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EQuIP

Enhancing the Quality of Industrial Policies

Crash Course

Selected Indicators for a Quick Assessment of Inclusive and Sustainable Industrial Development

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EQuIP Crash Course:

Selected Indicators for a Quick Assessment of Inclusive and Sustainable Industrial Development

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Introduction

The full EQuIP toolbox is quite voluminous and provides a long list of diagnostic and analytical indicators. Going through all EQuIP tools and all the indicators described therein can be pretty time-consuming. This EQuIP crash course document is meant for analysts and other users who would like to undertake a quick assessment in order to obtain a snapshot of their country's manufacturing sector. It presents a selection of indicators taken from different EQuIP tools that allow the analyst to get a broad understanding of his or her country's industrial performance relative to other countries.

This EQuIP crash course document also draws greatly from the EQuIP conceptual framework document that importantly informed our selection of some simple, initial indicators to map a country's current performance in terms of inclusive and sustainable industrial development. These indicators can be used to track and compare progress along the lines of the desired structural transformations outlined in the EQuIP conceptual framework document. The diagnostics based on these indicators can be an important starting point for policymakers when determining strategic priorities and monitoring industrial progress over time. Obviously, each of the dimensions explored here can be examined in much more depth using the EQuIP toolbox. Currently, the EQuIP toolbox contains methodologies (e.g. tools) to analyse:

1) Industrial capacity and growth: domestic and export dimensions
2) Manufacturing sub-sector competitive performance
3) Industrial and export Upgrading
4) Diversification: domestic and export dimensions
5) Industrial employment and poverty alleviation
6) Greening industry: Energy efficiency module
7) Global value chains
8) Industrial organisation and firm profiling at sub-sector level
9) Industrial capabilities

This EQuIP crash course document will therefore act as a starting point for analysts as it is meant to examine the broader development objectives to which industrialisation can contribute. Once policymakers have determined the overarching strategic priorities and objectives for their country, the individual EQuIP tools can be used to assess the intricacies of their industrial sector and help to identify potential points of intervention. Although the indicators selected for this EQuIP crash course document have been structured to reflect some of the core conceptual points outlined in the conceptual framework for the EQuIP toolbox, they will be motivated in their own right so that analysts understand why these indicators were chosen and how they relate to processes of growth, structural transformation, poverty alleviation and sustainable development.

In the following, which constitutes Part I of this EQuIP crash course document, eleven selected indicators will be presented:

1) Poverty rate
2) Economic structural change
3) Employment structural change
4) Growth rates of manufacturing value added (MVA) and manufacturing employment (ML)
5) Employment elasticity

6) Labour productivity

7) Average wages in manufacturing

8) Diversification of manufacturing production

9) Export capacity

10) Resource transformation

11) Energy efficiency of the manufacturing sector

Part I also provides a motivation and rationale for the choice of each indicator as well as a brief definition and the formula for its computation. Part II then shows how to obtain and download relevant data and how to process these data in order to allow for the calculation of the selected indicators for inclusive and sustainable industrial development discussed in Part I. This is done in a step-by-step manner using a lot of practical examples, screen shots from databases and graphical devices in order to facilitate as much as possible independent replication by users of this EQuIP crash course document.

Part I: Selected Indicators for a Quick Assessment of Inclusive and Sustainable Industrial Development

1) **Poverty Rate (Poverty Headcount Ratio at US$ 2 a day in Purchasing Power Parity)**

Motivation

The most pressing issue for lower-income countries is to create an economic system that can liberate their populations from situations of extreme poverty. However, lower-income countries are not a homogenous group and some countries have been more successful than others in terms of building an economic system that disseminates wealth and economic opportunities in a manner that effectively eradicates poverty. It is therefore paramount for governments of lower-income countries to consider the poverty rate when contemplating active intervention in their country's economic system, as the severity of poverty will crucially influence how much *pro-poor focus* the country's industrial strategy will need to have.

Definition

The poverty headcount ratio tells us the share of the population (e.g. the percentage of people) living on less than US$ 2 a day at 2005 international prices, i.e. in Purchasing Power Parity (PPP) terms.

Rationale

This indicator represents a measurement of absolute poverty. It has the advantage of being applicable across time and space so it makes cross-country comparisons easier. The disadvantages of this indicator are that the US$ 2-a-day cut-off value can be seen as somewhat arbitrary, and the fact that the amount of wealth required for a life without poverty is not the same in all places at all times.

2) **Economic Structural Change (MVA/GDP)**

Motivation

As outlined in the EQuIP conceptual framework document, development in its most fundamental sense relates to an evolutionary process whereby the country's economic structure becomes more diverse and productive so as to provide higher living standards for its population. The growth and expansion of the manufacturing sector plays a critical role in stimulating this structural transformation. Therefore, understanding the relative importance of manufacturing for a country's total economic output is important as it gives us an understanding of the level of structural change.

Definition

The Economic Structural Change indicator is defined as the share of manufacturing value added (MVA) in gross domestic product (GDP). In other words, the indicator measures how much of all the value generated in an economy is contributed by manufacturing. MVA is defined as the returns received from output minus the costs of all materials and services required for production. MVA is closely approximated by adding manufacturing wages + manufacturing profits + taxes from

manufacturing, which are the sources of income for workers, business owners and governments, respectively. MVA is therefore a good indicator to reflect *industrial development*. GDP is equal to the sum of the gross value added of all firms who produce for market transactions in a country.

Rationale

This indicator gives us an understanding of the relative importance of the manufacturing sector within the economy. Especially for lower-income countries it is often desirable to move the economic structure away from agriculture and raw material extraction into activities with higher value addition (e.g. manufacturing); a higher MVA/GDP, thus, represents a higher level of structural transformation.

