A Social Accounting Matrix for Iraq

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Abstract

This paper deals with the challenges associated to the generation of a social accounting matrix (SAM) in conditions where up-to-date measured data is particularly scarce, and provides future researchers of economic systems with the first social accounting matrix (SAM) for Iraq. It delivers a unique and updated countrywide database for use in modeling and policy analysis, and applies this database to the empirical investigation of the expected effects of economic diversification in Iraq as stated in the recent Iraq National Development Plan 2013-2017.

Keywords: social accounting matrix (SAM) – semi-input-output analysis – Iraq – economic system

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1. Introduction

From their inception, Social Accounting Matrix (SAMs) have been instrumental in considering how different counterfactuals can affect the economy in terms of its total production, the participation of

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different sectors and production factors in its value added, its pattern of international trade, and the distribution of income among its institutions. SAMs record the transactions that take place in an (usually national) economy during a period of time (usually a year). As documented by Kehoe (1996), the origin of SAMs can be traced back at least until Quesnay's (1759) tableau économique. Subsequent contributions from Kuznets (1937), Leontief (1941), and Meade and Stone (1941) paved the ground for Stone (1947) to set the main conventions for social accounting, embedded in the United Nations System of National Accounts that is used until present.

Against this historical background, the first SAM was generated by the Cambridge Growth Project (Stone, Brown et al. 1962), and was used to inform the Cambridge Growth model (Stone and Brown 1962), which in turn allowed investigating the implications of different growth strategies in the United Kingdom with assumptions that diverged from the well-established neoclassical paradigm (Ramanathan 1982). As documented by Round (2003b), SAMs were then "further developed and used to help address poverty and income distribution issues in developing countries" by many researchers. In particular, after the seminal work conducted by Pyatt and Thorbecke (1976) at the ILO, a large number of SAM-based multiplier studies followed, some of the earliest being for Sri Lanka (Pyatt and Round 1979), Botswana (Hayden and Round 1982), Korea (Defourny and Thorbecke 1984), Indonesia (Thorbecke, Downey et al. 1992) and, more recently, Ghana (Powell and Round 2000) and Vietnam (Tarp, Roland-Holst et al. 2002). In all of these studies the aim has been to examine the nature of the multiplier effects of an income injection in one part of an economic system on the economic structure and the functional and institutional distribution in general and on the incomes of socio-economic groups of households in particular. More recently, SAMs were extended to account for environmental issues, including for developing economy settings such as Indonesia (Resosudarmo and Thorbecke 1996), China (Xie 2000) and Brazil (Lenzen and Schaeffer 2004).

The economy of Iraq lacks a Social Accounting Matrix, making it difficult – if not impossible - to assess in a quantitative way the expected country-wide effects of relevant counterfactuals such as the diversification strategy proposed by the recent Iraq National Development Plan 2013-2017 (IMoP 2013), or different scenarios regarding conflict in the country. This paper seeks to fill this gap. The novelty of the work is not on analytical methods, but on dealing with the challenges associated to a particular application of SAM generation in a context where up-to-date measured data is scarce. Our paper is organized in the following way. In section 2, we explain our approach to estimating the SAM for Iraq based on the best available information, which includes the use of sensitivity analysis to assess the role of uncertainty in the measurement of its underlying data, in section 3 we analyze the structure of the Iraqi economy based on the resulting SAM, in section 4 we consider the effects of the present government's economic diversification strategy via conducting a SAM-based semi-input-output analysis, and the final section concludes.

2. Methodology for generating the SAM for Iraq

i. Design of the SAM

At an aggregated level, the SAM for Iraq takes account of a variety of payments among its economic actors. As shown in Table 2-1, households, the government, investors and non-residents pay for the commodities they demand to an account named 'commodities' (raw 'commodities'). The associated commodities column account, in turn, pays to domestic producers (activities) for their production (supply matrix), to non-residents for the Iraqi imports, and - via sales and imports tax windows - to the government. Producers ('activities') compensate for their use of production factors (different types of labor, capital and land) and pay activity taxes, which are subsequently channeled to the government. Factor earnings are channeled to domestic households, the government and non-residents. The SAM also accounts for a set of net transfers among institutions: foreign remittances and public transfers to

domestic households, and net current transfers from the domestic government to non-residents. Households use their income for consumption purposes, for paying (direct) taxes to the government and for saving purposes. Household savings, combined with public and foreign savings, finance the overall investment of the economy.

Given our interest in the economic structure of Iraq, production is disaggregated into a set of production sectors, as listed in Appendix (Table A1). Consistent with the emphasis on agriculture of the Iraq National Development Plan 2013-2017 (IMoP 2013), the SAM disaggregates the agricultural sector with relatively high detail (fifteen sectors) and, given the high relevance of oil extraction in the generation of value added in Iraq, crude oil is identified separately from other production. Manufacturing is split into five sectors, namely *crude oil*; *other mining*; *oil refining*; *food processing*; and *other manufacturing*. Finally, and as allowed by updated sector-specific value added data, services are split into seven sectors: *electricity and water*; *construction*; *trade, hotels and restaurants*; *transport, communication and storage*; *financial services*; *housing* and *public services*.

To allow future researchers of the Iraqi economic structure to conduct a detailed analysis of the functional distribution of income and allow looking into gender issues, the production factors are disaggregated into land, capital (separated into agricultural, oil and rest), and labor, separated by gender and three skill levels: unskilled (who did not finish primary school), semi-skilled (who finished primary but not secondary school), and skilled (who finished secondary school). These representative factors have significantly different income and expenditure patterns, as shown in Section 3.

To capture interestingly different characteristics of households incomes and expenditures patterns and the particularly disfavored group of female-headed households in the country (UN 2013), we disaggregate households into thirty-six groups, according to urban versus rural status, region of residence (*Baghdad*, *Kurdistan* and *Other Governorates*), female-headed household status, and quintiles

of per capita expenditure. Given the reduced number of female-headed households in the sample, and the disadvantaged characteristic of this group as a whole, these households are split only according to region and urban status but not according to per capita expenditure quintile. While the presence of religious-related conflict in Iraq makes disaggregating households by religion (Shia, Sunni and Kurd) potentially interesting as a devise to look into the differences in their pattern of incomes and expenses, the lack of availability of the needed data precludes us to do so.

ii. Estimation of the SAM

Our approach to developing SAMs is motivated by an information theoretical approach to estimation (Judge and Mittelhammer 2012) that takes a Bayesian view of the efficient use of information: "Use all the information you have, but do not assume any information you do not have." Previous work on SAM estimation using this approach includes Judge and Mittelhammer (2012); Golan et al. (1994); Thissen and Löfgren (1998); Golan and Vogel (2000); Robinson et al. (2001); Golan et al. (1996); Zellner (2004), Thurlow (2012) and Debowicz, Dorosh et al (2013). In this spirit, we follow a series of major steps that leads to an estimated macro-consistent and disaggregated SAM for a countrywide economy. The steps, which are listed below, start from a schematic SAM (Table 2.1) and lead to a macro-consistent and disaggregated SAM through the use of a variety of data sources. In particular, and as suggested by Breisinger, Thomas et al (2010), after constructing an aggregated SAM based on macro figures, parsimonious disaggregation of the accounts allows keeping sight of the role that different types of information play. Right after each disaggregation, the accounts of the SAM are balanced. In this balancing, and as described by Round (2003b), expert judgement and a balancing algorithm are combined to balance the accounts while keeping the information on the SAM consistent with macro figures publicly available for the country. The steps that we follow to estimate the SAM for Iraq are the following: 1) start from a conceptual Macro-SAM; 2) using different data sources, generate a numerical Macro-SAM; 3) incorporate sector detail; 4) relying on primary data and an understanding of the relative

reliability of the available information, conduct some sector-specific adjustments which, in the case of Iraq, given the outdated character of its input-output matrix (1988), focus mainly on proportionately adjusting its values, as detailed below; 5) balance minimizing cross entropy distance, assess the validity of this matrix given stylized characteristics of the Iraqi economy, and conduct sensitivity analysis regarding the influence of the uncertainty in the underlying data on the resulting input-output matrix; 6) incorporate factor and household detail, getting to a new proto-SAM; 7) perform household-specific adjustment to help in balancing this second proto-SAM; 8) balance minimizing the cross-entropy distance, getting to the final SAM.

