Z_3= \alpha_{31}X_1+ \alpha_{32}X_2+ \alpha_{33}X_3+ \gamma_3Y+E_2 \quad \text{---------- (1)}$$

As gross output X is part of total demand, so $X_1= \beta_1Z_1$, $X_2= \beta_2Z_2$ and $X_3= \beta_3Z_3$-- (i) Where $\beta_{1,2\ \&\ 3}$ is the share of domestic output. Where αij & βi (i,j =1, 2 and 3) are technical coefficients.
House hold income depends on share of factor income earnings so $Y= v_1X_1+v_2X_2$

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+ v_3X_3 where V represents value added from all three sectors. Replacing X1, X2 and X3 in (i), yields $Y=v_1 \beta_1 Z_1 + v_2 \beta_2 Z_2 + v_3 \beta_3 Z_3$ ---------- (ii) putting (i) & (ii) in equations (1) and re arranging,

$$(1 - \alpha 11\beta 1 - \gamma 1 v1\ \beta\ 1)Z1 + (-\alpha 12\beta\ 2 - \gamma 1\ v2\ \beta\ 2)Z2 + (-\alpha 13\beta 3 - \gamma 1 v3\ \beta\ 3)Z3 = E1$$

$$(-\alpha 21\beta 1 - \gamma 2 v1\ \beta\ 1)Z1 + (1 - \alpha 22\beta 2 - \gamma 2 v2\ \beta\ 2)Z2 + (-\alpha 13\beta 3 - \gamma 2 v3\ \beta\ 3)Z3 = E2$$

$$(-\alpha 31\beta 1 - \gamma 3 v1\ \beta\ 1)Z1 + (-\alpha 32\beta 2 - \gamma 3 v2\ \beta\ 2)Z2 + (1 - \alpha 33\beta 3 - \gamma 3 v3\ \beta\ 3)Z3 = E3$$

Converting this into matrix form and simplifying, yields $Z= (1\text{-}M)^{-1}$ E, Unconstrained Multiplier.

In words, Total Demand= Multiplier Matrix * Exogenous Demand.

The constrained, multiplier is presented as, $\begin{pmatrix} ZI \\ E1 \end{pmatrix} = (I - M)^{-1} B \begin{pmatrix} E1 \\ E2 \end{pmatrix}$ (adopted from Bresinger et al., 2010).

Assumptions of Sam Multipliers

The SAM multiplier estimates are the effects of a policy change or shock to the economy, however the multiplier is based on certain assumptions. The key is the assumption of existence of excess capacity in all sectors and unemployed factors which creates an opportunity for extension in production as a result of demand increase. If the capacity constraints are existing the multipliers will overestimate the total effects. The other source of overestimation is the existence of fixed prices and non-substitution effects, indicating that any changes in demand leads to changes in physical output (real output changes) rather than nominal or price induced changes. Similarly linkage effects are linear and no behavioral change are existing as input coefficients remains independent of exogenous demand changes.

The endogenous responses will be limited as when exogenous accounts are effected by shocks and by changes in the leakages to the exogenous account from endogenous accounts to balance exogenous changes which are the only responses captured by the multiplier where as in practice other response are there too.

Results and Discussion

Key features of KP SAM 2015-16

The first sub national SAM for Khyber Pakhtunkhwa was developed for the FY-2015-16 which includes 64 activity sectors, 12 factors and
8 household groups. The SAM accounts in the form of activities, commodities and factors has the following listed categories and subsets. The household category is grouped into four income groups of rural and urban.

I-Activities

Agriculture (22): *wheat irrigated, wheat non-irrigated, rice irri rice basmati, sugarcane, maize, oilseeds, tobacco, other field crops, forestry, potato, onion, tomato, other vegetables, peach, plum, Apple, Other fruits, cattle, milk, poultry and fishing.*

Industry (30): *crude oil, natural gas, other mining, meat, dairy, vegetable oils, wheat milling, refine sugar, other food, cotton gin (lint), cotton spin (yarn), cotton weave (cloth), garments, other textiles, leather, wood, petroleum, fertilizers, chemicals, cement, baked construction items, metals and metal products, appliances, machinery, vehicle,*

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other manufacturing, electricity and electricity distribution and construction
Services (12) *trade, restaurants, transport, financial services, business services, services of real estate agents and housing cooperative societies, dwelling, public services, healthcare, education, services of domestic staff and all other services.*