3) Employment Structural Change (ML/L)

Motivation

In addition to understanding how efficiently the population is generating MVA, we will also want to look at the flipside of this coin and understand how much employment is provided by the manufacturing sector. Therefore we will be interested in understanding structural change from an employment perspective by evaluating the shares of manufacturing employment (ML) in total employment (L) across countries. This will give us an idea of how much employment there is in the manufacturing sector relative to the agriculture and services sectors.

Definition

According the International Labour Organization (ILO), the "employed" comprise all persons of working age who, during a specified brief period, were in the following categories: a) paid employment or b) self-employment. Employment is disaggregated by economic activity (e.g. manufacturing, agriculture, etc.) according to the latest version of the International Standard Industrial Classification of All Economic Activities (ISIC) available for that year.

We can calculate the Employment Structural Change indicator by dividing manufacturing employment (ML) by total employment (L) and then compare it with the shares of other economic activities in the country.

Rationale

By examining the relative employment shares of different economic activities in a country we are able to get a good understanding of how many people are working in manufacturing relative to agriculture as well as of labour flows from one sector to another. This indicator, therefore, gives us a quick snapshot of the status of "structural change" from an employment perspective: the higher the ML/L indicator, higher the level of structural transformation in that country.

4) Growth Rates of Manufacturing Value Added (MVA) and Manufacturing Employment (ML)

Motivation

From an analysis using the indicators presented so far, we are able to get a good understanding of the relative importance of manufacturing for a country's economic and employment structure. Such an analysis, therefore, gives us a useful snapshot of the relative status of structural change in an economy. However, structural change is fundamentally a dynamic process; just because Country A is more advanced in terms of its industrial development at one point in time does not mean that

Country B cannot *industrialise* at a faster pace – which could lead to convergence or even Country B surpassing Country A in terms of its economic and employment structure. We will, hence, be interested in understanding the growth rates of MVA and manufacturing employment (ML).

Definition

There are many ways to calculate a growth rate. If, for example, we are interested in knowing the total growth rate of a variable for a period of time we can use the following simple equation:

$$\text{Total Growth Rate} = \frac{End\ Value - Beginning\ Value}{Beginning\ Value}$$

However, across the EQuIP toolbox we predominantly use the Compound Annual Growth Rate (CAGR). The CAGR is the year-over-year growth rate of, in this case, MVA and ML. The benefit of using the CAGR is that it helps to remove the volatility in the underlying values of the variable of interest in order to tell us the uniform rate at which MVA and/or ML grew (or declined) per year.

The formula for calculating the CAGR is:

$$CAGR = \left(\frac{End\ Value}{Beginning\ Value}\right)^{\left(\frac{1}{no.\ of\ years}\right)} - 1$$

Rationale

By calculating the CAGR for MVA and ML, we get an understanding of how much these variables grew each year over a certain period of time. This number can be helpful if we want to make some quick estimates of potential future expansion in manufacturing value added and employment. However, since the past is not always and not necessarily a good predictor of the future, we need to be cautious when looking at these growth rates with the objective to predict future trends. Moreover, it is important to keep in mind that the CAGR represents a "smoothed" annual average and therefore is an approximation. That is, it does not directly reflect the actual growth from one year to another.

5) **Employment Elasticity (ΔML/ΔMVA)**

Motivation

For developing countries, labour-intensive industrialisation can be a very important mechanism for poverty alleviation as it means that productive employment opportunities are being generated which can absorb the underemployed and working poor. Particularly at early stages of development it can be desirable to see a high level of manufacturing employment being generated as this will help to stimulate a movement of labour out of rural agricultural employment and into more productive activities that can contribute to rising standards of living. One of way of evaluating how much employment is being generated from industrialisation is to examine the *Employment Elasticity of MVA*.

Definition

The employment elasticity of MVA is defined as the percentage change in the number of persons employed in manufacturing resulting from a one-percentage change in MVA. In other words, it will tell us how much new employment was generated (ΔML) as the manufacturing sector grew (ΔMVA). We can calculate the employment elasticity of MVA by simply dividing the CAGR of ML by the CAGR of MVA.

A resulting employment elasticity of 1 would mean that a 1% increase in MVA is associated with a

1% increase in manufacturing employment. An elasticity of .5 implies that a 1% increase in MVA is associated with a .5% increase in ML, and so on.

This number can be helpful if we want to make some quick predictions in terms of the employment effects of continued or targeted industrial expansion. However, like with the MVA and ML growth rates that we calculated above, we must be very careful when making future predictions on the basis of elasticities because all they can do is tell us about the *historical* (i.e. *past*) relationship between manufacturing employment and value added growth; they cannot account for future changes (e.g. the introduction of labour-saving technologies, skills mismatches, etc.).

Rationale

By calculating the employment elasticity of MVA for select countries we are able to get a sense of how labour-intensive the industrialisation process has been in these countries. This is because if a country has an industrial structure that is largely dominated by labour-intensive sectors, agro-processing for example, we would expect to see this reflected in their overall employment elasticity. Calculating the employment elasticity will also give us an indication of whether a country's industrial structure is generating "jobless growth", which would mean that we are seeing MVA growth without a corresponding increase in employment. From a social perspective this can be a warning sign for lower-income countries as this will mean that the direct employment benefits of industrialisation are minimised.

We can use Conceptual Device 1 presented below to interpret the employment elasticity's so as to classify each country and get an initial understanding of productivity dynamics occurring.