Table 2.2 shows the numerical macro-SAM for 2011 that we obtain at this stage in domestic currency for Iraq. Table A2 in the Appendix shows the role of each of the data sources in the estimation of the cells of the macro-SAM, and allows replicating the Macro-SAM. The data for Iraq that inform the Macro-SAM (for 2011 unless stated otherwise) are the following: 1) GDP (IMF 2013a), 2) exchange rate (Iraq dinars per US dollar) (IMF 2013a), 3) share of public domestic consumption in GDP (IMF 2013a), 4) share of gross domestic investment in GDP (IMF 2013a), 5) ratio of government oil revenue to GDP (IMF 2013a), 6) tax to activities as share of GDP (IMF 2013b), 7) subsidy to food as share of public budget (Naji 2012), 8) share of labor in value added 2007-2008 (CSO 2013a), 9) ratio of government revenue and grants to GDP (IMF 2013a), 10) current public expenditure as share of GDP (IMF 2013a), 11) value of exported goods (IMF 2014a), 12) value of exported services (IMF 2014a), 13) value of imported goods (IMF 2014a), 14) value of imported services (IMF 2014a), 15) revenue from sales of hotels and restaurants, in turn provided by tax rate on sales of hotels and restaurant (CPA 2003) times value added of hotels and restaurants (CSO 2013b) times ratio of gross output to value added (CSO 1988), 16) implicit average tariff rate, given by Customs Tariff Table – Harmonized System (IPCoC 2011) weighted by Iraqi imports (UNCTAD), 17) international current account balance (IMF 2014a), 18) income debit in public current account (IMF 2014b), 19) income debit in same source, 20) tax rate on household income (CPA 2004),

21) net private transfers from non-residents to private sector (IMF 2013a), 22) public transfers (IMF 2013a), and 23) grants from non-residents to government (IMF 2013a).

The resulting Macro-SAM (Table 2-2) highlights that Iraq has twin (fiscal and external) surplus and a particular low share of private consumption in total domestic production (28.4 percent). It also shows the significant activity and commodity subsidies implemented by the Iraqi government (24.4 and 7.3 trillions of Iraq Dinars, respectively).

After estimating the preliminary Macro-SAM, the domestic value added is disaggregated into the multiple sectors present in the SAM. The data used for their estimation is dictated by the availability of data for the economy. In estimating the value added of each sector, we start by splitting domestic GDP using the share in value added by each major sector as informed by the Central Statistical Office of Iraq (CSO 2013b)–shown in Figure 2-1, which reflects the high relevance of *mining and quarrying* (which includes oil extraction) and *social and personal services* (which includes public services).

For the remaining disaggregation of value added into the activities present in the SAM, given the absence of more disaggregated information in the System of National Accounts of Iraq, we rely on alternative sources: namely, data on the value of agricultural outputs informed by the Central Statistical Office (CSO 2012), the value of livestock production as informed by FAOSTAT (FAO) for the closest year for which data is available (2012), and the last input-output matrix of Iraq (CSO 1988). While it would be ideal to incorporate updated information on the input-output coefficients for every sector, the last input-output matrix for Iraq dates back to 1988, which means that the inter-sector relations need to be considered in detail, as it is below. The values of the subsidy to activities are disaggregated by activity using the “Pre-tax Subsidies for Petroleum Products, Electricity, Natural Gas, and Coal, 2011” table present in IMF (2013b).

Having disaggregated value added by activity, the aggregate demand components and import taxes are disaggregated by commodity. Private final consumption is decomposed based on the expenditures present in the micro-data of the nationally-representative Iraq Household Socio-Economic Survey (IHSES) (WB 2006-07)– expanded with its sample household weights –, using the mapping presented in Table A3. The sector composition of public final consumption and investment is informed by the input-output matrix of Iraq, and the respective mapping into SAM accounts (Table A4). The sector composition of imports and exports is informed by international trade data for 2011 (UNCTAD). Commodity-specific tariff revenue is estimated by multiplying the value of imports of each commodity and the associated tariff rates available for Iraq from the Customs Tariff Table for 2011 (IPCoC 2011), which are in various cases null consistently with Order 37 of the Coalition of Provisional Authority for Iraq.

In the following step, the intermediate use of commodities in Iraq is identified. In the absence of updated and disaggregated input-output matrix or supply and use tables for the country, and following advice from CSO, the initial estimates are provided by the following sources of information: 1) production costs of wheat and barley received from the Central Statistical Office (CSO) of Iraq for 2012; 2) technical coefficients in the last Input-Output Matrix of Iraq (1988) for industry and services; 3) agricultural input coefficients from a neighbor country – Syria - which, as Iraq, is located in the Mesopotamia region, and has similarities with regard to climate, soil characteristics, and agricultural production structure (ICARDA 2012)[i].

Given that the Input-Output Matrix of Iraq does not account for secondary production, we allocate the supply of each activity to its corresponding commodity - generating a diagonal make matrix. We then disaggregate the value added of each activity into payments to labor, land and capital, using the share of labor in value added of domestic activities for 2007-2008 (CSO 2013a) for the non-agricultural sectors,

the cost structure for wheat and barley (informed by Iraq's Ministry of Agriculture), and agricultural technical coefficients from Syria for the rest of agriculture[2].

Before balancing the matrix via cross-entropy, we conduct a series of adjustments in the input coefficients - where we perceive uncertainty is relatively high – to get close to a situation where the supply of each commodity meets its demand. Finding that *other manufacturing* has excess demand and *public services* excess supply by a higher absolute value, we balance *other manufacturing* increasing its existing demand by *public services*. Also, we find a number of crops (*wheat*, *barley*, *paddy*, *maize*, *tomato*, *vegetables*, *fodder*, *industrial crops*, *sesame*, *oil crops*, *potato*, and *other tubers and bulbs*) with excess supply and *food processing* with (even higher) excess demand, so we balance the crops commodities increasing the intermediate use by *food processing*. After these sets of adjustments, we apply cross-entropy, fixing the GDP at factor cost at the level informed by the Macro-SAM.

We analyze the level of shifts in the elements of the transactions matrix, finding that they are relatively low, as the histogram in Figure 2-2 and Table A5 indicate. The bulk of the non-zero cells in the transactions matrix (87.1%) change by less than 5 percent, and only 4 percent of the cells change by more than 10 percent. This information provides an indication that the requirements to produce the different outputs in the Iraqi economy have not changed significantly from the last available input-output. This is consistent with salient structural characteristics of the Iraqi economy remaining unchanged during this period. These characteristics include the predominance of the oil sector in the economy – both in terms of production and exports –, with very weak domestic backward and forward linkages -, strong role of the government as an economic actor, and stagnant agriculture, realities that were present in the last input-output matrix and that are still in force, as reflected in the formulation of the recent National Development Plan (2013-2017).

[2] While mixed income is an important category in developing countries, the data does not allow identifying it.

We explicitly consider the higher uncertainty that is arguably present in the underlying data of the transactions matrix. As a recent study in this journal mentions, “in general practice, only a minor proportion of authors actually add uncertainty analysis to their input-output case studies” (Lenzen, Wood et al. 2010,p.44). Given information on the uncertainty of the components of the SAM, and using simulation methods, researchers are able to provide estimates of the uncertainty attached to their cells. This is illustrated by Lenzen, Wood et al (2010), who add uncertainty analyses to a multi-region input-output model to contribute to the assessment of the responsibility of the UK in the generation of global carbon emissions, and suggests the extension of the analysis to a set of developed and resource-endowed countries. While the available data for Iraq are silent in regard to measured uncertainty, the uncertainty associated to the transactions matrix is arguably above the rest of the information underlying the SAM. Reflecting this, we carry out sensitivity analysis on the standard deviation of the cells in the transaction matrix. In order to assess the role that the higher uncertainty on the transactions matrix of Iraq may be playing in the generation of the resulting Social Accounting Matrix, and given the absence of data on the standard deviation of the point estimations publicly provided, we conduct sensitivity analysis. In particular, we assume that the standard deviation of the error with which the data in the transaction matrix is observed is much higher than that of the rest of the matrix. We increase the standard deviation of the additive errors for the cells located in the transaction matrix first by 50 percent, and then by 100 percent. As shown in Figures 2-3 and 2-4, while this experiment does increase the balancing changes in the transactions matrix, the increases are rather small, providing further evidence of the validity of the resulting matrix.