II-Commodities
Agriculture (21): *wheat, rice-irri, rice-basmati, sugarcane, maize, oilseeds, tobacco, other field crops, forestry, potato, onion, tomato, other vegetables, peach, plum, apple, other fruits, cattle, milk, (poultry) and fishing*
Industry (30) *crude oil, natural gas, other mining, meat, dairy, vegetable oils, wheat milling, refine sugar, other food, cotton gin (lint), cotton spin (yarn), cotton weave (cloth), garments, other textiles, leather, wood, petroleum, fertilizers, chemicals, cement, baked construction items, metals and metal products, appliances, machinery, vehicle, other manufacturing, electricity and electricity distribution and construction.*
Services (13) *trade, restaurants, transport, financial services, business services, services of real estate agents and housing cooperative societies, dwelling, public services, healthcare, education, services of domestic staff, all other services and trc.*

III-Factors
Labor (5): *labor (very small farmer), labor (small farmer), labor (other), labor (low skill), and labor (high skill)*
Land (3): *land (very small farm), land (small farm), (land other)*
Other Factors (4): *capital livestock, capital agriculture, capital formal and informal*
IV- Enterprises (3): *agriculture enterprises, formal enterprises, and informal enterprise*
V-Household (8):
Rural 1/Urban 1 (annual income below 150k),
Rural 2/ urban 2 (annual income between 150k-300k),
Rural 3/ urban 3 (annual income between 300k-600k)
Rural 4/ urban 4 (annual income above 600k)

VI- Institutions Accounts (12) *government, subsidies, changes in stocks, savings-investment, hydel profits, sale tax excise, sale tax GST on domestic, sale tax on imports, sale tax surcharges, import duty, export tax, export duties and the rest of world.*

MACRO SAM

Table 4 shows the macro SAM for KP constructed for the year 2015-16. The rows indicate income while the columns show expenditure of each listed item. Nine rows and columns have been inducted to present the SAM in square form which comprises of activities, commodities, transaction cost, factors, household, government, saving and investment, tax and rest of Pakistan and the world. Column 1 includes domestic production and factors value added to arrive at a value of 4487.6 million which is matched by the row 1 value mainly from production of commodities by firms and slightly from government subsidies. Columnn2, row 1 is the total domestic production to which imports, transaction cost and other items are added up which is matched by commodity demand a sum of household, government, investment and export demand. Column 4 titled factors indicates how factor earnings are channelized into households (wages) and enterprises (capital earnings). The counterpart row includes factor income

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received by household, distributed profits from enterprises, Government transfers and the key inflows in the form of remittances. Household column (Column 5) shows the scale of personal consumption, savings made (220 millions) and the transfer to rest of Pakistan and world.

Government row (row 6) shows the revenues received by government and transfers from rest of the world (official grants). Government savings are recorded in row 7 of column 6, which is the difference between total income and current expenditure. The economy saving-investment data is shown in row and column 7. The sum of house hold's, firm's, governments and foreign's savings is the total savings. These savings are allocated to investment to arrive at Saving-investment equality. Tax payments are recorded in row 8 which consists of import tariffs, indirect taxes on commodities and income taxes. All the taxes are transferred to government is indicated in column 8.

The all-important last column and row shows the external balance. Import payments and transfer by household and government are recorded in row 9 while payments from the rest of the world in the form of export payment and transfer from abroad to household and enterprises are documented in column 9. The difference of inflows to outflows is external savings or current account balance and is recorded in row 7 column 9.

Table 4 MACRO SAM KHYBER PAKHTUNKHWA

	Activities	Commodities	Transaction Cost	Factors	Households	Government	Savings/ Investment	Tax	Rest of pak & world	Total
	Ca1	Cc2	Ct3	Cf4	Ch5	Cg6	Cis7	CT8	Crw9	
Activities Ra 1		4484.7				2.9				4487.6
Commodities Rc2	1922		285.6		1972.7	252.1	110.2	0	1399.8	5942.3
Transaction Cost Rt3		285.6								285.6
Factors R4f	2565.6			858.4		77.4			47.8	3549.2
Households R5				1494.1		51.1			715	2260.2
Government R6		9.7		99.2	2.1	2.9	45.1	190.7	239.7	589.3
Savings/ Investment R7				20.3	220.2	18	21.4			279.9
Tax R8		77.7		67.4	45.5					190.7
Rest of world R9		1084.6		1009.8	19.7	184.9	103.3			2402.3
Total	4487.6	5942.3	285.6	3549.2	2260.2	589.3	279.9	190.7	2402.3	

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Source: Author's calculation from KP SAM 2015-16

Figure 4 indicates the contribution of agriculture, industry and services sectors in the KP GDP based on SAM data. The provincial economy is service led with a contribution of 58% followed by industry 25% and agriculture 17 % depicted by the GVA Figure. The provincial government estimated GDP contribution of agriculture to be 21%, industry 23% and services 56% for FY 2015-16 (BOS KP GDP estimates, 2017). Agriculture continues to be a major source of rural employment engaging a great number of women and children.