Conceptual Device 1: Interpreting the employment elasticity of MVA

	Manufacturing Value Added (MVA) Growth	
Employment Elasticity	**Positive MVA Growth**	**Negative MVA Growth**
$\varepsilon < 0$	(-) Employment growth (+) Productivity growth **Jobless Growth**	(+) Employment growth (-) Productivity growth **Unproductive Employment Growth**
$0 \leq \varepsilon \leq .5$	(+) Employment growth (+) Productivity growth **Productivity-Led Growth**	(-) Employment growth (-) Productivity growth **Declining Sector**
$.5 \leq \varepsilon \leq 1$	(+) Employment growth (+) Productivity growth **Employment-Led Growth**	(-) Employment growth (-) Productivity growth **Declining Sectors**
$\varepsilon > 1$	(+) Employment growth (-) Productivity growth **Unproductive Employment Growth**	(-) Employment growth (+) Productivity growth **Declining Sector**

Table adapted from Steve Kapsos (2005), "The Employment Intensity of Growth", ILO

6) **Labour Productivity (MVA/ML)**

Motivation

The EQuIP conceptual framework outlined why productivity dynamics are core to structural transformations and development for an economy. The benefits of manufacturing activities are largely based on the fact that they typically are characterised by higher productivity than those in other sectors of the economy, especially at the earlier stages of economic development. The average labour productivity of manufacturing can be a reflection of how "innovative" the production process is in different countries. A higher productivity will mean that a country is able to produce more manufactured goods (output) per worker, which should translate into lower prices for consumers and/or higher incomes for workers.

Definition

It is important to note here that the most commonly used indicator for productivity is labour productivity (e.g. as opposed to resource or capital productivity). In this context, labour productivity is defined as the number of US dollars of value addition generated by the average manufacturing employee. We can therefore measure productivity by dividing MVA by ML.

In addition to understanding the labour productivity in one country's manufacturing sector relative to that of other countries, we will also want to compute the growth rate to determine the relative pace with which productivity is increasing over time. We can do this by calculating the CAGR of labour productivity (i.e. Δ(MVA/ML)).

Rationale

From the definition above we can see that labour productivity reverses the two variables we used to calculate employment elasticity. This is an important consideration, as an industrial structure that is dominated by labour-intensive sectors will generally show lower labour productivity than one that specialises in high-technology activities, because the former by definition require more workers for production. We can therefore begin to see the important trade-offs which industrial policymakers have to deal with when determining which sectors to support as they will want to balance the desire for a highly productive manufacturing sector with one which is able to generate large amounts of productive employment opportunities for its citizens.

Countries with high levels of poverty and underemployment should ideally embark on an industrialisation trajectory characterized by both steadily growing productivity and high employment elasticity. This will mean that the industrial structure is continuously innovating while generating employment opportunities that offer higher wages for its population.

7) **Average wages (Manufacturing Wage Bill/ML):**

Motivation

One of the core benefits of enhanced productivity in the manufacturing sector is that it should translate into higher wages and salaries for employees, which then directly contribute to rising incomes in the economy (e.g. aggregate demand). However, as outlined in the EQuIP conceptual framework, the relationship between enhanced productivity and wages is not automatic and therefore it is important to critically examine this relationship to ensure rising productivity is translating into rising incomes for labour.

Definition

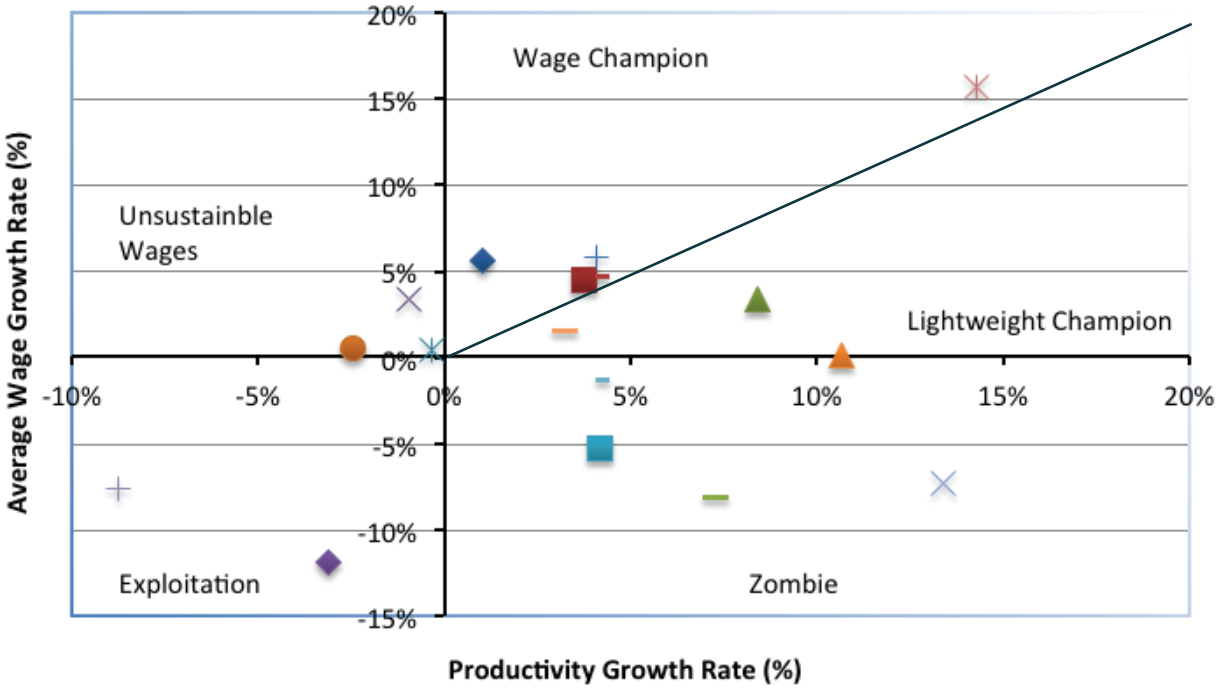
The manufacturing wage bill is defined as the total amount of money paid by manufacturing firms to their employees (in the form of wages and salaries). This then needs to be divided by the total number of manufacturing employees to determine the average manufacturing wage. In order to compare average wages with productivity trends we will then calculate the growth rate of average wages by using the CAGR equation outlined above.