Labor income is subsequently disaggregated by gender and skill level based on the micro-data present in IHSES. Having disaggregated production activities and production factors, we proceed to disaggregate the incomes and expenditures of the representative household groups, a step that is conducted based on information in the micro-data present in IHSES, which informs the income and expenditure levels and

the income sources and the expenditure destinations of a nationally-representative sample of households, with the corresponding sampling weights. For this purpose, and using IHSES, the households are categorized into our set of representative household groups, as described above. Then, we identify the value of consumption by the sampled households by SAM commodity and, accounting for the expansion factors in the survey, we generate a consumption matrix that is subsequently re-scaled to match national private final consumption as in the Macro-SAM. In a similar way, we look into the incomes of the sampled households, classifying them into labor income (by type of labor), capital income and land income from the sectors present in the SAM, and re-scale them for consistency with the values in the Macro-SAM. The SAM is finally balanced using cross-entropy, fixing once again the GDP at factor cost.

3. Structure of the Iraq economy: observations from the SAM

The structure of the Iraq economy in terms of its aggregate demand composition – shown in Table 3-1- confirms the stylized facts commented at the beginning of the analysis in light of the macro-SAM. Iraq export value exceeds substantially its import value, leading to a significant trade superavit of 36 trillions of Iraq Dinars, or 19.3 percent of its GDP (gross domestic product) at market prices. The participation of private consumption in GDP is only 46.8 percent, a reflection of the high relation between the fiscal and current account superavits, on the one hand, and the gross domestic product, on the other hand. Table 3-1 also shows the sizable indirect subsidies existent in the Iraqi economy which exceed indirect taxes in 25 trillions of Iraq Dinars, that is, more than 13 percent of its GDP at market prices.

The domestic production of Iraq is clearly dominated by oil, leaving agriculture and other industry with relatively low participation in the generation of domestic value added (Table 3-2). The production of crude oil accounts for almost half of the value added of the economy (47.9 percent). Almost all the crude oil that is extracted in Iraq is exported (99.8 percent), allowing the sector to explain the vast

majority of the country's export value (98.0 percent), as well as the main source of finance for the public sector[3]. Around 40 percent of the value added in the country is generated by (non-traded) services, a significant part of which is provided by the public services. In contrast, agriculture and industry generate less than 15 percent of the domestic value added, and have negative international trade positions.

As shown in Table 3-3, the share of capital in domestic income is nearly three times that of labor (73.3 versus 24.0 percent), leaving labor with a share of domestic income that is strikingly low at international level (Karabarbounis and Neiman 2013). This high participation of capital in the domestic income is explained by the combination of a high participation of mining in domestic value added and a high share of capital in the distribution of mining income, where only half of a percentage point of value added is used for remunerating labor. The heterogeneity in the value added share of labor among the Iraqi sectors is significant, going from 0.5-07 percent (oil and other mining) to 64.3 percent (agricultural crops).

Iraq has a relatively urbanized population, with 21.5 out of 30.3 million inhabitants, or 71 percent, located in urban areas (Table 3.4), and 7.1 million inhabitants (23.5 percent) residing in Baghdad. Households in Iraq have 6.9 inhabitants on average. This size is even larger in poor and rural areas: the household size in the bottom quintile of the rural area reaches 9.5 inhabitants on average. Households in Baghdad and Kurdistan are relatively small (6.4 and 6.1 inhabitants, on average). Per capita income is significantly higher in the urban areas: urban inhabitants earn on average 50 percent more than their rural counterparts. Inequality within urban and rural areas is also high. The top per capita income quintile of the urban (rural) population gets 3.9 (3.7) times the figure for their bottom quintile counterparts.

[3] The oil sector in Iraq is characterized by the pre-eminence of the state (Iraq National Development Plan 2013-2017, page 59).

Public transfers account for a measurable fraction of the income of the households, especially in the female-headed ones, where they explain nearly 18 percent of total household income. More than three forth of household income (78.2 percent) is earned by urban households (last column of Table 3-5). Compared to rural households, urban households get significantly higher per capita income (as shown above), have a higher share of capital and skilled labor income (especially in the case of the wealthier households), and a lower share of land and unskilled labor income. Households in Kurdistan have a relatively high share of capital and a low share of public transfers in their income in comparison to their non-Kurdistan counterparts.

Controlling for the income level, the share of food (crops, livestock and processed food) in the total consumption value of the households tends to be higher in rural areas (for the same income quintile), and the share of services is systematically higher in urban areas (Table 3-6). Our SAM suggests that the Engel law is valid for Iraq: as we move into household groups with higher per capita expenditure, the share of food in total expenditure tends to go down, both in rural and urban areas.

Finally, even when the number of production factors in the SAM is significantly below the number of sectors and households, the SAM does capture factor income and expenditure patterns that are quite different among the ten production factors present in the SAM. As Figure 3-1 shows, there are particularly high differences in the composition by source of factor earnings in the oil and the public services sector: the oil-specific capital stock derives all its income from the oil sector, while other factors (e.g. agricultural capital) have no income in that sector; most of the income (81.5 percent) of the (few) skilled women comes from work in the public sector, while other factors earn no income in this sector (e.g. oil-specific capital). As Figure 3-2 suggests, the allocation of factor expenditures among institutions is also quite different among factors. Given that the income earned by oil capital is captured by the government, any shock affecting this sector will tend to change significantly the income distribution

among factors and among institutions. The mentioned differences in factor income and expenditure patterns suggest that the present SAM is not particularly affected by distribution invariance (Pyatt and Round 2012).

4. The 2013-2017 Iraq National Development Plan

With significant support from international organizations and bilateral donors, the Government of Iraq has recently designed a National Development Plan for 2013-2017. In its strategic document (IMoP 2013), the Government of Iraq diagnoses the country as "a revenue-generating economy dependent on a single resource, oil" (page v), and commits "to expanding its base to depend on other activities" (page v), "with industry, energy, agriculture and tourism as the main drivers and pillars of development" (page 58). The Plan is silent regarding the effects of relying on these drivers, either on the resulting production structure once the interrelations among the production sectors are taken into account, or on incomes of different household groups. Relying on a semi-input-output model, with constrained linear relationships among quantities in the model and fixed prices[4], and where the supply-constrained sectors are identified as the tradable goods[5] [6], we consider these effects in the light of the estimated SAM, providing potentially valuable information on the economic effects of the Plan.

Considering the size of the economy of Iraq, we simulate a monetary injection of 20 trillion Iraq Dinars at constant prices of 2011 -i.e. slightly less than 10% of GDP - to the economy. Reflecting the driving sectors in the Plan, we run four simulations, with the injection: 1) focused on agriculture; 2) focused on oil extraction; 3) focused on industry (excluding crude oil extraction); 4) combining the mentioned

[4] An introduction to the method can be found in Breisinger, Thomas et al (2010).
[5] Namely: Wheat, Barley, Paddy, Maize, Other Grains, Other Vegetables, Fodder, Industrial Crops, Oil crops, Tubercules, Livestock, Crude Oil, Other Mining, Oil Refining, Food Processing, Other Manufacturing, Construction, and Electricity.
[6] The inclusion of relative price changes potentially generated by these simulations would require setting up a computable general equilibrium (CGE) model and is out of the scope of the present research.

sectors[7] [8]. In each sector of the SAM, the injection is directed either to domestic supply (for supply-constrained sectors) or to net exports demand (for supply-flexible sectors), with the latter affecting in turn the sectors' endogenous supply. We consider two policy-relevant questions in particular: 1) is one of these injections particularly good at broadening the production base, as measured by the size of the non-oil extraction sector?; and 2) is one of these injections particularly good at improving the income of the more disfavored – in terms of their original per capita income - groups of households?.

