

MyGTAP Data Program:

A Program for Customizing and
Extending the GTAP Database
Multiple Households
Split Factors
Remittances
Foreign Aid
Transfers



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Forward

The GTAP Standard model has proved a useful analysis tool and data source for over 20 years. The GTAP model has been updated and refined overtime, but it largely maintains the same structure of a regional household, broken into three components: government, private and savings-investment expenditures. This accounting framework has been supported and constrained by available international data sources. The standard GTAP framework was\is acceptable and is sufficient for many applications. However, there have been numerous calls for a more detailed accounting system for the GTAP regional household, especially as it relates to estimating the potential impacts of policies and global shocks on poverty, sustainable and inclusive growth. A single household does not suffice for these purposes. The requirement for these types of analysis is that the household be representative of key demographic and income groups, such as rural and urban households, as well as maintains linkages to the sources of household incomes.

A number of CGE models have been developed to incorporate multiple households. However, none of these models have provided a flexible, easily replicated approach to adjusting the GTAP database to include multiple households. The approach presented in our paper is to present not only a method for splitting the GTAP regional household and linking these households to factor incomes and taxes, but also introducing a GEMPACK based application, MyGTAP, for splitting the GTAP regional household based on basic data and splitting shares which may be obtained from a Social Accounting Matrix (SAM), greatly reducing the development requirements for introducing a split household into any analysis utilizing the GTAP model. The introduction of a split regional household (which does not require splitting data for every region in a particular aggregation of the GTAP database) supports greater analysis of impacts based on detailed households, factor income, remittances, foreign aid and income transfers.

This paper is a guide to employing the data tools and programs for splitting the regional household and factors of production in the GTAP database. It is intended to be used in tandem with a complimentary paper detailing the theory and model code “MyGTAP Model: A Model for Employing Data from the MyGTAP Data Program: Multiple Households, Split Factors, Remittances, Foreign Aid, and Transfers” by Walmsley and Minor 2012.

Introduction

MyGTAP is a set of GEMPACK programs designed to re-organize and customize the standard GTAP database into multiple households and factors of production to facilitate analysis within a CGE framework¹. The “My” in the program name reflects customization you define. The “GTAP” in the program name emphasizes that what will be re-organized is the GTAP database—all the original flows in the GTAP database are maintained after your customization. The standard GTAP model and database are organized around a single regional household. One of the objectives of MyGTAP is to provide a means for the user to define more than one household. This is especially helpful when one is concerned with the distribution of policy impacts across differing households. For example, will a shock to food import prices impact urban households and rural households equally? By re-organizing the GTAP regional household into multiple households, one can model, explicitly, the distributional impacts of shocks. Only available information and the user’s time limit the number of households which may be specified.

Another common requirement from users is to divide the standard five endowment factors, land, skilled labor, unskilled labor, capital and natural resources into more detailed categories. For example, it may be worthwhile to divide capital into agricultural and non-agricultural capital. Or, it may be meaningful to divide unskilled labor into rural and urban unskilled labor. MyGTAP provides tools to split the standard GTAP endowments into new categories. In addition, the user can combine analysis of multiple households with multiple endowment factors by providing factor ownership shares, thereby creating a solid link between factor earnings and household incomes. The same linkages between taxes and government income follow as a result of removing the regional household—tax revenues will be linked to government savings and deficits.

Sometimes analysis of household impacts requires an expanded definition of “income” to include foreign remittances, aid and household transfer. MyGTAP provides, in the cases of remittances and aid, country level estimates of these values, as well as tools for dividing the values between households and government². Household transfers are entirely user defined.

The current version of MyGTAP is a DOS batch file driven program which executes a series of GEMPACK compiled files as well as several utility programs (e.g., Agghar.exe). The user must be familiar with working with a DOS command box and understand batch files on a basic level. GEMPACK is a suite of programs licensed by Monash University, and a user may be required to purchase a basic license

¹ The MyGTAP set of programs are based on Mark Horridg’s Splitcom program. The authors are grateful for the original open source programs provided by Mark, these programs greatly facilitated the development of MyGTAP and some of the underlying structure of Splitcom can be found in the source code.

² This is in contrast to bilateral data, which provides source and destination details, which MyGTAP does not provide. For user familiar with the GTAP database, the treatment of remittance and aid in the current MyGTAP database are similar to the global bank.

(<http://www.monash.edu.au/policy/gpprice.htm>) to fully execute data exercises of unlimited size³. The programs are open source and may be altered by a user to further extend their usefulness.

The following documentation provides step-by-step directions on the use of MyGTAP. Since MyGTAP is constrained to return the GTAP data flows, users will find that their inputs into the program for splitting the database stand as targets, with the actual data returned often differing from the user's suggested divisions. This is a consequence of maintaining the balance of the GTAP database. Most users will find several iterations of their inputs will lead them closer to their desired output. This is expected. MyGTAP provides several checks and comparison "headers" which provide concise summary statistics on the information you provided, and how that information had to be modified to achieve balance in the database. By referring frequently to these files, the user can avoid surprises and begin a process of refining their input data.