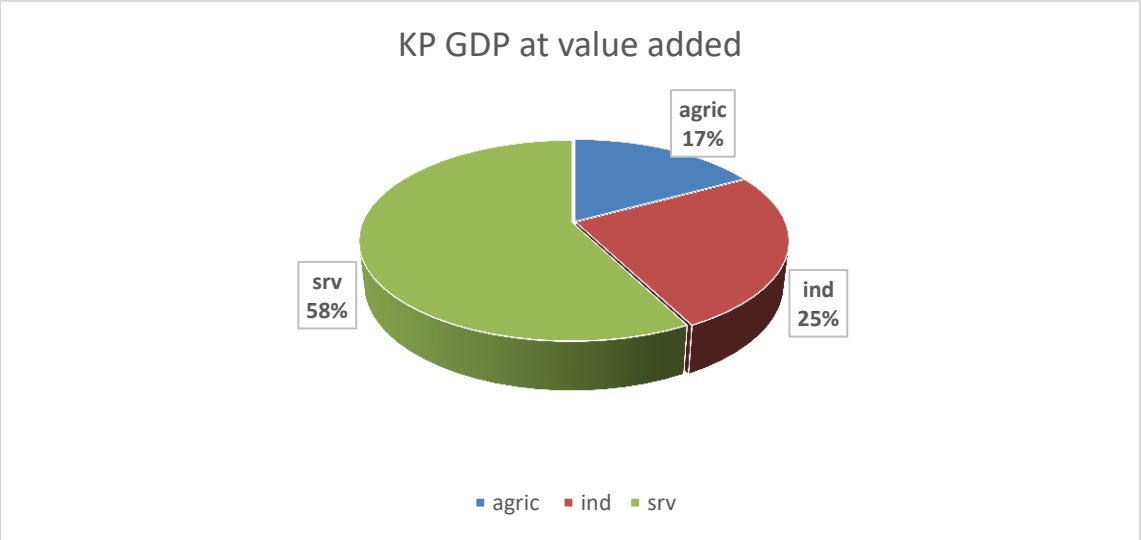

Figure 4 Sectoral share in KP GDP SOURCE: Author's estimation from SAM KP

The evidence shows that agriculture contribution to GDP is on the decline despite the fact the sector still has a lot of room to grow by increasing productivity and using cutting-edge agricultural technologies. The Agriculture's efficiency in KP has increased in recent years, however threats such as climate change, insect attacks, water scarcity, and other factors have prevented agriculture production from reaching its full potential. Increased allocation to agriculture sector will have a positive impact on the sector and provincial economy.

SAM KP has been dis-aggregated to 12 activities; livestock has been separated from other Agriculture activities due to the fact that Livestock contribution to Agriculture and PGDP is very high. The other notable dis-aggregation is the separate activity listing of construction and health sectors in order to witness the impact of change in policy variable on these sectors. Some sectors are not disaggregated as the study objective is to focus on health construction and livestock. Figure 5 indicates the breakup of KP GDP based on 12 sectors disaggregation and added value. The largest value-added contribution comes from construction (16%) followed by domestic and other services (12%).