Table 4-1 shows the resulting value added for broad sectors, both in terms of value (trillions of Iraq Dinars) and in terms of share of total value added (percentage), and Table 4-2 shows the resulting income changes for aggregated household groups, as percentage of their pre-simulated income. We find that, while the injection in the oil extraction sector is the one that achieves the maximum increase in the economy's value added (19.7 trillion of Iraq Dinars), due to the weak backward linkage of this sector with unconstrained-supply sectors in the domestic economy, it ends up significantly reducing the share of the non-oil sector in the economy (by 4.1 percentage points, from 52.1% to 48.1%), against the diversification goal of the Plan. In contrast, the agricultural and the industrial injections result in a significant increase in the production of services (particularly, domestic trade services increase by 19.1% with the agricultural-focused injection and 25.8% with the industry-focused injection, and domestic banking services increase by 8.6% and 10.8%, respectively[9]), and hence result in a significant final increase in the share of the non-oil sector in the economy's value added (3.1 percentage points). The industry-focused simulation leads to a relatively larger service sector, reflecting relatively high direct requirements of non-tradable services by the industrial sector. The combined injection leads to a

[7] The distribution of the simulated injection among the sectors in the SAM follows that of value added on the sectors under focus. For example, in the agricultural-focused simulation, livestock receives 6.1% of the injection, following the proportion of value added in Table 3.2 (0.6 out of 9.7).
[8] An injection in the tourism sector is not simulated due to the lack of feasibility of developing the tourism sectors in the present country's security context and also due to lack of associated disaggregated data.
[9] Not tabulated.

significant increase in the value added of the oil sector (14.5%), which has relatively low input requirements from other sectors. The increase in the value added of the non-oil sector, which relies to a larger extent on imports to satisfy its production requirements, is significantly smaller (3.5%). The results suggest then that a combined injection as the one suggested by the National Development Plan runs the risk of ending up generating a significant reduction in the participation of the non-oil sector in the economy, in the order of 2.5 percentage points.

The agricultural injection significantly increases average household income in Iraq (by 11.6%), by a proportion that exceeds the ratio between the injection and the value added of the economy (below 10%) - reflecting the relative detachment of household income from the generation of value added in the oil extraction sector commented in Section 2, a structural characteristic of the economy–, and exceeding the effect on household incomes of the other simulated injections. Given the low participation of factors owned by households into the production of oil and the low domestic input requirements of the oil sector, the oil-focused injection and the combined injection lead to particularly small increases of average household income (0.6% and 2.9%, respectively). In contrast, both the agricultural injection and the industrial injection increase urban and rural incomes in a measurable way, and significantly affect household incomes in Baghdad, Kurdistan, and Other Governorates. The agricultural injection, as opposed to the industrial injection, leads to increase the relative income of households groups whose original income is relatively low. The real income of rural households increases by 17%, while the urban household income increases by 10.1%. Household income in Other Governorates increases by 12.3%, slightly above the national average household income increase (11.6%). However, the female-headed households, a group whose welfare is targeted by social policy in Iraq, find their income increasing by less than average in the agricultural-focused simulation (as well as in other simulated injections), reflecting their relatively low share of factor income – and significant incidence of public transfers - in their income composition (as shown in Table 3-5), and suggesting the

need for the Government of Iraq to continue implementing complementary policies to help this disadvantaged group.

5. Conclusions

The present study provides the first country-wide Social Accounting Matrix for the analysis of economic counterfactuals in Iraq, and a subsequent semi-input-output analysis of the potential effects of the National Development Plan of Iraq on its production structure and household incomes.

In dealing with the challenges associated with the generation of the SAM in a context where up-to-date measured data is scarce, the validity of the resulting matrix is assessed in the light of stylized characteristics of the Iraqi economy, the analysis of the levels of shifts in the elements of the transactions matrix at the time of balancing the accounts of the SAM, and sensitivity analysis regarding the influence of the uncertainty in the underlying data on the resulting transactions matrix. Overall, and under different assumptions regarding the uncertainty in the observed transaction matrix, the analysis suggests that the requirements to produce the different outputs in the Iraqi economy have not changed significantly from the last available input-output matrix, which is consistent with salient structural characteristics of the Iraqi economy having remaining unchanged.

The SAM-based semi-input-output analysis of the effects of the present National Development Plan of Iraq suggests that diversification efforts to expand the production base of Iraq into agriculture and non-oil industry are prone to increase significantly the relative size of the service sector, leading to a significant increase in the relative size of the non-oil sector in the economy. It also suggests that the diversification efforts will have widespread effects on households in different areas of the country, and that diversifying the production base in the direction of agriculture leads to increase the relative income of the disfavored rural households. The analysis also suggests that the diversification strategy is

unfortunately not prone to affect the income of the disfavored female-headed households in a significant way by itself, and that complementary policies will continue to be needed to support this group, either in the form of direct transfers or boosting their participation in market activities.

These conclusions rely on the semi-input-output model assumption that the domestic commodity and factor markets can be equilibrated relying mainly on changes in quantities (production, consumption, and international trade) without relative price adjustments. While domestic relative prices in Iraq are linked to mostly exogenous world prices and are partly subject to state-driven price controls, future research could successfully exploit the constructed database in the implementation of a computable general equilibrium model with endogenous relative prices to assess the potential effects of economic diversification and other economic policies in Iraq under varying assumptions regarding relative price flexibility.

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Table 2-1 Schematic Social Accounting Matrix (SAM) for Iraq

	Activities	Commodities	Labor	Capital	Land	Households	Government	Activity tax	Sales tax	Import tax
Activities (27)		Supply (make) matrix								
Commodities (27)						Final private consumption	Final public consumption			
Labor (by gender and skill level)	Value added by labor at factor cost									
Capital (agricultural, oil, and rest)	Value added by capital at factor cost									
Land	Value added by land at factor cost									
Households (by gender of household head, quintile, urban status and region) (36)			Payments from factors to households				Transfers from government to households			
Government			Payments from factors to government					Activity tax	Sales tax	Import tax
- Activity tax	Activity tax									
- Sales tax		Sales tax								
- Imports tax		Tariffs								
- Direct tax						Direct taxes				
Saving-Investmment						Household savings	Government savings			
Rest of the World		Imports	Payments from factors to non-residents				Net payments from government to non-residents			

Source: author's elaboration. Households split according to urban indicator, region (*Baghdad*, *Kurdistan* and *Other Governorates*), gender of househ

headed by males, disaggregated according to quintile of per capita expenditure at market prices. This provides six female-headed and thirty male-he

totaling thirty-six household groups. Given the reduced number of female-headed households in the sample, and the disadvantaged characteristic o

female-headed households were split only according to region and urban status but not according to per capita expenditure quintile.

Table 2-2 Preliminary Macro-SAM for Iraq 2011 (in Trillions of Iraq Dinars)

	Activities	Commodities	Labor	Capital and Land	Households	Government	Tax to activities	Tax to sales	Tax to imports	Tax to institutions	Saving-Investmment	Rest of the World	Total
Activities		186.9											186.9
Commodities					60.1	45.9					40.8	96.5	243.2
Labor	38.1												38.1
Capital and Land	173.2												173.2
Households			38.1	51.2		10.7						0.1	100.1
Government				121.6			-24.4	-7.3	3.2	6.4			99.5
Tax to activities	-24.4												-24.4
Tax to sales		-7.3											-7.3
Tax to imports		3.2											3.2
Tax to institutions					6.4								6.4
Saving-Investmment					33.6	37.8						-30.7	40.8
Rest of the World		60.5		0.4		5.1							66.0
Total	186.9	243.2	38.1	173.2	100.1	99.5	-24.4	-7.3	3.2	6.4	40.8	66.0	925.6

Source: author's estimation. Each positive (negative) cell of the SAM represents a payment from the account in the column (row) to the account in the row (column). The data used to generate the Macro-SAM is listed in the body of the document.

Table 3-1 Gross Domestic Product and Aggregate Demand Components (trillions of Iraq Dinars and percentage of GDP)

	Trillions of Iraq Dinars	Share of GDP at Market Prices
Domestic absorption	150.3	80.7
Private final consumption	87.2	46.8
Fixed investment	37.7	20.2
Public final consumption	25.5	13.7
Exports	96.5	51.8
Imports	-60.5	-32.5
Gross Domestic Product at Market Prices	186.3	100.0
Net indirect taxes	-25.0	-13.4
Gross Domestic Product at Factor Cost	211.3	113.4

Source: author's elaboration based on Social Accounting Matrix Iraq 2011. Domestic absorption equals the sum of private final consumption, fixed investment, and public final consumption. Gross Domestic Product at Factor Cost equals Gross Domestic Product at Market Prices minus Net indirect Taxes, which in the case of Iraq are negative given that indirect subsidies exceed indirect taxes. Private (public) final consumption captures the sum of the payments from households (government) to commodities in the SAM. Fixed investment (exports) captures the sum of the payments from the Saving-Investment (Rest of World) account to commodities in the SAM. Imports capture the sum of the payments from the Commodities account to the Rest of World account in the SAM. Net indirect taxes captures the sum of the payments (some of which are negative) from the sales tax and tariff accounts to the government account.