The GTAP database is closely linked to the GTAP model. The Standard GTAP model is based on a single regional household and it does not permit varying ownership of factor returns, nor does it contain variables for foreign aid, remittances or household transfer. An adaptation of the standard GTAP model (Hertel 1997) is now available which has been modified and augmented to include these variables, along with an option to include a linear expenditure function, which better represents household consumption in cases where subsistence consumption is a significant portion of a households expenditure. The new model by Walmsley and Minor 2012, may be found at https://www.gtap.agecon.purdue.edu/resources/res_display.asp?RecordID=3810.

There are plans to further expand the capabilities of MyGTAP. Currently, users are limited to splitting the household and factors in one region. This greatly reduces data requirements by limiting required splitting information to one country. Often a social accounting matrix (SAM) will contain the required information. The current version of MyGTAP also limits the splitting of imports and domestic goods; users can not split them separately. Future releases will eliminate this restriction. Users may desire a graphic user interface(GUI) which would make the processes of running MyGTAP efficient and friendly. This too is planned for future releases. Finally, the current method requires the user to iterate through several runs of the program to achieve a desired goal in splitting shares. We are currently considering an option which will permit a user to prioritize certain data in the splitting process or a program, perhaps in a spreadsheet, which will permit the user to define ideal shares, which are feasible, before running MyGTAP. Please provide any comments or questions to PeteMinor@comcast.net or twalmsle@purdue.edu.

³ A limited exe license, the most basic, should suffice to disable any size restrictions. An unlimited license would be required to alter the code in the programs.

What Software Do I Need?

A user of MyGTAP will have to possess several software packages and data:

- GEMPACK (<http://www.monash.edu.au/policy/gempack.htm>);
- GEMPACK utility programs (<http://www.monash.edu.au/policy/gpwingem.htm>);
- GTAP Database (<https://www.gtap.agecon.purdue.edu/databases/default.asp>).

MyGTAP was developed on a Windows 7 operating system, but it is backwards compatible with most Windows operating systems. The programs are compiled in 32 bit Lahey Fortran and should function on 64 and 32 bit operating systems.

GEMPACK is a suite of programs; while not all components are required, we do require ViewHar, since it is the only program on earth which can read a GEMPACK har file.

TABMATE or a good text editor is not required, but could be helpful. A Limited Executable License is required for larger aggregations.

Updated GEMPACK utility programs can be helpful for smooth running of the program, especially as future releases of GEMPACK and the GTAP Database evolve to more advanced specifications. However, we do include current versions of the most recent utility programs in the MyGTAP suite and install them into the MyGTAP directory: you may have to update them in the future.

Access to the GTAP database is also assumed. Some user may gain access to an aggregation of the GTAP database and will not require a license. MyGTAP assumes that you will provide an aggregation of the database in the first place. MyGTAP default is to reorganize the GTAP V8.1 database with 134 countries and 57 sectors. Users wishing to reorganize the GTAPV7 database with 119 countries and 57 sectors will have to take particular care in reviewing the instructions contained in this document; we do provide data files which are consistent with GTAP V7, but some additional steps are required.

What Do I Need to Know to Run MyGTAP?

MyGTAP can be run by a novice user, with some practice and care. However it is best that a user is already familiar and comfortable with:

- GEMPACK programs and environment;
- DOS Batch file execution and modification to trouble shoot errors;
- The GTAP database, including the names of variables and their; relevance within an accounting structure;
- Familiarity with working Windows based file systems (Windows Explorer and command prompts).

If you feel you require a refresher on these topics, we recommend downloading and reading over "Exercises in Contributing I-O Tables to the GTAP Data Base" GTAP

Resource 2850⁴. The reader should restrict their reading to the sections which introduce GEMPACK coding, DOS batch files and file manipulation within Windows.

Structure of MyGTAP Program

MyGTAP is comprised of a set of GEMPACK files, DOS batch files, and GEMPACK header array files. Tab files are the native format for GEMPACK programs, here you can read the code of all the MyGTAP processes. HAR files are data files in the native GEMPACK format and can only be read with GEMPACK programs like ViewHar. DOS batch files are scripts which help automate running a number of programs and processes all with one command (the technology is as old as the hills, but is the standard for most GTAP and GEMPACK applications). The files are organized into one root directory, ..\MyGTAPVXX, where the XX will be the numbered version of the program you have downloaded. There are four subdirectories listed in table 1:

Table 1

MyGTAP Directories

Directory	Description
..\MyGTAP	Contains the CMF files for running tab files contained in SRC. MyGTAPf.bat file for running the GEMPACK .exe programs and MyGTAPg.bat for running GEMSIM programs (for users with an appropriate GEMACK license). Compallg.bat and Compallf.bat for compiling GEMSIM files and .exe files respectively
..\MyGTAP\SRC	Contains the original tab files listed in table 2
..\MyGTAP\Input	Directory with original GTAP data files (transferred by user from GTAPag) including: <i>basedata.har</i> , <i>BaseView.har</i> , <i>sets.har</i> , <i>default.prm</i> . Template for entering splitting sets: <i>HHsplit.har</i>
..\MyGTAP\Output	GTAP data files with split data. <i>Userwgt.har</i> file containing the weights applied in splitting the GTAP data, along with several checks of weights entered and weights actually applied
..\MyGTAP\Work	Numerous files created in the processes of running MyGTAP.