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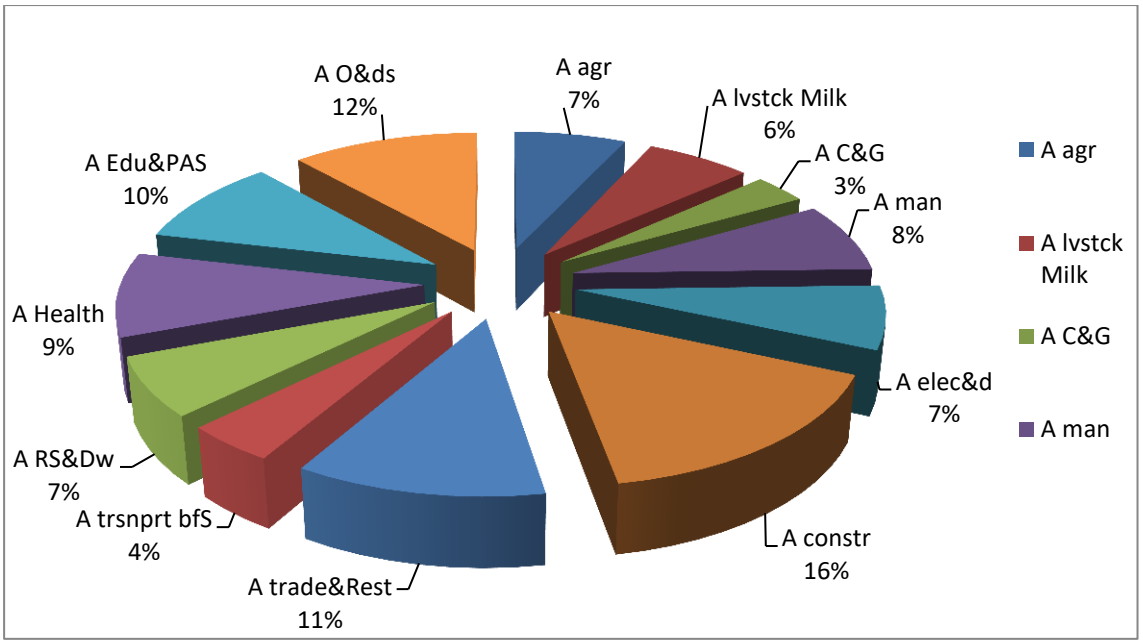

Figure 5 Provincial Value add Source: Author calculations from KP SAM 2015

The agriculture as a sector has contributed more in developing than in developed countries while increase in agricultural productivity is regarded as the key factor of the sector (Arendonk, 2015). The disaggregation of agriculture sector shows that the greatest contribution to agriculture comes from Livestock (49%). The KP agriculture sector is living on Livestock, manufacturing on construction and services on trade and restaurants. The large youth population and unskilled workers are absorbed in construction industry.

KP is a small open economy, it usually trades with Punjab and Afghanistan and with ROW. The key imports and exports of the province are listed in figure 6 which indicates that manufactured goods (84%) are the largest import to the province. The reason is the high dependency on Punjab and rest of the world for manufactured goods and the base of weak industrial sector of KP. The other key category of imports is agriculture goods mainly because of wheat and other crops imported from Punjab and rest of the world. The exports of the province is dominated by electricity production and distribution followed by trade and restaurants business. Because of its scenic values KP has a greater potential for tourism and hence the contribution to restaurants value added is high. Seven out of twelve sectors have more exports than imports.