It is important to note that the average manufacturing wage will mask wage inequalities within the manufacturing sector. As it includes both wages and salaries, we can imagine many situations where senior management is paid exponentially more than shop floor workers. In such situations, the average wage will appear to be much higher than what is really received by the majority of manufacturing workers.

Rationale

When we compute the average wage rate we can compare it across countries, and we should find that in countries with higher productivity labour receives higher (average) wages. However, we can check this relationship by comparing the productivity growth rate with the wage growth rate. To compare across a number of countries, we can use a simple scatter graph to determine how a specific country is performing in terms of its ability to transfer the benefits of enhanced productivity to workers; see Conceptual Device 2 for an example.

Conceptual Device 2: Growth rate of labour productivity vs. growth rate of average wages



In this graph we can think of the 45° line as the "fairness line" whereby there is a direct correlation between productivity gains and wage gains. If a country is located above the 45° line we can label it as a "wage champion" as there are very high returns to labour from productivity gains. If it falls below the 45° line but is still above zero, we could call it a "lightweight" wage champion which experiences more moderate wage increases alongside productivity gains. Countries that show up in the bottom right hand quadrant are seeing declining wages in the face of rising productivity, which is an indication of wage suppression, or "exploitation". In the bottom left hand quadrant, there both productivity and wage dynamics are negative so that we can classify these countries as "zombies" which means that the industrial sector in this countries is alive but deteriorating

both in terms of both labour productivity and average wages. Finally, the upper left hand quadrant indicates that countries are seeing wages increase despite falling productivity, which is likely not to be sustainable over longer periods of time.

8) **Diversification of manufacturing production (Mnf. HHI)**

Motivation

Diversification is a vital indicator of economic development. At the earliest stages of development, what is desirable is diversification of economic activities reflected in a movement out of agriculture and into more productive activities (e.g. manufacturing) which is what was discussed in the structural change analysis above (see Indicators 2 and 3 above). However, we will also be interested in understanding how diversified the industrial structure itself is or, in other words, whether or to what extent manufacturing activities are concentrated in a single or a few sub-sectors only. A more diversified manufacturing sector is likely to increase the density of linkages and spill overs across different manufacturing activities (or sub-sectors) as well as with other sectors in the economy (such as agriculture, mining or service). A more diversified manufacturing sector will also increase the stability and resiliency of the manufacturing sector against shocks since the experience of a shock, such as natural disasters, drops in commodity prices or shifts/decreases in demand, will not completely collapse the industrial sector if there are a variety of activities underway.

Definition

There are many ways to capture the degree of diversification but the method we will use here is the Hirschman-Herfindahl Index (HHI). The HHI is actually a commonly used method of calculating concentration, e.g. of market power. You can calculate the HHI your country's manufacturing sector (Mnf. HHI) by squaring the share of each manufacturing sub-sector in total MVA and then summing the resulting numbers. As an equation the HHI is shown as:

$$Mnf.HHI = s_1^2 + s_2^2 + \cdots + s_N^2 = \sum_{i}^{N} s_i^2$$

where N is the total number of manufacturing sub-sectors, s_1 is the share of sub-sector 1 in total MVA, s_2 is the share of sub-sector 1 in total MVA, and so on. Generally, the HHI can take values that range from close to zero to a maximum value of 1. If the manufacturing sector were dominated by a single activity, for example textiles, we would see an HHI of 1. If, on the other hand, there were a perfect distribution of manufacturing value added across all manufacturing sectors we would see a value that is closer to 0. The lower boundary is, in fact, determined by the number of variables we are analysing (in our case here the number of manufacturing sub-sectors) and is defined by 1/N, which means that the fewer variables you have, the higher your lower boundary will be.

Rationale

By calculating the Mnf. HHI for different countries' industrial structures, we can compare concentration rates. Additionally, by calculating the Mnf. HHI for two years (e.g. 2000 and 2010) we can learn about how a country's industrial structure is evolving over time and whether it has become more or less diversified over the period of analysis. This is, in fact, the only time we will examine dynamics at the sub-sector level here in this crash course document. From looking at the raw data on sub-sectoral value added we are already able to identify those activities that dominate the country's industrial structure. This can be an important starting point for applying some of the other tools in the EQuIP toolbox that provide methodologies to conduct more in-depth analyses at the sub-sector level.

9) **Export Capacity (Manufactured exports per capita = Mnf. exports / Population)**

Motivation

Manufactured exports (Mnf. exports) are an important source of foreign currency for countries and a good indication of international industrial competitiveness. If countries are able to compete in the international market, this indicates that the cost and/or quality of their manufacturing products are at the global standard. Exports are particularly important for small developing countries where the size of the domestic market is small and where manufacturers will quickly face demand constraints if they purely orient supply towards the domestic market. Exports therefore allow manufacturers to tap into and exploit economies of scale. Moreover, exports allow developing countries – especially small ones – to obtain the foreign exchange required to buy goods from abroad, which are needed to fulfil the material needs of their populations.

Definition

The measure we will use to analyse export performance is the value of all manufactured exports of a country over its population size. This indicator tells us how many US dollars an (hypothetical) average person in a country generates through exporting manufactured products. By placing the population size as the denominator, this indicator controls for country size so that larger countries will not be given an automatic bias in terms of their export capacity.

Rationale

By calculating the export capacity indicator, we are able to compare countries' ability to produce and export goods that are demanded on the international market. This indicator will therefore give us a quick idea of how well countries are able to integrate into global markets and compete with other international suppliers. It is crucial once we calculate this indicator to consider the important trade-offs between a more diversified industrial structure (measured above) and a more specialised one. A lot of investment is required in order to generate manufactured products that can compete in international markets. Investment in innovation and research and development (R&D) will be required to develop niche or high quality products and/or investment is required to achieve economies of scale that enable cost structures that are internationally competitive. For lower-income countries with limited resources, an export-oriented strategy will therefore often require the channelling of resources into specific activities, which ultimately might be reflected in a more concentrated industrial structure (e.g. a high HHI).