Initially, the main file of interest is the MyGTAPf.bat file in the root directory, which will run the MyGTAP programs⁵. After the first run of the program, the directories will be fully populated with the default files.

Table 2 lists the tab files employed by MyGTAP. The files are numbered in the order in which they are run. The programs must be run in this specific order, since subsequent

⁴ https://www.gtap.agecon.purdue.edu/resources/res_display.asp?RecordID=2850.

⁵ An alternative file, MyGTAPg.bat is provided for users who have an appropriate GEMPACK license.

programs rely on earlier ones. Each program is self documented and can be read and modified in GEMPACK. Most users will not have to be concerned with these details, unless there is an error message or in the case if you wish to modify the code.

Table 2
My GTAP Program Files

File Name	Description
1_MyGTAP.TAB*	Creates default splitting shares
2_GTP2NORM.TAB*	Transforms GTAP database into “normalized” data format for splitting purposes***
3_NORMCHEK.TAB*	Checks that the normalized data matches the GTAP data
4_EXPWGTHH.TAB*	Weights consistent with the normalized format are created for splitting flows. Numerous re-scaling and checks take place in this processes
5_SPLITFLO.TAB*	The normalized GTAP data flows are split. Final checks are made
6_NORMCHECK.TAB*	The split data in normalized format are checked for consistency with the original GTAP data flows
7_NORM2GTAPHH.TAB*	The split data flows are re-organized into the standard GTAP header files
8_AGGINCREM.TAB	Program dedicated to aggregating the renitence and aid data
9_INCOME.TAB	Program which changes the GTAP income data to include aid and remittances
10_GTPVEWHH.TAB**	Adaptation of the popular GTAP view program to include the multiple households, factors, remittances, household transfers and aid flows
11_CHKDIFF.TAB*	Checks the new flows, in GTAP format, against the old flows

**Programs were based on code originally authored by Mark Horridge in SplitCom and adapted by the authors of MyGTAP.*

***Programs originally authored by Hertel, Bacou, and Yu and adapted by the authors of MyGTAP.*

****The normalized data set stands in contrast to a more conventional and comprehensive SAM approaches. The normalized format provides some advantages in its ease for splitting data. On the other hand, the normalized format is stylized and does not provide the comprehensive double entry accounting contained in a SAM. MyGTAP could be implemented in a SAM format with no impact on the results.*

The following sections provide step-by step directions for entering the splitting data and running the programs outlined above.

LOADING YOUR BASE GTAP DATA

You will have to run either GTAPAgg or FlexAgg to create a version of the GTAP database suited to your purposes. Transfer files from FlexAgg or GTAPAgg after you have made your aggregation into the `..\input` directory under MyGTAP. Several files are required and should have the file names specified below:

- basedata.har;
- baseview.har;
- sets.har;
- default.prm.

RESTRICTION: THE FIVE GTAP FACTORS OF PRODUCTION, LAND, SKILLED AND UNSKILLED LABOR, AND CAPITAL CAN NOT BE RENAMED OR AGGRIGATED⁶.

Use ViewHar to open the file `HHsplit_Base.har` and use the menu options `FILE->SAVE AS` and rename `HHsplit_Base.har` to `HHsplit.har` by typing in the new name in the box when prompted and `SAVE`. After you have saved the file, Open it and review its contents. This file includes four headers listed in Table 3.

Table 3

Header Array File HHSPLIT.HAR

Row No.	Header	Name
1	REGS	Special region for which data will be split
2	ENDS	The new factor split--old and new factors
3	EMAP	Mapping from new factors to old (FAC1 to FAC0)
4	HHS	The household split--includes mainhh

In `HHSplit.har`, click on the header `REGS`. Enter the name of the country\region you wish to split under header `REGS`. The current version of MyGTAP supports one split region. There is one dummy region to start you off ("`Reg_Split`"). Overwrite this with your split region as follows in Table 4 (assuming you are following along with the example here, eventually you will provide your own data). Return to the top view of the headers in this header array file by clicking `CONTENTS` in the menu.

⁶ New household names and new factors should not use any unusual characters or spaces. Although GEMPACK allows for the use of flexible characters by entering a style statement into the CMF file, unpredictable errors can occur when using many of the GEMPACK "utility programs" such as `agghar.exe` and cannot be supported in a generalized application like MyGTAP without bypassing these utilities.

Table 4
Header REGS

Row No.	String
1	Tanzania

Click on the header ENDS. Enter your new factors into ENDS. There are six “dummy” names to start you off in this example (“fac1”, “fac2”, “fac3” fac4”, “fac5” and “fac6”). You will likely have to resize the header array to fit the expected number of new factors, including any unsplit factors which you will want to use in your own application⁷. You may do this manually in Viewwhar or cut and paste from an Excel file⁸. DO NOT UTILIZE THE ORIGINAL GTAP FACTOR NAMES FOR A FACTOR THAT IS SPLIT⁹. If a factor is unsplit, enter the standard GTAP factor name (e.g., “land” and “Natres” see Table 5). Return to the top overview again to view the headers by clicking Contents in the menu.