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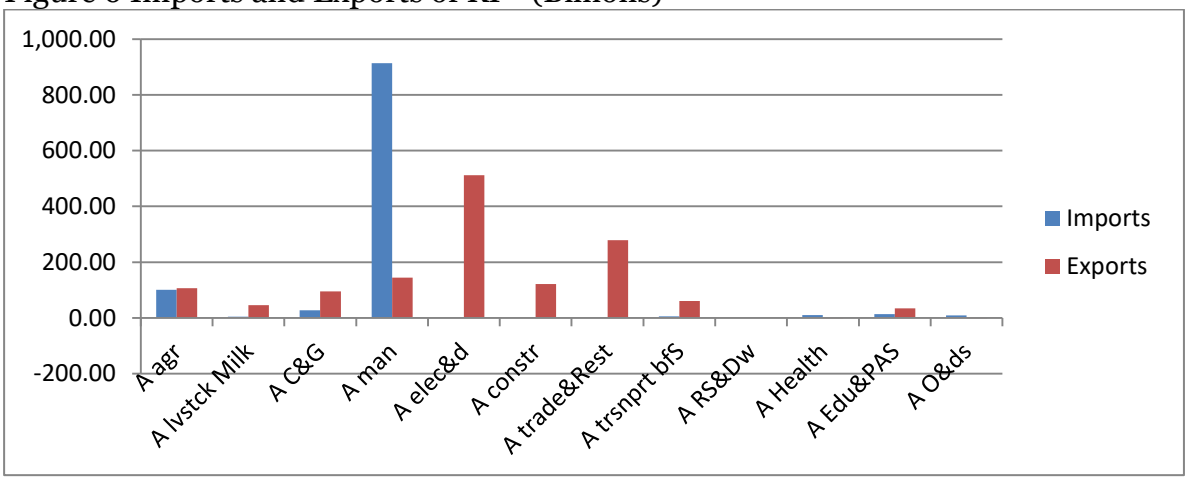
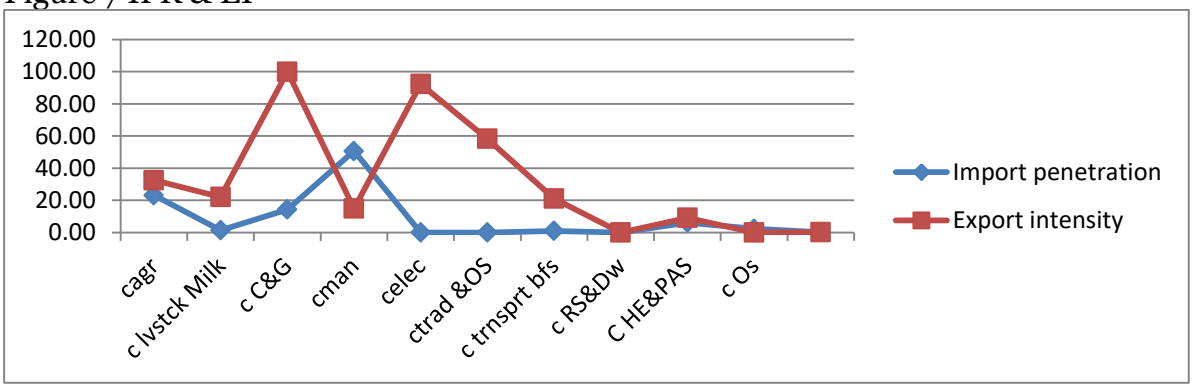
Figure 6 Imports and Exports of KP (Billions)



Source: Author calculations from KP SAM 2015

The relative importance of Import and exports for various commodities is indicated by Import penetration ratio and export intensity. The ratio of imports to total demand is import penetration having overall value of (0.18). Sector wise values suggest that manufacturing sector (0.51) is facing the toughest competition followed by agriculture commodities (0.23).The export intensity values shows that crude oil and gas sector are the largest exporting sectors followed by the electricity production & generation sectors.

Figure 7 IPR & EI



Source: Author calculations from KP SAM 2015

The all-important household section and their expenditure are described in the following section. The demand share figure shows the various demand heads for all commodities.