Table 3-2 Economic structure: sector shares in value added, domestic absorption, exports and imports

Sector	Value added	Absorption	Export	Import	Export intensity	Import intensity
Crops	9.1	16.3	0.1	11.7	0.003	0.131
Livestock	0.6	4.0		3.0		0.139
Crude	47.9	0.0	98.0		0.998	
Other mining	1.4	2.3	0.1	0.1	0.012	0.005
Oil refining	0.5	1.1	0.8	3.9	0.349	0.640
Processed food	0.3	14.4		16.5		0.207
Other manufacturing	1.4	13.7	0.9	64.0	0.112	0.849
Electricity and Water	1.7	1.8		0.1		0.015
Construction	5.3	7.8		0.7		0.017
Trade	6.8	5.1				
Transport	3.7	5.9				
Financial services	2.0	1.3				
Housing	7.9	5.5				
Public Services	11.5	20.8				
TOTAL	100.0	100.0	100.0	100.0	0.252	0.182

Source: author's elaboration based on Social Accounting Matrix Iraq 2011. Domestic absorption is the sum of domestic intermediate consumption plus domestic final consumption, domestic investment, and domestic public consumption. Export intensity: ratio between export and output value. Import intensity: ratio between import and domestic absorption value.

Table 3-3 Composition of value added (percentages)

	Labor	Capital	Land	Total
Agriculture	62.0	9.7	28.3	100.0
Crops	64.3	7.1	28.6	100.0
Livestock	27.4	48.4	24.2	100.0
Industry	3.2	96.8		100.0
Crude	0.5	99.5		100.0
Other mining	0.7	99.3		100.0
Oil refining	15.8	84.2		100.0
Processed food	48.1	51.9		100.0
Other manufacturing	84.1	15.9		100.0
Services	42.0	58.0		100.0
Electricity and Water	61.6	38.4		100.0
Construction	60.5	39.5		100.0
Trade	10.1	89.9		100.0
Transport	37.0	63.0		100.0
Financial services	9.0	91.0		100.0
Housing		100.0		100.0
Public Services	85.5	14.5		100.0
Total	24.0	73.3	2.7	100.0

Source: author's elaboration based on Social Accounting Matrix Iraq 2011. Each cell is informed by the ratio between the payments in the SAM from the sector in the row to the factor in the column and those from the sector in the row to all the production factors present in the SAM (labor, capital and land).

Table 3-4 Income and Population by Representative Household Group

	Income (trillion ID per year)	Population (millions)	Average household size	Per capita income (thousand ID per year)
Rural Female-Headed	1.4	0.6	5.7	2,496
Rural Quintile 1	6.1	3.9	9.5	1,576
Rural Quintile 2	4.3	1.9	7.6	2,235
Rural Quintile 3	3.5	1.3	6.9	2,808
Rural Quintile 4	3.0	0.8	6.1	3,816
Rural Quintile 5	2.5	0.4	5.2	5,821
Urban Female-Headed	8.6	2.3	5.9	3,693
Urban Quintile 1	6.5	3.6	9.0	1,827
Urban Quintile 2	9.5	4.2	7.7	2,286
Urban Quintile 3	12.2	4.3	7.0	2,875
Urban Quintile 4	14.8	3.9	6.0	3,778
Urban Quintile 5	23.2	3.3	5.0	7,097
Urban	74.8	21.5	6.6	3,485
Rural	20.8	8.8	7.7	2,362
Baghdad	22.4	7.1	6.4	3,162
Kurdistan	21.0	3.9	6.1	5,403
Other Governorates	52.2	19.3	7.3	2,703
Total	95.6	30.3	6.9	3,158

Source: author's elaboration based on Social Accounting Matrix Iraq 2011 and Population data in IHSES 2007. The income column was generated by the sum of the incomes received by each of the household groups and their aggregates (e.g. urban households). The population for each group of households is provided by multiplying the row vector of number of individuals in the households by the column vector of expansion factors for each household. Average household size obtained dividing population by number of households in each household group, accounting for expansion factors. Per capita income (thousand ID per year) obtained dividing income (trillion ID per year) by population (millions) and multiplying by 10^{-3}.

Table 3-5 Composition of household income (percentages)

Household Group	Labor unskilled male	Labor unskilled female	Labor semiskilled male	Labor semiskilled female	Labor skilled male	Labor skilled female	Capital agricultural	Capital rest	Land	Government	Remittances	Total	Total (%)
Rural Female-Headed	13.0	5.6	20.0	0.8	3.7	2.4	4.8	16.2	14.8	18.4	0.3	100.0	1.5
Rural Quintile 1	14.6	1.1	24.9	0.1	7.6	0.6	7.6	12.2	21.5	9.7	0.1	100.0	6.4
Rural Quintile 2	12.6	0.5	19.9	0.2	11.5	1.4	7.3	14.8	21.1	10.6	0.1	100.0	4.5
Rural Quintile 3	15.4	0.4	15.6	0.1	13.4	1.5	6.4	15.2	19.7	12.2	0.1	100.0	3.7
Rural Quintile 4	8.6	0.0	15.3	0.2	10.0	1.5	8.5	17.4	26.6	11.7	0.1	100.0	3.2
Rural Quintile 5	21.6	0.8	15.8	0.1	8.5	1.6	5.0	21.9	15.7	9.0	0.1	100.0	2.6
Urban Female-Headed	11.3	4.2	17.2	2.5	10.9	9.3	0.2	24.7	1.0	18.5	0.2	100.0	9.0
Urban Quintile 1	20.0	0.7	29.2	0.5	14.7	0.8	0.4	20.5	1.3	11.8	0.1	100.0	6.8
Urban Quintile 2	13.7	0.6	29.6	0.5	14.3	2.2	0.2	24.0	0.9	13.9	0.1	100.0	9.9
Urban Quintile 3	10.4	0.3	23.3	0.5	16.5	3.6	0.6	28.9	2.0	13.8	0.1	100.0	12.8
Urban Quintile 4	8.2	0.5	18.9	0.6	20.3	6.2	0.2	30.7	1.0	13.2	0.1	100.0	15.4
Urban Quintile 5	11.5	0.4	12.1	0.7	18.4	6.8	1.1	34.8	3.6	10.2	0.2	100.0	24.3
Urban	11.7	0.9	19.6	0.8	16.8	5.3	0.6	29.2	2.0	13.0	0.1	100.0	78.2
Rural	14.2	1.0	19.5	0.2	9.6	1.3	6.9	15.5	20.7	11.1	0.1	100.0	21.8
Baghdad	8.5	0.4	24.1	0.8	18.7	6.1	0.4	25.4	1.4	14.2	0.1	100.0	23.4
Kurdistan	22.0	2.4	13.6	1.2	10.7	3.7	1.6	30.4	4.8	9.4	0.2	100.0	22.0
Other Governorates	9.9	0.6	20.0	0.4	15.5	4.1	2.8	24.9	8.6	13.1	0.1	100.0	54.6
Total	12.2	0.9	19.5	0.7	15.2	4.5	2.0	26.2	6.1	12.6	0.1	100.0	100.0

Source: author's elaboration based on Social Accounting Matrix Iraq 2011. Each cell (except those in the last column) represents the share of income of the household group in the row heading coming from each of the factor and non-factor sources in the column headings. The final column provides the participation of the household group in the row heading in the total household income of Iraq.