10) **Resource Transformation (MVA/DMC)**

Motivation

Manufacturing is defined as the transformation of raw materials into final goods. It is through this transformative process that innovation and wealth are generated in an economy. Manufacturing and its benefits are therefore always dependent upon and a result of the basic raw materials that are transformed through this process, placing the natural environment as a core asset and constraint to successful and sustainable structural transformations. We live in a world of finite resources and therefore we will want to understand how efficiently the resources being consumed in an economy are transformed into manufactured goods.

Definition

We can examine the efficiency of resource transformation by examining MVA over Domestic Material Consumption (DMC). Domestic Material Consumption is defined as the total amount of

materials directly used in an economy (domestic material inputs + imports – exports). Material inputs are defined as all solid, liquid and gaseous materials that enter the economy and are used for production and consumption processes. This indicator therefore includes all minerals, biomass (e.g. agriculture, wood, etc.) and fossil fuels. Conceptually, DMC can be understood as the physical equivalent to GDP.

By dividing MVA by DMC, we can analyse how many US dollars of manufacturing value added are generated from all of the raw materials consumed in an economy for a given year. In other words, this indicator quantifies how many US dollars of MVA are extracted from each unit of DMC; it therefore can be read as an efficiency measure.

A limitation of this indicator is that DMC accounts for all the resources being consumed in the entire economy and not just the manufacturing sector more narrowly. That is, DMC data do not reveal which share of total resource use actually fed into manufacturing processes. Therefore, if a country went through a drought, for example, this indicator might suggest a high level of resource transformation but only because of a drop in agricultural consumption.

Rationale

By calculating this indicator we can analyse the relative efficiency of countries to generate value added from the resources consumed. To some extent, we can think of it as an ecological structural change indicator as it gives us an understanding of the ability of countries to transform resources into new, final goods. From an ecological perspective, the process of extracting and transforming raw materials has inherent impacts on the environment (in terms of resource depletion, contamination and pollution) and the more efficiently societies are able to undertake manufacturing processes, the less likely they are to see hazardous social and environmental impacts occurring.

11) Energy Efficiency: MVA/Manufacturing Energy Consumption

Motivation

In the proceeding paragraphs, we outlined how one can examine the overall efficiency with which an economy is able to transform raw materials into manufactured goods. However, we will want to get more specific and understand how efficiently the manufacturing sector is using certain resources in its production processes. In many lower-income countries, energy is a scarce resource with prices being high and energy supply volatile. The manufacturing sector requires a large amount of energy and therefore its expansion can be constrained by a lack of access to energy or high-energy prices. Moreover, the more energy the industrial sector consumes, the more pressure it puts on access to energy for the rest of the population. By enhancing energy efficiency in manufacturing, the sector's competitiveness will be improved since it will be able to produce more goods per unit of energy input. Assessing the relative energy efficiency of countries, therefore, is not only an indicator of environmental but also economic performance.

Definition

Energy efficiency is defined as MVA over manufacturing energy consumption. This indicator tells you how many US dollars of manufacturing value added are generated per unit of energy (measured in kilo tonnes of oil equivalents (ktoe)) used in production.

One limitation of this indicator is that since it aggregates across manufacturing activities, we cannot account for the importance of different industrial sub-sectors for energy efficiency. Some manufacturing activities are highly energy-intensive (for example, the production of cement or pulp and paper requires a lot of energy). Therefore, this indicator would signal low overall energy efficiency if these energy-intensive activities dominate the manufacturing sector, even if the actual efficiency of other activities or in other sub-sectors is high. It is also important to note that enhanced

efficiency can have a “rebound effect” whereby efficiency improvements trigger increased economic activity and industrial expansion which, ultimately, can lead to an increase in the usage of energy in absolute terms.

Rationale

By calculating the energy efficiency of a manufacturing sector, we are able to assess if a country is employing more innovative techniques over time to minimise energy usage. This will mean that the country is increasing its resource productivity (or efficiency), which implies that it requires fewer units of energy to produce the same output over time. Meanwhile, comparing energy efficiency across countries can give us an understanding of relative performance of, say, Country A vis-à-vis Country B. If Country A’s energy efficiency is very low, it could aim to increase efficiency to the level of County B over time as part of its industrial strategy. An additional advantage of focusing on enhanced resource efficiency in manufacturing is that it provides an alternative route to reduce production costs without reducing the number of workers which can provide a “win-win” for countries who want to see rapidly rising productivity and an employment-intensive industrialisation trajectory.

Part II: Downloading, Processing and Calculating Indicators for Inclusive and Sustainable Industrial Development

The EQuIP toolbox puts a premium on quantitative measures that draw on secondary data. There are a variety of data sources that can be used to calculate the 11 indicators outlined above and an infinite number of ways to interpret the results. The following international databases have been chosen because they allow for cross-country comparisons. Within this EQuIP crash course document we do not spend a lot of time interpreting the results of the diagnostic exercises undertaken because they are specific to the examples used here and we do not want to confine the thinking of potential users of the EQuIP methodologies, as their unique understanding of their country context will necessarily enrich and strengthen their findings and interpretations.