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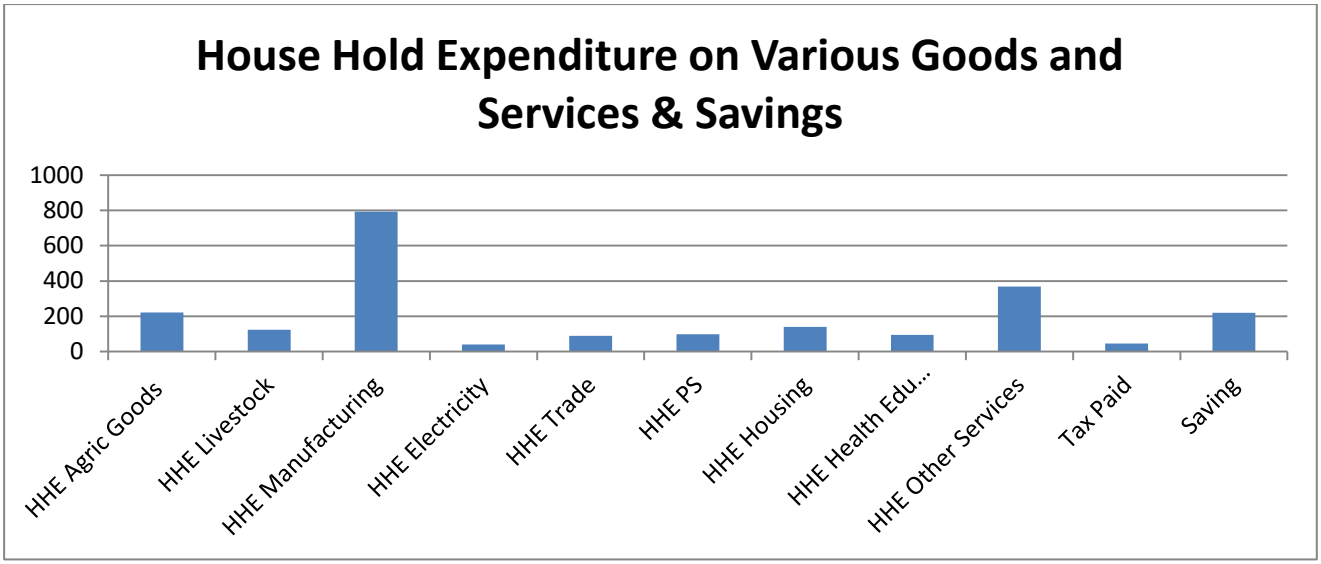
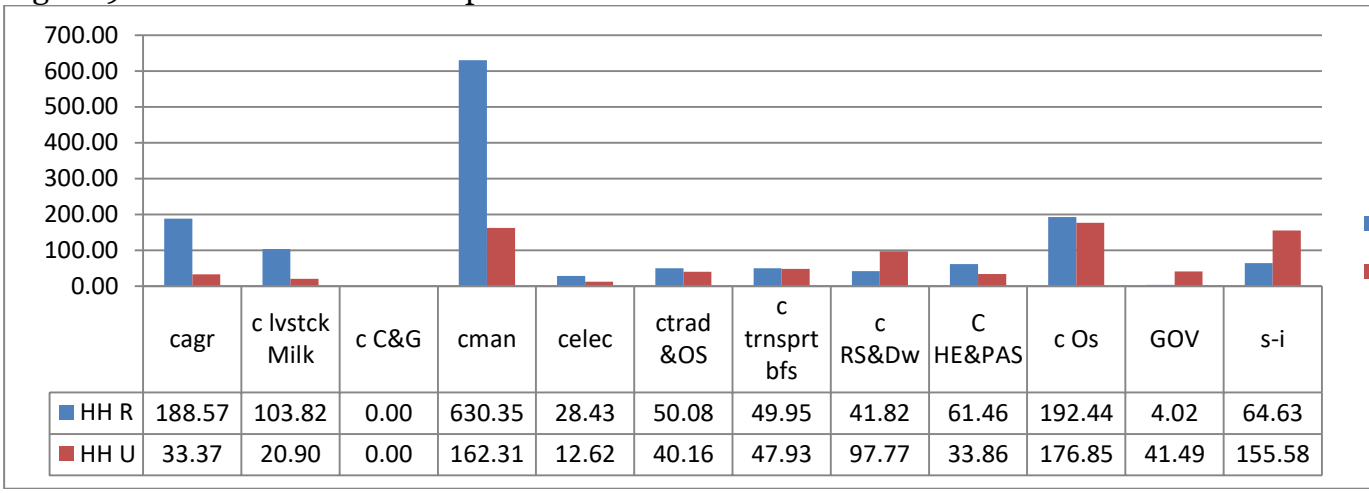


Figure 8 *Source: Author calculations from KP SAM 2015*

Household share of expenditure on various commodities shows that consumers spend mostly on manufactured goods and on domestic and other services. The rural household also spends a greater portion of their income on manufactured goods. The savings to GDP ratio stands at 9 percent while the Private consumption is very high at 91 pc.

Total household and enterprise expenditures on activities are estimated to PKR 4487 billion. Out of this 43 percent was utilized on intermediate demand for inputs while the rest (57 percent) paid to factors of production. The activities earnings are matched by the total expenditure on it, as the total output was sold in the market.

Figure 9 Rural & Urban HH Expenditure on Various Goods



	cagr	c lvstck Milk	c C&G	cman	celec	ctrad &OS	c trnsprt bfs	c RS&Dw	C HE&PAS	c Os	GOV	s-i
HH R	188.57	103.82	0.00	630.35	28.43	50.08	49.95	41.82	61.46	192.44	4.02	64.63
HH U	33.37	20.90	0.00	162.31	12.62	40.16	47.93	97.77	33.86	176.85	41.49	155.58

Source: Author calculations from KP SAM 2015

Table 5 Factor Earnings

	Labor	capital	Gov. FACTORS	row	total
HOUSHOLD Rural	318.46 (26.3)	258.03 (21.3)	31.46 (2.6)	602.06 (49.8)	1,210.01

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HOUSHOLD Urban	278.99 (65.00)	17.81 (4.15)	19.66 (4.58)	112.94 (26.30)	429.40
Total	597.45(36.4)	275.84 (16.8)	51.12 (3.12)	715.00 (43.6)	1,639.41

Source: Author calculations from KP SAM 2015

The most important source of income is ROW (remittances 44%) while labor earnings (36%) stands second important source. Based on high flow of remittances the province is termed as remittance driven economy. The provincial government has to work out the facilitation of better utilization of these remittances for job creation and business facilitation.