Table 5
Header ENDS

Row No.	String	Original factor name
1	Land	← Unsplit factor
2	unsk_rural	← Split factor (Unsklab)
3	unsk_urban	← Split factor (Unsklab)
4	skl_rural	← Split factor (Sklab)
5	skl_urban	← Split factor (Sklab)
6	Natres	← Unsplit factor
7	oCapital	← Split factor (Capital)
8	agCapital	← Split factor (Capital)

Note: The shaded are is added here to assist in understanding, it does not appear in the .har file.

After returning to the list of headers, click on the header EMAP. Edit EMAP to provide an appropriate mapping from the new factor names to the old factor names. We make some suggestion you may wish to follow in this example in Table 6.

Making a GEMPACK mapping file requires you to reference the positions \line numbers of the new factors as ordered in ENDS header and enter the “original” GTAP factor name next to the line number corresponding to the split factor name in ENDS¹⁰. The mapping

⁷ Go to Edit-> Change Size.

⁸ Go to File->Advanced Editing Menu. Then Import-> Paste to Screen from Clipboard.

⁹ If you do, the program will abort prematurely

¹⁰ For new users of GEMPACK, element order is important and meaningful. GEMPACK mapping files can take some time to master, despite their relatively straightforward structure and interpretation. New users would do well to take care and check their mappings after the program is run the first time, to verify what

includes any GTAP factors left unsplit (e.g., in Table 5 “Land” and “NatRes” are included).

Table 6
HeaderEMAP

No.	String	Maps to
1	Land	→ Land
2	UnSkLab	→ unsk_rural
3	UnSkLab	→ unsk_urban
4	SkLab	→ skl_rural
5	SkLab	→ skl_urban
6	NatRes	→ Natres
7	Capital	→ oCapital
8	Capital	→ agCapital

Note: The shaded area is added here to assist in understanding, it does not appear in the .har file.

Return to the header list by clicking on Contents and open header HHS and enter the element names of the split private household¹¹. The base file includes three dummy elements for the split household (“hh1”, “hh2”, “hh3”). Again, you may need to edit the size of the array to correspond to the number of households you desire. In Table 7, the dummy headers have been edited to be meaningful descriptions of households.

Table 7
HEADER HHS

No.	String
1	Rural
2	Urban
3	Mixed

Note: No mapping file is required for the households, since they all map back to a single household in GTAP-the regional household. Government income and expenditure will be derived from existing tax rates and expenditures.

was done was what they intended to do. Refer to the GEMPACK documentation for more information on mapping files.

¹¹ The government component of the regional household will be split out by default. The user should only list private household splits.

RUNNING MYGTAP

These four arrays are all that are required for MyGTAP to begin its work and split the GTAP database. We recommend that you run the program at this point to:

- Ascertain any errors you might have made in data entry (prior section);
- Generate default splitting weights and annex data, which you can then edit to suit your specific situation (it is easier to start with these default splitting weights and modify them. The default weights will be contained `..\input\splitwgt.har`)

Running MyGTAP involves executing numerous programs. This process is managed through a “DOS” batch program. The program is run from the command prompt, which can be accessed by selecting the MyGTAP directory in windows explorer and holding down the <SHIFT> key while right clicking on your mouse. A menu will appear and there will be an item “Open command window here.” Select this option and the DOS box command window will appear (easily recognized by its distinct “retro” look of white letters (no graphics) on a black background¹².

From the command line in the DOS command box, in the `..\MyGTAP` directory, type `"MyGTAPf "` without the quotes to execute the batch file `MyGTAPf.bat`.

The batch file will run and it will list the log files of the various programs. If you appropriately entered the correct data, the program will end with a prompt “**BATCH JOB SUCCESFUL**”

If your program did not complete successful, the program will list the log files. You will be interested in exploring the last log file, which will contain the offending error. You must correct this error to continue. The log file may be edited with any text editor, including TABmate. While in the DOS box, one can type `Tabmate <filename.log>` with the name of the relevant log file. TABmate should execute and open the log file¹³. Proceed to the end of the file to discover a clue to the error. Fix the error and re-run MyGTAP.

ENTERING SPLITTING WEIGHTS AND SHARES

After you have successfully executed the first run of MyGTAP, several files will appear in the output directory. These include new GTAP data files: `basedata.har`, `BaseView.har`, `sets.har`, `default.prm` and a new file called `usewgt.har`.

¹² Note, you could execute batch programs from inside windows, by doubling clicking them in Windows Explorer. However, you would not be able to monitor any of the screen output which would indicate errors in the execution of the program. We highly recommend running these from the “retro” DOS command window.

¹³ If Tabmate does not respond to this command, you may have to insert the location of Tabmate, into your computer’s PATH. See Windows documentation on the PATH statement.

Splitting weights or shares are required for three value flows for the split region defined in the prior section¹⁴:

- factor splits;
- household consumption splits;
- and factor ownership shares for redistributing income to the new, split, households.