Table 3-6 Composition of household expenditure (percentages)

Commodity	Rural							Urban							Region			Total
	Female-headed	Quintile 1	2	3	4	5	Total	Female-headed	Quintile 1	2	3	4	5	Total	Baghdad	Kurdistan	Other Governorates	
Crops	15.7	18.3	14.7	13.1	11.2	8.5	14.4	9.9	15.5	13.1	11.5	9.9	6.9	10.2	10.5	8.6	12.4	11.1
Livestock	21.4	27.2	22.8	19.8	17.8	13.0	21.8	15.4	23.0	20.3	18.1	15.7	10.9	16.0	16.2	12.0	19.6	17.2
Processed food	11.0	12.8	12.2	12.6	10.8	8.9	11.8	10.8	11.9	12.0	12.0	11.3	7.8	10.5	13.0	9.0	10.5	10.8
Other manufacturing	10.8	10.1	11.5	12.7	13.0	12.2	11.5	10.9	9.6	10.8	11.5	12.4	12.0	11.5	10.0	12.7	11.7	11.5
Electricity and Water	1.8	1.5	1.6	1.8	1.9	2.1	1.7	2.3	1.8	2.0	2.2	2.5	2.3	2.2	2.6	2.1	1.9	2.1
Trade	1.5	1.2	1.4	1.9	2.2	2.5	1.7	2.4	1.3	1.7	1.8	2.4	3.8	2.5	1.8	3.5	2.1	2.3
Transport	10.2	5.1	8.9	11.9	17.8	29.3	11.9	9.2	3.7	5.2	7.4	10.4	19.9	11.3	7.7	19.2	10.0	11.4
Financial services	1.4	0.2	0.4	0.6	0.8	1.2	0.6	1.3	0.4	0.3	0.4	0.7	1.7	0.9	0.4	1.9	0.7	0.9
Housing	23.9	21.2	23.9	22.7	21.3	19.7	22.0	34.8	30.7	32.2	32.5	32.0	31.5	32.2	35.1	27.7	28.6	29.9
Public Services	2.3	2.3	2.6	2.8	3.2	2.7	2.6	2.9	2.3	2.5	2.5	2.8	3.2	2.8	2.7	3.3	2.6	2.8
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: author's elaboration based on Social Accounting Matrix Iraq 2011. Each cell represents the share of expenditure of the household group in the row headings (and their aggregates) that is spent into each of the commodities in the row headings.

Table 4-1 Simulated value added by broad sectors (trillions of Iraq Dinars and share of total)

	Base		Injection in Agriculture		Injection in Crude Oil		Injection in Other Industry		Combined Injection	
	Value	%	Value	%	Value	%	Value	%	Value	%
Agriculture	20.5	9.7	28.5	12.6	20.5	8.9	20.7	9.2	21.8	9.5
Crude Oil	101.2	47.9	101.2	44.8	120.0	51.9	101.2	44.8	115.9	50.4
Other Industry	7.5	3.5	7.5	3.3	7.5	3.2	14.2	6.3	7.9	3.4
Services	82.1	38.9	88.9	39.3	83.0	35.9	89.6	39.7	84.3	36.7
Non-Oil Subtotal	110.1	52.1	124.9	55.2	111.0	48.1	124.4	55.2	114.0	49.6
Total	211.3	100.0	226.1	100.0	231.0	100.0	225.6	100.0	229.9	100.0

Source: authors' semi-input-output analysis.

Table 4-2 Per capita income by household groups, base levels (thousand of Iraq Dinars per year) and simulated changes (%).

Household Group	Base	Injection in Agriculture	Injection in Crude Oil	Injection in Other Industry	Combined Injection
Rural Female-Headed	2,496	14.9	0.4	6.4	3.1
Rural Quintile 1	1,576	17.7	0.5	6.4	3.5
Rural Quintile 2	2,235	17.1	0.5	6.6	3.5
Rural Quintile 3	2,808	16.4	0.5	6.5	3.4
Rural Quintile 4	3,816	18.5	0.4	6.3	3.6
Rural Quintile 5	5,821	15.5	0.5	7.8	3.3
Urban Female-Headed	3,693	9.7	0.6	8.3	2.5
Urban Quintile 1	1,827	10.6	0.6	8.9	2.7
Urban Quintile 2	2,286	9.8	0.7	9.1	2.6
Urban Quintile 3	2,875	10.0	0.7	9.4	2.7
Urban Quintile 4	3,778	9.5	0.7	9.6	2.6
Urban Quintile 5	7,097	10.7	0.7	9.9	2.8
Urban	3,485	10.1	0.7	9.4	2.7
Rural	2,362	17.0	0.5	6.6	3.5
Baghdad	3,162	9.6	0.7	9.0	2.6
Kurdistan	5,403	12.1	0.7	9.4	3.0
Other Governorates	2,703	12.3	0.6	8.5	2.9
Total	3,158	11.6	0.6	8.8	2.9

Source: authors' semi-input-output analysis.

Appendix: additional tables

Table A1. Accounts in the Iraq SAM

Sectors	Factors	Households	Other accounts
Wheat	Labor unskilled male	Rural Baghdad Female-Headed Households	Government
Barley	Labor unskilled female	Rural Baghdad Quintile 1 Households	Activity tax
Paddy	Labor semiskilled male	Rural Baghdad Quintile 2 Households	Direct tax
Maize	Labor semiskilled female	Rural Baghdad Quintile 3 Households	Import tax
Other grains	Labor skilled male	Rural Baghdad Quintile 4 Households	Sales tax
Tomato	Labor skilled female	Rural Baghdad Quintile 5 Households	Saving_Investment
Other vegetables	Capital agricultural	Urban Baghdad Female-Headed Households	Rest of world
Fodder crops	Capital oil	Urban Baghdad Quintile 1 Households	Total
Legumes	Capital rest	Urban Baghdad Quintile 2 Households	
Industrial crops	Land	Urban Baghdad Quintile 3 Households	
Sesame		Urban Baghdad Quintile 4 Households	
Other oil crops		Urban Baghdad Quintile 5 Households	
Potato		Rural Kurdistan Female-Headed Households	
Other tubers and bulbs		Rural Kurdistan Quintile 1 Households	
Livestock		Rural Kurdistan Quintile 2 Households	
Crude Oil		Rural Kurdistan Quintile 3 Households	
Other Mining		Rural Kurdistan Quintile 4 Households	
Oil Refining Industry		Rural Kurdistan Quintile 5 Households	
Processed food		Urban Kurdistan Female-Headed Households	
Other Manufacturing Industries		Urban Kurdistan Quintile 1 Households	
Electricity And Water		Urban Kurdistan Quintile 2 Households	
Construction		Urban Kurdistan Quintile 3 Households	
Trade, Hotels And Restaurants		Urban Kurdistan Quintile 4 Households	
Transport , Communications And Storage		Urban Kurdistan Quintile 5 Households	
Financial Services		Rural Other Governorates Female-Headed Households	
Housing		Rural Other Governorates Quintile 1 Households	
Public Services		Rural Other Governorates Quintile 2 Households	
		Rural Other Governorates Quintile 3 Households	
		Rural Other Governorates Quintile 4 Households	
		Rural Other Governorates Quintile 5 Households	
		Urban Other Governorates Female-Headed Households	
		Urban Other Governorates Quintile 1 Households	
		Urban Other Governorates Quintile 2 Households	
		Urban Other Governorates Quintile 3 Households	
		Urban Other Governorates Quintile 4 Households	
		Urban Other Governorates Quintile 5 Households	

Source: author's elaboration. Household quintiles based on household per capita expenditure, disaggregated in quintiles at national level, and then classified by urban status and region of residence.

Table A2. Use of data sources for Iraq Macro-SAM

	Activities	Commodities	Labor	Capital and Land	Households	Government	Activity tax	Sales tax	Imports tax	Direct tax	Saving-Investmment	Rest of the World
Activities		Residual of activity account										
Commodities					Residual of commodity account	#1x#2x#3					#4x#1x#2	#2x(#11+#12)
Labor	#8 times #1 times #2											
Capital and Land	#8 times (1 - #1) times #2											
Households			Residual of labor account	Residual of Capital and Land account		Residual of government account						#2x#21
Government				#5x#1x#2-Activity tax			Activity tax income	Sales tax income	Import tax income	Direct tax income		
Activity tax	#6 times #1 times #2											
Sales tax		#7 x #9 x #1 x #2 + #15										
Imports tax		#16 x Imports										
Direct tax					#20*Household income							
Saving-Investmment					Residual of saving-investment account	(#9-#10)x#1x#2						-#2x#17
Rest of the World		#2 x (#13 + #14)		Residual of Rest of the World account		#2x(#18-#19)						

Source: author's elaboration. #: data source number in the list of data sources for Iraq Macro-SAM (see Section 2).