Table 6 Important Provincial Indicators

Fiscal balance	18 billion
Trade-to-GDP ratio (%)	93.52 (Imports plus exports as share of GDP)
Fiscal balance-to-GDP ratio (%)	0.68
Current account-to-GDP ratio (%)	0.0
Private savings-to-investment ratio (%)	78.7

Source: Author calculations from KP SAM 2015

The trade to GDP ratio which is a sum of exports and imports as share of GDP indicates that KP is an open economy. A high private savings to investment ratio is also noted.

Results of Multiplier Analysis

A fixed price multiplier analysis was conducted to calculate the indirect and induced effects of an exogenous shock to the economy of Khyber Pakhtunkhwa, which is a small and relatively open to the surrounding economic environment (Zhou et al., 2018). The table 7 indicates 12 sector KP SAM model with three different scenarios whose result is shown in respective columns. An increased exogenous demand adds to output level, GDP and incomes of the household. The GDP multipliers pool together the earnings of labor and capital created by the increased production. The output multipliers add up the linkages effects to arrive at the gross output for each sector. The income effect of multiplier measures the addition in income made by the various house hold groups as a result of increased production. The growth drivers to the KP Economy are Livestock, Health and construction (CDPR, 2015) for which direct and indirect impacts are estimated.

Livestock Scenario

A one billion increase in livestock demand results into 1.30 billion increase in GDP. It further causes livestock output to increase by 0.94 billion and trade and restaurants by 0.16 billion. Livestock has strong linkages with agriculture and trade & Restaurants sectors. The output multiplier gauges as 1.80 billion meaning that 1 billion increase in demand leads 80% expansion in output. The total demand change (2.29 billion) is greater than the output increase (1.80 billion) implying that imports of the livestock to the province will rise also. This is indicated by the fact that manufacturing output has expanded by 0.17 billion while the demand has expanded by 0.47 billion showing high import intensity of

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KP Economy. As a result of increased livestock demand the HH Rural income has increased by 0.39 billion while that of urban household has risen by 0.32 billion.

Table 7 Results of Multipliers Analysis

Activity	Livestock & Milk Scenario	Construction Scenario	Health Scenario
Activity Agriculture	0.091189	0.057571	0.049869
Activity Livestock	0.935873	0.062113	0.046464
Activity Crude Oil	0.006173	0.009697	0.005343
Activity Manufacturing	0.176509	0.314812	0.173274
Electricity	0.042142	0.054202	0.029821
Construction	0.009953	1.202249	0.01812
Trade and Restaurants	0.15926	0.25131	0.152518
Transport Business Finance Service	0.171935	0.280577	0.130154
Real Estate & Dwellings	0.050173	0.040281	0.040804
Health	0.009675	0.007471	0.8238
Education and Public Administration	0.02074	0.018874	0.019873
Other and Domestic	0.124401	0.09682	0.101157
Commodity Agriculture	0.146837	0.092705	0.080302
Commodity Livestock	1.060516	0.070386	0.052653
Commodity Crude Oil	0.009839	0.015456	0.008516
Commodity Manufacturing	0.469904	0.838092	0.46129
Electricity	0.042541	0.054715	0.030103
Construction	0.009954	1.202424	0.018123
Trade and Restaurants	0.15926	0.25131	0.152518
Transport Business Finance	0.174148	0.284188	0.131829
Real Estate & Dwellings	0.050173	0.040281	0.040804
Health	0.011857	0.009156	1.009593
Education and Public Administration	0.022249	0.020247	0.021319
Other and Domestic	0.127901	0.099545	0.104004
Transaction Cost	0.172735	0.095271	0.058001
Labor	0.464976	0.479085	0.580477
Capital + Land	0.831743	0.499507	0.451784
HH Rural	0.388749	0.29511	0.312311
HH Urban	0.324663	0.248981	0.264961
Enterprises	0.454598	0.273011	0.246927
Government	0.117367	0.09297	0.075864
Agric. Subsidy	0	0	0
Saving – Investment	0.088539	0.066143	0.069375
Hydel Profit	0	0	0
Rest of the World	0.794094	0.840888	0.854762
GDP Multiplier	1.296719	0.978592	1.03226