MyGTAP will generate default splitting weights if none are provided. These default weights are not very helpful in of themselves, but they do provide an excellent starting point for entering your own splitting weights. Simply run the program after specifying the sets above, and then refer to the file `userwgt.har` in the `..\output` directory. The `userwgt.har` file has the following headers¹⁵ (Table 8):

Table 8

Header Array File ..output\userwgt.har

No.	Header	Description
1	WTF	Factor splitting weights
2	OWN	Factor ownership shares
3	WTC	Consumption weights by hh
4	SAV	Savings by hh
5	WTK	Capital splitting weights
6	TRNG	Government transfers to hh STRANSGOV(HOU:REGS)
7	FYIH	Shares of foreign income received (in) by household
8	FYOH	Shares of foreign income paid (out) by household
9	RMIH	Shares of remittances in, by household
10	RMOH	Shares of remittances out, by household
11	PCON	Private household consumption shares PRIVCONS(TRAD_COMM0:REG)
12	KFAC	Check factor splits old to new
13	KOWN	Check ownership shares old to new
14	KCON	Check on private consumption shares
15	KSAV	Check hh savings rates old to new
16	KHC	Share of hh in non-savings consumption

¹⁴ Optionally, a savings rate and capital splitting weight may be specified for each household and factor, respectively.

¹⁵ If the headers are not arranged as presented here, you may have to change the header order option found in File->Options->Sort Headers Alphabetically. Make sure this option is not checked.

The first five headers are the subject of this section on factor and household splitting weights. The separate section covers transfers, remittances, and foreign income and aid to the government.

Factor Splitting Weights

The first header array WTF, includes the factor splitting weights, which define how factor payments are split into the new factors. This header has three dimensions, ALLFAC and COM1 by REG. In order to see meaningful data, at least one dimension must be selected. In this case, it is meaningful to select the region (REG) concerned. We will pick “Tanzania”, since it is the region for which we wish to split the household. Table 9 lists the default splitting weights for the new factors and the original factors. Note, we have limited the number of commodities here to just five, several others may be present.

Table 9
Header WTF – Default Factor Splitting Weights (Tanzania)

WTF	1 GrainsCrops	2 MeatLstk	3 Extraction	4 ProcFood	5 TextWapp
1 Land	1	1	1	1	1
2 UnSkLab	0	0	0	0	0
3 SkLab	0	0	0	0	0
4 Capital	0	0	0	0	0
5 NatRes	1	1	1	1	1
6 unsk_rural	0.5	0.5	0.5	0.5	0.5
7 unsk_urban	0.5	0.5	0.5	0.5	0.5
8 skl_rural	0.5	0.5	0.5	0.5	0.5
9 skl_urban	0.5	0.5	0.5	0.5	0.5
10 OCapital	0.5	0.5	0.5	0.5	0.5
11 AgCapital	0.5	0.5	0.5	0.5	0.5
Total	5	5	5	5	5

The values in Table 9 indicate original factors in two ways: they have either a one or a zero value. A one indicates the factor is unsplit, and the zero indicates the factor is split.

Where there is a split factor, the default splitting share is simply calculated by allocating equal parts to the new factor e.g., if the original GTAP factor was split in two parts, then each new split factor gets .5 (50%) of the factor income. If the factor was split into three factors, each would get .333 (33%) etc.

For maximum flexibility, the factors have been listed by PROD_COMM, so factor splits may be carried out by commodity, allowing factors to be differentially split by produced commodity.

Editing a .har file directly can be somewhat cumbersome, so you may wish to export the .har file to Excel for editing, and import the results back into the .har file.

When you are done editing the userwgt.har file, be sure to **SAVE THE FILE IN THE** ..\INPUT directory. The userwgt.har file in the ..\output directory will be over written when the program is re-run.

After you have made and saved your new splitting weights, you will have to make one last change to the header to make MyGTAP recognize your unique splitting shares. The header must be renamed WTF1. Adding the last character, one (1), indicates that the header is the new, user defined, splitting share, not the default (which is named WTF0 in the programs). The Viewhar feature for changing a header name can be found under **EDIT -> CHANGE HEADER OR NAME**. Be sure to change the header name, the coefficient name (WTF) is for information purposes.

SAVE YOUR NEW SPLITS - FILE->SAVE AS. Be sure to save your changes into the ..\INPUT directory.

Factor Ownership Shares

After defining factor splits, you will want to consider the factor ownership shares. Factor ownership shares define household incomes when combined with factor incomes. The second header, OWN, defines the ownership of factor incomes by household. Again, the header has three dimensions, requiring that we hold one dimension constant to view meaningful data. Again, we will look at Tanzania, the country with a split household in Table 10.