Table A3. Map from commodities in IHSES to those in the SAM

SAM commodity	IHSES commodity
C_WHEAT	1061
C_BARLEY	1111
C_PADDY	1011 to 1059
C_MAIZE	1135
C_GRAINO	2373 to 2467 and 2497
C_TOMATO	2485
C_VEGETO	1961 to 2273, 2309 to 2359, 2511 to 2573, 2624 to 2735, 2761 to 2785, 2985, 3209 and 2509
C_LEGUMES	2909 to 2923
C_SESAME	2947
C_POTATO	2585
C_TUBBULB	2597 to 2623
C_LVST	1361 to 1573, 1597 to 1661, 1685 and 1709 to 1765
C_FOODP	1073 to 1109, 1123, 1159 to 1359, 1873 to 1897, 2797, 2835 to 2897, 2935, 2959 to 2973, 2997 to 3197, 3211 to 3261, 3559 to 3609, 1585, 1673, 2285 to 2297, 2361, 2747, 2809 to 2823, 1909 to 1959, 3285 to 3523, 3611 to 3635
C_MANUFO	'Clothing' plus 'Furniture'
C_ELECWAT	'Electricity'

C_TRANSP	'Transport' plus 'Communication'
C_BANK	'MIscelanea' excluding 'Electricity'
C_SERVO	'Housing'
C_SERVPER	'Health' and 'Education' Services

Source: author's elaboration.

Table A4. Sectors in Iraq Input-Output Matrix and mapping into the accounts of the SAM

Nr.	Sector in Input-Output 1988	Sector in SAM 2011
1	Agriculture, Hunting and Forestry	Agriculture, then splitted
2	Crude oil	Crude
3	Sulpher extraction	Miningo
4	Other mining	
5	Dairy products	Foodp
6	Canning industry	
7	Cooking oil industry	
8	Flour milling	
9	Sugar refining	
10	Other food industry	
11	Drink and tobacco industry	
12	Textile industry	Manufo
13	Cloths and other textile industry	
14	Leather and shoes products	
15	Wood and wooden products	
16	Paper pulp products	
17	Paper and printing industry	
18	Chemical industry	
19	Other chemical products	
20	Oil refining industry	Oilrefin
21	Other oil and coal products	Manufo
22	Rubber and plastic industry	

23	Glass and glass products	
24	Cement industry	
25	Other non-metallic industry	
26	Basic metal industry	
27	Other metallic industry	
28	Agricultural machinery production and repair	
29	Other machinery and tools production and repair	
30	Electrical machinery and tool industry	
31	Automobile production and repair industry	
32	Other transport means industry	
33	Other manufacturing industry	
34	Electricity and water	Elecwat
35	Construction	Construc
36	Trade, hotels and restaurants	Trade
37	Transport, communications and storage	Transp
38	Financial services and ownership of dwellings	Bank, Servo
39	Personal services	Servper
40	Other services	Servper

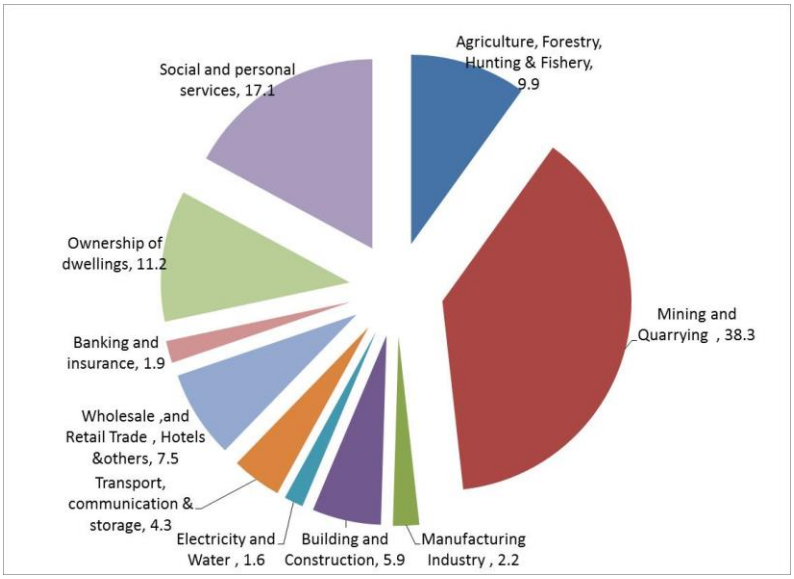
Source: Iraq Input-Output Matrix 1988 and authors' elaboration

Table A5. Percentage differences generated in the transactions matrix by cross-entropy balancing process

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	Wheat	0.25																		-0.97	
2	Barley		0.06																	-0.11	
3	Paddy			0.06																-1.57	
4	Maize				0.22															-3.20	
5	Other grains					0.07															
6	Tomato						-0.39													-4.37	
7	Other vegetables							0.77												-2.95	
8	Fodder crops								6.36							-9.61					
9	Legumes									8.42											
10	Industrial crops										0.01									-3.09	
11	Sesame											-0.10								-5.44	
12	Other oil crops												0.00							-0.26	
13	Potato													-1.41						-11.98	
14	Other tubers and bulbs														0.00					-2.50	
15	Livestock															11.99				0.08	
16	Crude Oil																		-1.09		
17	Other Mining															-4.88	-0.09	-0.83	-0.02	-0.10	-0.91
18	Oil Refining Industry															-0.88	0.27	0.83	0.02	0.01	0.03
19	Processed food															-2.29				0.11	0.00
20	Other Manufacturing Industries	3.79	0.98	0.17	0.36	-0.19	1.19	2.47	-1.19	-11.44	0.26	0.45	0.03	1.61	0.23	-8.18	2.17	5.30	0.07	0.26	1.35
21	Electricity And Water	-0.35	-0.83	-0.13	0.23	-0.20	0.06	-1.30		-9.89	0.78		-0.05	1.29	0.25	-0.52	0.37	0.05	-0.01	-0.02	-0.12
22	Construction															-0.33	0.25	0.03	0.00	0.00	-0.01
23	Trade, Hotels And Restaurants	-0.37	-0.07	0.14	0.67	-0.24	0.71	0.27	-4.95	-14.60	0.65	0.51	-0.01	2.40	0.43	-48.07	6.13	5.35	0.26	-0.21	-1.27
24	Transport , Communications And Storage	1.48	0.28	0.31	0.67	-0.13	0.88	1.74	-2.42	-9.00	0.46	0.35	0.02	1.77	0.32	-31.85	12.96	4.81	0.08	0.23	0.35
25	Financial Services															-0.27	-0.81	-0.36	0.00	-0.04	-0.42
26	Housing																				
27	Public services															-0.20		0.65	0.03	0.04	0.04

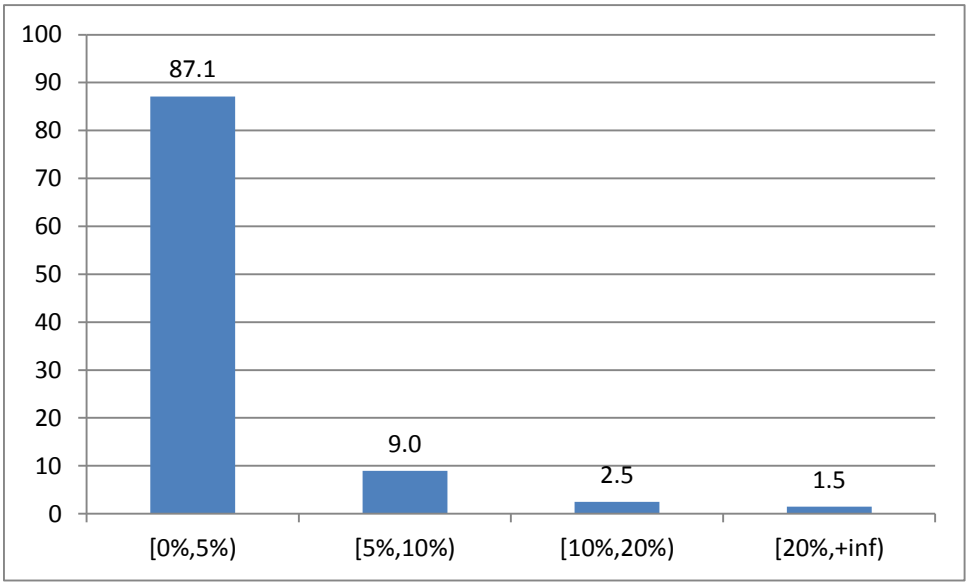
Source: author's elaboration. Cell values rounded at two decimal points.