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Output Multiplier	1.798024	2.395978	1.591197
Income Multiplier	0.713411	0.544091	0.577272
Demand Multiplier	2.28518	2.978504	2.111052

Source: *Source: Author calculations from KP SAM 2015*
Agriculture via livestock has strong linkages with the rest of the sectors of the economy as many industries and institutions use large share of domestically produced goods and services. Expanding agriculture export demand will have positive impact on farmer's income who supply intermediate inputs. The positive impact on rural household's income will help reduce poverty in KP. The expansion in livestock sector will lead to stronger consumption linkages and fewer leakages.

Construction Scenario
The second simulation of construction indicates that a 1 billion increase in construction demand adds the same to the PGDP. That total demand of 2.98 billion exceeds the output level of 2.40 billion by about half billion rupees showing the import dependent nature of KP economy. The household income raises as a result of increased construction activities by about 0.54 billion and almost by the same ratio among rural and urban categories. However the rural income multiplier is slightly over the urban indicating that rural income is more sensitive to external shock and have a positive effect. Labor income will raise by about half of the magnitude of exogenous shock and the category of factors (land and capital) has witnessed a rise of about half a billion.
As closely related sector is the real estate and dwelling which is a scenario of great importance as a 2 billion exogenous shock to the sector adds about 2.90 billion to PGDP and an expansion of 3.45 billion in output. However demand multiplier of 4 billion exceeds the output level by only 0.56 billion indicating that a small portion of this demand will be provided by the rest of Pakistan and world.

Health Scenario
An increased demand expenditure of 1 billion on health sectors yields GDP Multiplier to rise by 1.03 billion, output by 1.59 billion and income to rise by 0.58 billion. This base line shock indicates that a certain portion of health service will be provided by the rest of Pakistan and rest of the world. Due to increased government spending in the form of health insurance will boosts manufacturing and service sectors. Thus will lead to increased employment and earning opportunities.

Conclusion and Recommendations
A SAM is an accounting data base of an economy represented in the form of a square table. In Pakistan regional accounts are not maintained thereby the true economic picture about a particular region like KP is not clear. The current study is an attempt to come up with a first provincial SAM with the objective to highlight the key aspects of the KP economy. Further to assess the impact of livestock, construction and health sectors on the provincial economy. The study manifests that KP economy is service led with a contribution of 57%, followed by industry 25% and agriculture 17%. The largest valued added contribution comes from construction (16%) followed by domestic services (12%). The largest sub

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sector of the agriculture sector is live stock with a contribution of 49%. The total value of imports to the provincial economy is 1084.6 billion while the export to the ROW are 1399 billion. The import penetration ratio stood at 0.18 with manufacturing sector is facing toughest competition while crude oil and gas are the largest exporting sectors. Households spends most of their income on manufactured goods while drives most of their income from remittances. The trade to GDP ratio indicates that KP is an open economy.

The fixed price multiplier analysis suggests that a billion exogenous shock to the sector cause GDP to rise by 1.30 billion while import to the province will rise by 0.49 billion. The increase in household income will help reduce poverty. The construction scenario indicates that the sector can absorb unskilled workers and will add to household income PKR 0.54 billion. The increased demand for health will add to GDP by 1.03 billion and 0.58 billion to the Household income.

The study recommends that the certain sectors of the KP economy are key to the growth of the provincial economy and needs focus in the form of better allocation of resources. An increased exports or government spending's in the livestock, construction and health sectors will boost the sectors as well as the provincial economy. It will help improve the household income and as well as reduce the poverty level in the rural areas of the province.

Statement of Contribution, Conflict Of Interest and Data Availability

Due its greater relevance and importance in the context of Khyber Pakhtunkhwa, the SAM multipliers can be used for the empirical study of the socio-economic effects of various policies. However the study is the output of joined effort of many of which the following are mentionable.

Dr Zahoor contribution: SAM disaggregation, Household section data estimation and hydel profit data and balancing the final SAM

Zia Ud din's Contribution: SAM Data collection, Data Entry, Multiplier estimation and write up.

This research is not funded by any organization or person nor there do any conflict of interest related to this Document.

The detail SAM table and accounts information are available on request.

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