Table 10

Header OWN – Default Factor Ownership Shares (Tanzania)

OWNWGT	1 MainHLD	2 Rural	3 Urban	4 Mixed	Total
1 Land	0	0.333333	0.333333	0.333333	1
2 UnSkLab	0	0	0	0	0
3 SkLab	0	0	0	0	0
4 Capital	0	0	0	0	0
5 NatRes	0	0.333333	0.333333	0.333333	1
6 unsk_rural	0	0.333333	0.333333	0.333333	1
7 unsk_urban	0	0.333333	0.333333	0.333333	1
8 skl_rural	0	0.333333	0.333333	0.333333	1
9 skl_urban	0	0.333333	0.333333	0.333333	1
10 OCapital	0	0.333333	0.333333	0.333333	1
11 AgCapital	0	0.333333	0.333333	0.333333	1
Total	0	2.666667	2.666667	2.666667	8

Table10 includes ownership shares for each of the factors in Tanzania. Original factors, split, have a zero value in the ownership shares. For original factors unsplit (“Land” and “NatRes”), a default splitting share of 1 / (# of households) or one-third is entered. New, split factors, have the same default splitting shares. The MainHHLID represents the non-split regional household in the GTAP model and applies to the regions with unsplit data. In this case, the MainHHLID has zeros in the case of Tanzania, since the household has been defined as split in the earlier section of our work. Each of the three new households (“Rural”, “Urban”, “Mixed”) has an equal share of the factor incomes by default.

In the default case here, each household will be allocated exactly one-third of disposable factor income. If the shares of factor ownership are changed, as they likely will be, then disposable household income (EVOA) will vary by household. However, at all times, total disposable household income will be the same; the shares in the split household will change. **Factor ownership (adjusted for depreciation) defines household disposable income.**

Change the shares, using the method applied in the previous section on factor weights. You may change the ownership shares in Viewhar, or use a spreadsheet to provide rich and transparent calculations of factor ownership shares and the resulting household incomes implied by them. Then import the shares into the OWN header.

Finally, change the name of the header OWN to OWN1 so MyGTAP knows that these are your unique factor ownership shares.

SAVE YOUR NEW OWNERSHIP WEIGHTS by going to FILE->SAVE.

Commodity Consumption Shares

The third header on the userwgt.har file is WTC, the weights of each commodity in the private household consumption basket. Once again, this header is defined over three dimensions, COM1, ALLH, and REG, requiring us to hold one of the dimensions constant. Again, we will hold the region (REG) constant to “Tanzania” our region with a split household and factors.

The ten commodities are listed in the rows (Table 11), with each of the households listed in the columns. MyGTAP has populated each household with the share of each commodity in the GTAP regional household’s consumption basket. In this case, the GTAP database (V8) asserts that 25.7% of private consumption in Tanzania is “GrainsCrops”. The value is the same for each household, “Rural”, “Urban” and

Factor Substitution and Factor Ownership

Many CGE models with multiple households will define a one-to-one correspondence between a factor and a household. This is common where you might have unskld_rural all going to the rural household. In this case, simply enter a one in the row and column for that factor and household. If there is not a one-to-one correspondence, you will define shares. The fact that MyGTAP allows you to map factors in something else than a one-to-one correspondence provides flexibility. When a factor is split, it then has its own price in the model, which will vary independently of other prices. Allowing a factor to have ownership, which crosses households, recognizes the fungibility of a factor, or substitution, resulting in the law of one price.

“Mixed”. For each household, the shares add to one, as illustrated in the bottom total row (the right hand totals are meaningless).

Table 11

Header WTC – Default Consumption Shares(Tanzania)

WTC	1 MainHHD	2 Rural	3 Urban	4 Mixed	Total
1 GrainsCrops	0	0.257	0.257	0.257	0.771
2 MeatLstk	0	0.068	0.068	0.068	0.204
3 Extraction	0	0.047	0.047	0.047	0.142
4 ProcFood	0	0.304	0.304	0.304	0.912
5 TextWapp	0	0.047	0.047	0.047	0.142
6 LightMnfc	0	0.022	0.022	0.022	0.066
7 HeavyMnfc	0	0.077	0.077	0.077	0.231
8 Util_Cons	0	0.018	0.018	0.018	0.055
9 TransComm	0	0.125	0.125	0.125	0.374
10 OthServices	0	0.035	0.035	0.035	0.104
Total	0	1	1	1	3

You can edit the shares of each commodity in the consumption bundle of each household. However, bear in mind, your new shares will be recalibrated so that the total regional consumption of a given commodity will be equal to the original private household consumption by commodity in the GTAP database. In practice, the shares you input are guidance, or targets, which often must be adjusted to fit the existing GTAP data.

An additional header, PCON, for private household consumption, by commodity, at market prices, is provided in header 11 and may be useful for analysis when defining WTC and savings in the following section. The data are extracted from the GTAP database and must hold before and after the splitting of households.

The user should be careful **NOT TO ASSIGN A CONSUMPTION SPLITTING SHARE OF ZERO** weight for any commodity in any household, or the model may not solve. This is an artifact of the model’s elasticity calibration. Instead, code zero shares as very small numbers, for example .00001-which is one-one-thousandth of a percent-so close to zero as it does not matter to anything other than software running the model.

Household Savings Rates

The fourth header in the userwgt.har file is the household savings rate SAV. In the earlier headers, we defined factor splits, factor ownership shares and consumption by commodity and household. In order to derive private expenditure shares by household, we have to subtract savings from disposable household income (EVOA). In the case of SAV, the header is defined across two dimensions, since it is only defined over the split region. Comparing the savings rate from the non-split region to the split region would not be reasonable, since the regional household savings rate includes government savings. Our split region has two savings rates, one for government and one for the split household. The two rates, when combined, will equal the savings rate for the original, unsplit, regional household.