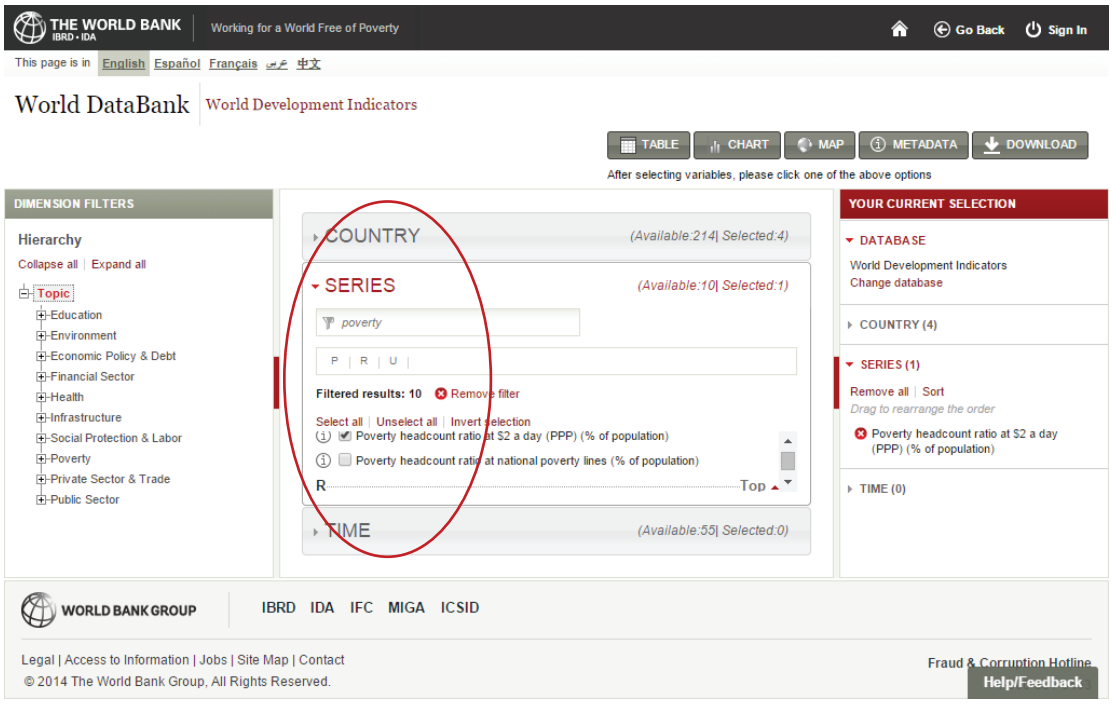
1) **Indicator: Poverty Rate (Poverty Headcount Ratio at US$ 2 a day (PPP))**

a. ***Data Selection***

In order to get the Poverty Rate for your country and comparator countries you can use the World Bank's World DataBank.

Go to: http://databank.worldbank.org/data/views/variableSelection/selectvariables.aspx?source=world-development-indicators for the World Development Indicators (WDI)

This is what your screen should look like:



1) Choose your **COUNTRY**/comparator countries. You will see a drop-down menu where you can choose the countries you would like to get data for.

Note: in this case we chose Ethiopia as our case study and Egypt, Malawi and Kenya as comparator countries.

2) Choose your **SERIES** (which means the topic or variable you want to examine for your country/ countries).

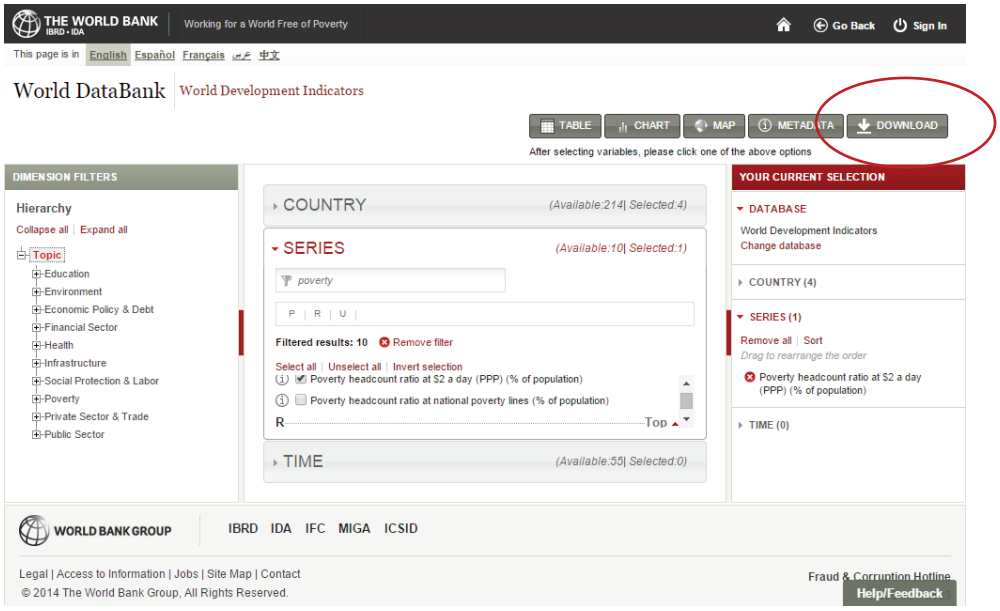
You can quickly search for the poverty rate by typing "poverty" into the search bar under SERIES.