Figure 2-1 Sector shares in Iraq's value added 2012



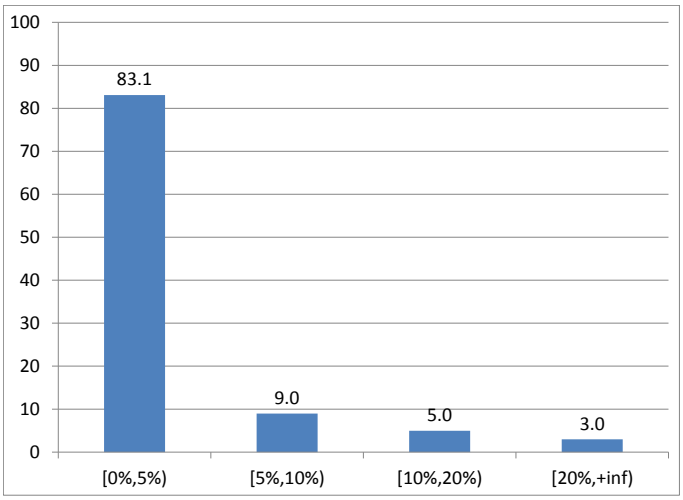
Source: author's based on CSO (2013b).

Figure 2-2 Histogram of absolute value of percentage differences generated in the transactions matrix by cross-entropy balancing process



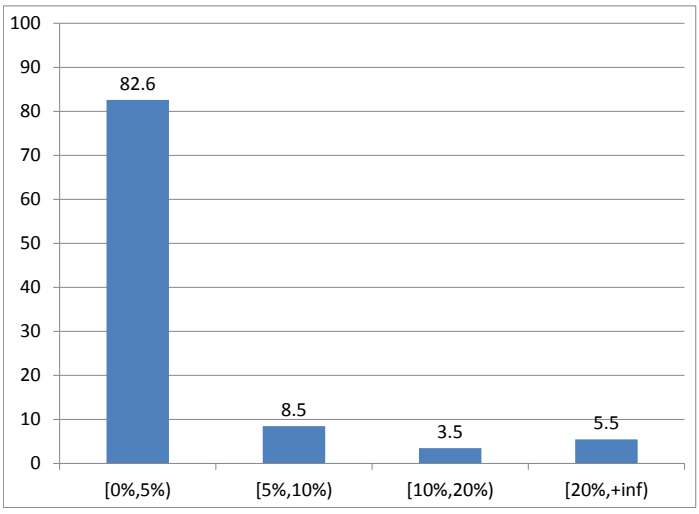
Source: author's based on Table A5. Heights reflect number of cells changing as stated in category as percentage of total non-zero cells in the transactions matrix (201). Percentages are rounded at one decimal point.

Figure 2-3 Histogram of absolute value of percentage differences generated in the transactions matrix by cross-entropy balancing process - Standard Deviations in Additive Errors increased 50%



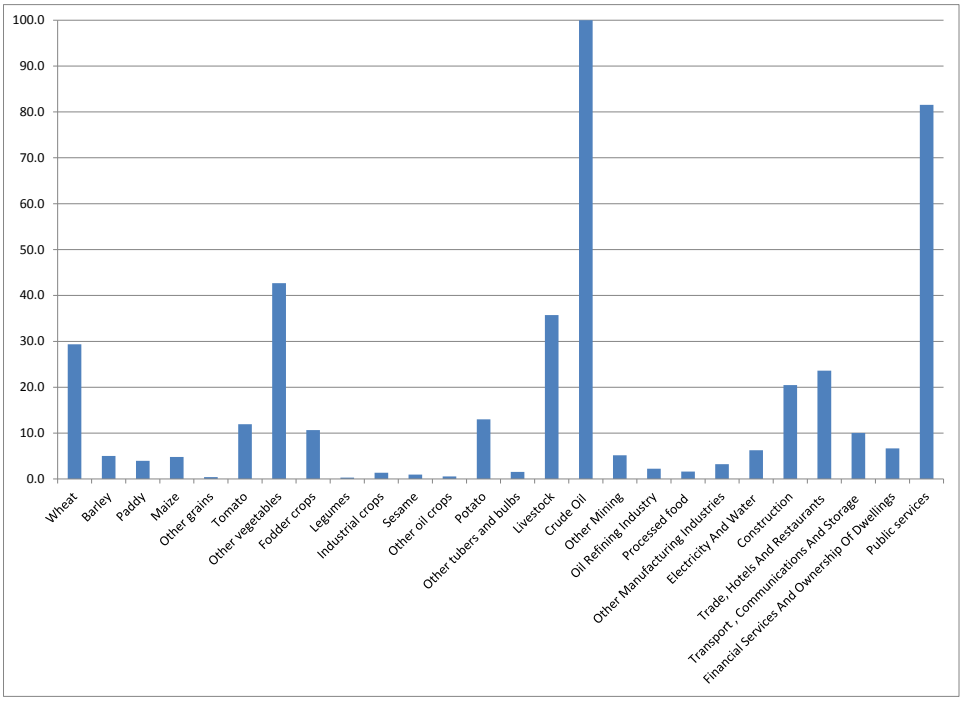
Source: author's calculation. Heights reflect number of cells changing as stated in category as percentage of total non-zero cells in the transactions matrix (201). Percentages are rounded at one decimal point.

Figure 2-4 Histogram of absolute value of percentage differences generated in the transactions matrix by cross-entropy balancing process - Standard Deviations in Additive Errors increased 100%



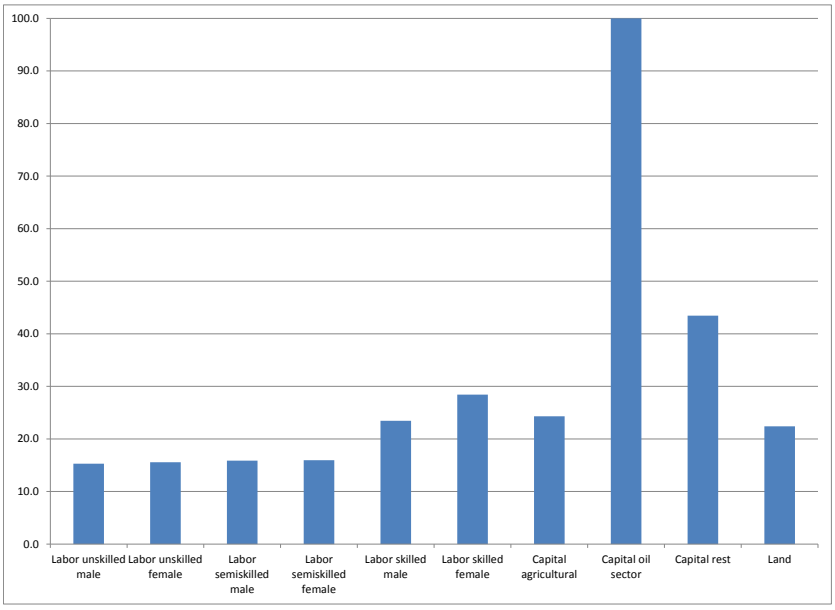
Source: author's calculation. Heights reflect number of cells changing as stated in category as percentage of total non-zero cells in the transactions matrix (201). Percentages are rounded at one decimal point.

Figure 3-1 Participation of production factors by sector of activity, maximum minus minimum (%)



Source: author's elaboration based on final SAM.

Figure 3-2 Participation of expenditure destinations by production factor, maximum minus minimum (%)



Source: author's elaboration based on final SAM.

[i] The mentioned similarities were confirmed by experts from the Ministry of Agriculture of Iraq, in particular Drs. Adnan Zowain and Jameel Dabagh.