Table 12 illustrates the household savings rate for each of the split households in the split region (“Tanzania”). The default values are calculated from the GTAP database and are implied from the data on total disposable factor income (EVOA- less depreciation) and private household expenditure (PCON). The values in Table 12 suggest a household (non-government) savings rate of less than two tenths of one percent—a very small value. Overall, the savings rate of 0.15% must hold. New savings rates can be entered, perhaps lowering the savings rate on rural household and raising it on urban households. You can enter the savings rates in absolute terms and MyGTAP will rescale them to comply with the overall rates implied in the data, listed in Table 12.

Table 12

Header SAV Household (non-government) Savings Rates (Tanzania)

SAV	SAVEO
1 MainHHL	0
2 Rural	0.0015
3 Urban	0.0015
4 Mixed	0.0015
Total	0.0045

If you find the rates contained in header SAV to be totally unreasonable, and you have better data on tax rates than GTAP offers, you can use Altax to change disposable (after tax) household income to support your analysis. Alternatively, you can use the aid and transfer data provided for latter in this documentation to move revenue from government to households etc.

Savings Rates – Without the Regional Household

The regional household in GTAP was designed to combine information on factor incomes and tax flows in one account. This design was driven, in part, by the fact that domestic tax data for many countries, especially for developing countries, could be difficult to reconcile. Therefore, detailed flows of income and expenditure were not required and the savings rate for the country as a whole could be determined with confidence.

MyGTAP eliminates the regional household and separates government income from household income and expenditures. This results in two savings rates: one for the household and another for government. Both are derived as revenue (taxes or factor incomes) minus expenditures. In some cases, a country may have a positive savings rate, but the household may have a small or even negative savings rate, since expenditures exceed factor incomes. The user will want to consider this situation carefully and consider changes to the database which may be required.

Capital Splitting Weights

Capital splitting weights are used to allocate depreciation across households. In the default case, depreciation is split based on the proportion of capital rents in household income. These values should suffice for most users and do not need to be changed.

Government Transfers

Transfers of income from government to households, for example pension payments, may be added in the header "TRNG". The amount to be transferred from the government, to the household should be entered in millions of dollars.

Augmenting GTAP Income Flows

The standard GTAP database does not distinguish important income flows such as foreign labor remittances, foreign capital remittances or foreign aid flows. These flows can be important components of household and government income and are included in the MyGTAP data application. For more information on augmenting income flows in the MyGTAP model and application, see McDonald and Sonmez 2012 and Walmsley and Minor 2012. In the cases of foreign remittances and capital payments and foreign aid, the MYGTAP application augments households income for these values automatically based on international estimates of these values. While the estimates on a national scale are fixed, the user has the capability to distribute the flows by altering selected shares.

Foreign Remittances (labor)

Labor remittances out of and into a given country are divided up by each households share in income. To change these default shares, refer to headers RMIH and RMOH, for remittances in and out of the country. The user should specify the share a total remittances allocated to each household in contrast to levels (dollars).

Foreign Income (capital)

Capital remittances (payments on foreign owned capital) out of and into a given country are divided up by each households share of capital in household income. To change these default shares, refer to headers FYIH and RYOH, for remittances in and out of the country. The user should specify the share a total remittances allocated to each household in contrast to levels (dollars).

Foreign Aid

Foreign aid is included in government income. The user is not permitted to change this flow directly. However, a user can transfer income from the government to the households employing "TRNG" (see earlier section).

Checking Your Results

MyGTAP is a program which splits the GTAP database, maintaining all of GTAP's value flows. Often a user will employ a SAM for a local economy. That SAM or other data sources are not likely to correspond exactly to the value flows within the GTAP database. In many cases, the differences will be modest; in other cases the differences could be very large. The presence of large structural differences in the two data sources must be reconciled. MyGTAP will employ the splitting weights and shares you provide as ideal targets; however, the data must balance and be consistent with the original GTAP database. This means MyGTAP will have to modify your targets (shares and weights) to best fit the structure of the GTAP data. Checking tables are provided to help you ascertain how your scaling weights have been modified from their original values.

Consumption Shares

The example applied in the following sections diverges from the one used in previous sections of this document, if only because it provides a richer view of the data. The following data can be generated by renaming `hhsplit_Tanzania.har` to `hhsplit.har`, overwriting the earlier `hhsplit` file based on the example file. The `userwgt_Tanzania.har` file is also renamed to `userwgt.har`. Re-run MyGTAP by typing `MyGTAPf`.

MyGTAP allows for a number of splits in factors, households, and household ownership of factor incomes. In most cases, these values will remain unchanged, unless you have submitted values which were not reasonable (i.e., factor ownership shares which add to more than one). In the case inconsistent data were entered, MyGTAP will rescale weights and shares to make them compatible with economically reasonable splitting shares.

In the case of consumption shares, `WTC`, it is likely that no matter what shares you put into this value, MyGTAP will likely rescale them to satisfy the requirement that all private consumption in the GTAP database are consumed by the split households. You will need to review these changes any time you run MyGTAP.