Click on the box next to **Poverty Headcount Ratio at US$ 2 a day (PPP) (% of population)**

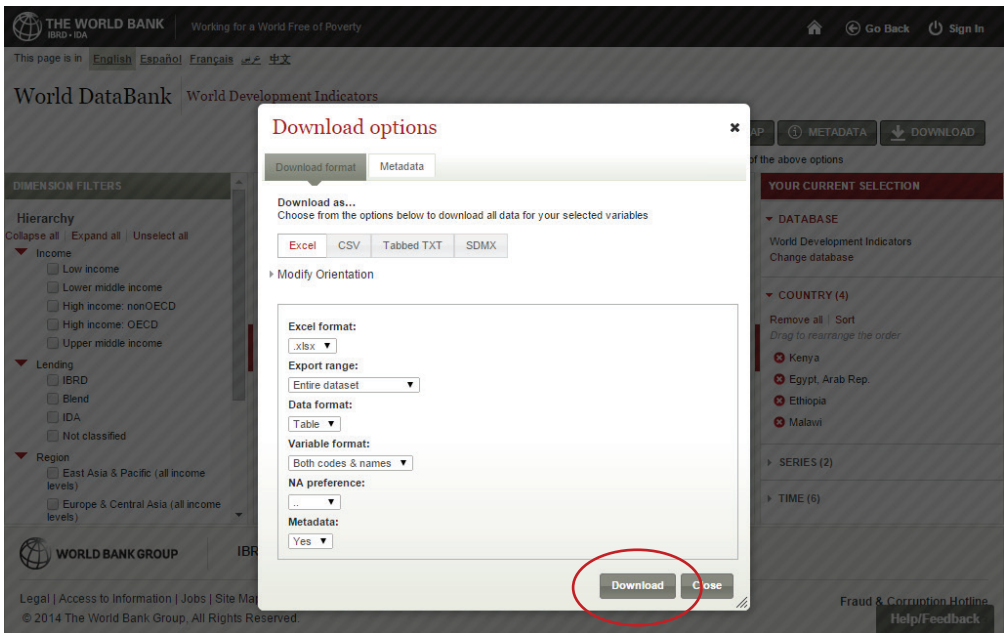
3) Choose your **TIME** (which means the years that you want to examine).

Note: In this case we chose 2000 and 2013 because we are interested in understanding how the poverty rate has changed over this period, but since data will not always be available for every county in every year we suggest downloading data for a variety of recent years to ensure a point of comparison across counties (which is why we also downloaded data for 2008, 2009, 2010, 2011, 2012 and 2013).

4) In the upper right hand corner you will see a **DOWNLOAD** button: press it.



A new box will pop up called **Download options**. The screen will look something like this:



Download Format: Optional selections

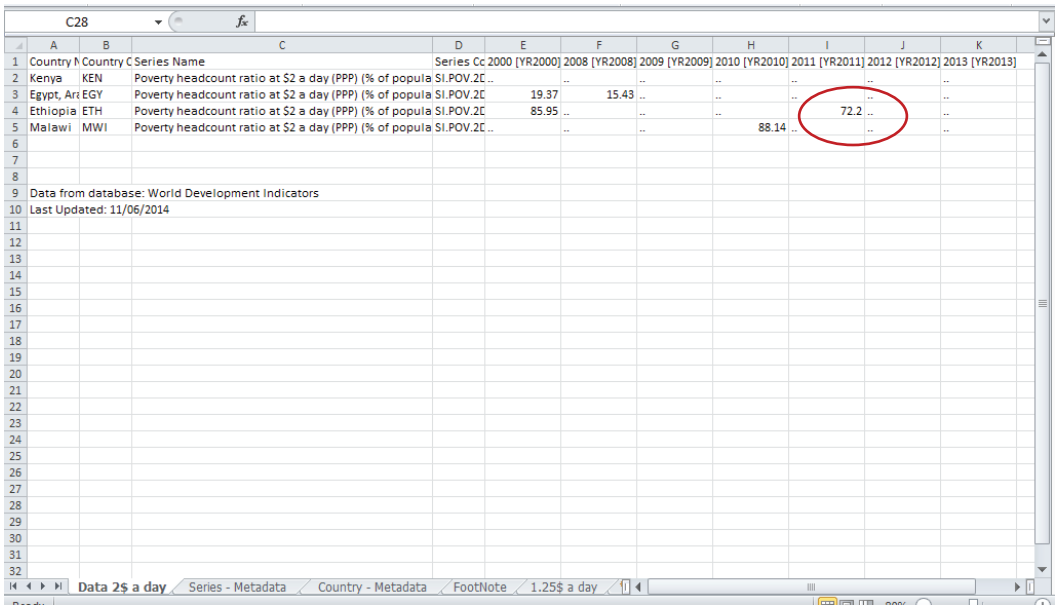
If you have a version of Excel that is older than 2007, click on the box below Excel Format and choose .xls instead of default option .xlsx.

If you need to write up a report from this analysis you may want to click **"Yes"** for the **Metadata** as it will give you precise definitions, country names, data sources and more!

5) Then click on **Download** at the bottom of the screen and you're ready to go!

b. ***Data Analysis***

Once you have downloaded the data, it will open in an Excel spreadsheet, which will look something like this:



	A	B	C	D	E	F	G	H	I	J	K
1	Country N	Country C	Series Name	Series Cc	2000 [YR2000]	2008 [YR2008]	2009 [YR2009]	2010 [YR2010]	2011 [YR2011]	2012 [YR2012]	2013 [YR2013]
2	Kenya	KEN	Poverty headcount ratio at $2 a day (PPP) (% of popula	SI.POV.2D	..	..	..	..	..	..	..
3	Egypt, Ara	EGY	Poverty headcount ratio at $2 a day (PPP) (% of popula	SI.POV.2D	19.37	15.43	..	..	..	..	..
4	Ethiopia	ETH	Poverty headcount ratio at $2 a day (PPP) (% of popula	SI.POV.2D	85.95	..	..	..	72.2	..	..
5	Malawi	MWI	Poverty headcount ratio at $2 a day (PPP) (% of popula	SI.POV.2D	..	..	..	88.14	..	..	..
9	Data from database: World Development Indicators										
10	Last Updated: 11/06/2014										

We can immediately see that data is missing for a variety of countries and years. This is a challenge you will come up against frequently in your data analysis work. Although it will be frustrating it is certainly not an insurmountable obstacle!

c. ***Data Interpretation/Illustration:***

From this data sheet we can see that in Ethiopia 72% of the population were living on less than US$ 2 a day in 2011 (and that it declined from 86% in 2000) which means that the majority of the population is still living in poverty and that a pro-poor industrialisation strategy will be needed in this context.