Header `kCON`, includes several tables for comparing your original household consumption shares, `WTC1`, with the new household consumption shares calculated by MyGTAP. The table has four dimensions, `COM1`, `ALLHH`, `CHK1`, and `REG`. The region you will be interested in is the split region, in this case Tanzania. That will leave three dimensions for your analysis. `CHK1` contains four elements: `UserIN`, `ProgOUT`, `Dif_Level`, `Dif_PCT`. Each of these elements corresponds to in the order presented here as: user input (`WTC1`), output from MyGTAP, the difference between the user specified shares and the programs calculations in levels, and finally the percentage difference between the user defined shares (`WTC1`) and MyGTAP's calculations in percent. It may be helpful to select a particular commodity, the split region, and display the households and `CHK1` variable at once. This will give you a full display of changes by commodity.

Table 13 includes an analysis of Tanzania using actual weights derived from Tanzania's SAM and multiple households.

Table 13

Header kCON – Check household consumption values (“Tanzania”, “MeatLstk”)

kCON	1 UserIN	2 ProgOUT	3 Dif_Level	4 Dif_PCT	Total
1 MainHHLD	0.0000	0.0000	0.0000	0.0000	0.0000
2 hapr	0.0774	0.1131	0.0357	46.0708	46.2970
3 hanp	0.0798	0.1120	0.0322	40.3093	40.5334
4 hrpr	0.0606	0.0866	0.0260	42.9608	43.1341
5 hrnp	0.1006	0.1376	0.0370	36.8239	37.0992
6 hupr	0.0622	0.0865	0.0243	39.1397	39.3127
7 hunp	0.0858	0.1028	0.0170	19.8654	20.0710
Total	0.4663	0.6386	0.1723	225.1700	226.4472

Note: this table has different data then the default values used earlier. Using the default values would result in a trivial example.

In Table 13, we have selected “Tanzania”, our split region, and one commodity “MeatLstk”. The four CHK1 values are listed across the top of the table. In the case of “hapr” (poor agricultural households), there was a decrease in the user defined consumption share in household consumption for “MeatLstk”. The share was reduced from 7.7% of consumption, to 7.0% of consumption, a -9.1% decrease or -7 percentage points. In contrast to this modest decrease, “hunp” (poor urban households) had a decrease in the consumption share spent on “MeatLstk” of -26.2% or 2.2 percentage points from 8.6% to 6.3%.

Savings Rates

Like the consumption shares, the household savings rates are likely to differ from the values you submitted in SAV1. The new savings rate by household, SAV, is obtained by referencing the savings rate in the GTAP data base, then scaling the GTAP savings rates by household according to the relative values submitted in SAV1. Header SAVE includes the original savings rate for the split household. Again, this rate is different than the savings rate for the regional household, which includes government savings as well.

Table 14*Header kSAV – Check Household Savings Rates (“Tanzania”)*

kSAV	1 UserIN	2 ProgOUT	3 Dif_Level	4 Dif_PCT	Total
1 MainHHLD	0.0000	0.0000	0.0000	0.0000	0.0000
2 hapr	0.0800	0.0282	-0.0518	-64.7535	-64.6971
3 hanp	0.1000	0.0352	-0.0648	-64.7535	-64.6830
4 hrpr	0.0500	0.0176	-0.0324	-64.7535	-64.7182
5 hrnp	0.0800	0.0282	-0.0518	-64.7535	-64.6971
6 hupr	0.0400	0.0141	-0.0259	-64.7535	-64.7253
7 hunp	0.1200	0.0423	-0.0777	-64.7535	-64.6689
Total	0.4700	0.1657	-0.3043	-388.5209	-388.1896

Other Shares and Weights

kCON and kSAV are likely to be the headers you are most interested in and will differ from the shares and weights you originally submitted on WTC1 and SAV1. There are three other check headers associated with the factor splitting shares (kFAC) and ownership shares (kOWN). These headers take on the same format as kSAV and kCON and they include an analysis of any re-weighting of the original values you submitted in FAC1 and OWN1. The difference here is that any changes made by MyGTAP are likely due to data entry errors and you may wish to revisit your data tables to ascertain the source of the inconsistency which MyGTAP has had to reconcile. If the data in these headers is entered accurately, and consistently, there is no reason they should be rescaled.

Differences in GTAP Value Flows

Up to this point, all the checks were between the weights you suggested and the weights applied by MyGTAP. As a final check, we want to make sure all the value flows in the new GTAP database equal the old, unsplit, database. Header array file ..\work\alldiffs.har includes fourteen headers corresponding to the differences in key value flows, from the original data, to the new database. The values in each of these headers should be zero, or contain very small values¹⁶.

Homogeneity Check

After any modification of the GTAP database, the user is encouraged to run a simulation with a numeraire shock to test for homogeneity. All changes in quantity should be zero, or very close to zero. This final check cannot be taken for granted. MyGTAP is a complex set of programs and it is impossible for the developers to predict every possible set of inputs a user might supply, correct or not. Running this check is your insurance all values have been modified to maintain the original balance in the GTAP database.

¹⁶ Viewhar can be setup to see the total of all values in a particular header. This option can be helpful to look at the values in all fourteen headers at once, without opening each header. See File->Options in Viewhar.

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