We can illustrate poverty rates in the form of a bar chart or a line graph (so as to look at trends over time and across countries) but since the data is so sparse in this case we will simply note that 72% of the Ethiopian population was in poverty in 2011.

2) **Indicator: Economic Structural Change (MVA/GDP)**

a. ***Data Selection***

In order to calculate the Economic Structural Change Indicator we can once again use the WDI Databank to get both the MVA and GDP variables.

Once again go to the WDI database:

1) Choose **COUNTRY** (s)

2) Choose **SERIES**

- **Manufacturing, value added (constant 2005, US$)**
- **GDP (constant 2005, US$)**

3) Choose **TIME**

4) Download Datab. ***Data Analysis***

Once you have downloaded your data you will end up with an Excel spreadsheet that looks something like this:

F13

	A	B	C	D	E	F	G	H	I	J	K
1	Country N	Country C	Series Name	Series Coc	2000 [YR2000]	2008 [YR2008]	2009 [YR2009]	2010 [YR2010]	2011 [YR2011]	2012 [YR2012]	2013 [YR2013]
2	Egypt, Ara	EGY	Manufacturing, value added (constant	NV.IND.M/	12135545583	17613785959	18344725219	19321910988	19275100341	19466771210	19877033653
3	Egypt, Ara	EGY	GDP (constant 2005 US$)	NY.GDP.M	75403498185	1.09959E+11	1.15112E+11	1.21036E+11	1.23169E+11	1.25895E+11	1.28536E+11
4	Ethiopia	ETH	Manufacturing, value added (constant	NV.IND.M/	463099013.9	795668493.2	864294772.1	943876365.5	1031075376	1152796152	..
5	Ethiopia	ETH	GDP (constant 2005 US$)	NY.GDP.M	8911851185	16661124577	18127717314	20402844450	22683533174	24662742422	27218401246
6	Malawi	MWI	Manufacturing, value added (constant	NV.IND.M/	305578570.2	347391541.9	363948887.4	371811472.3	371811472.3	348015538.1	369592501.4
7	Malawi	MWI	GDP (constant 2005 US$)	NY.GDP.M	2505954305	3335412862	3636795274	3874400290	4042839656	4119079507	4323776331
8	Kenya	KEN	Manufacturing, value added (constant	NV.IND.M/	1697586292	2308570608	2338756367	2444602753	2525245994	2606230510	..
9	Kenya	KEN	GDP (constant 2005 US$)	NY.GDP.M	15672664146	21642980382	22234977835	23525253226	24565223323	25683568303	26887431998
10											
11											
12											
13	Data from database: World Development Indicators										
14	Last Updated: 11/06/2014										

Data | Series - Metadata | Country - Metadata

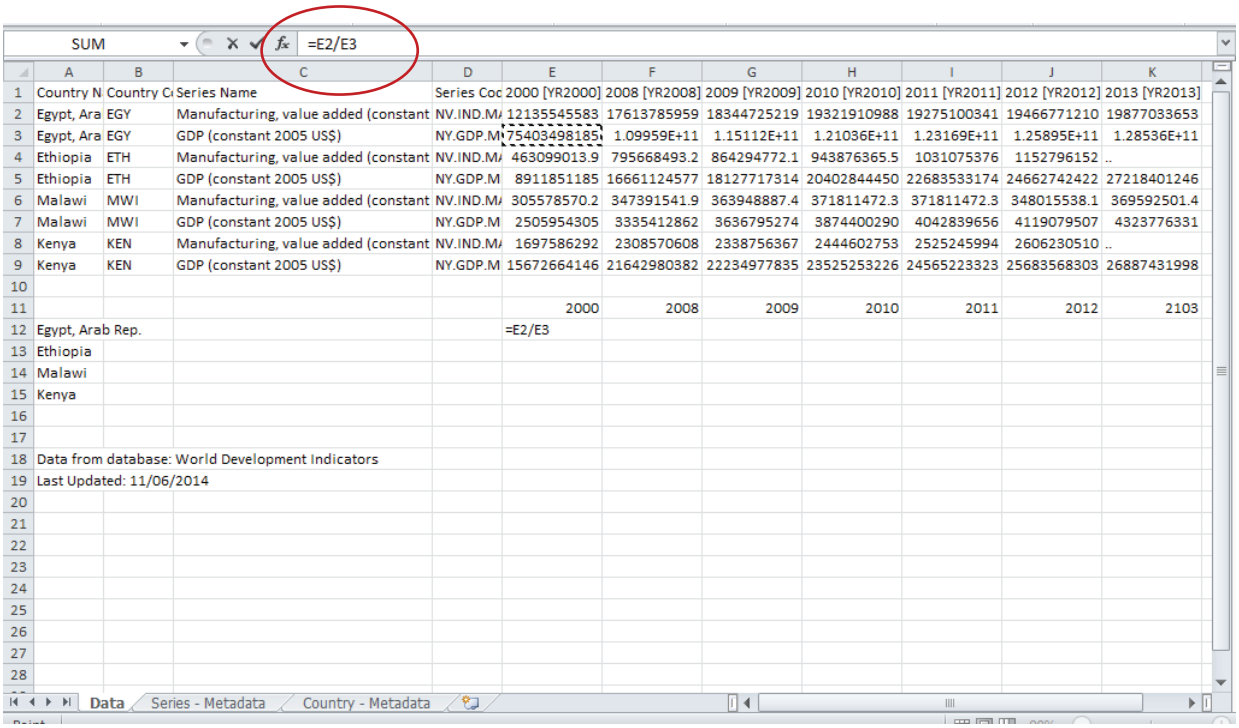
1) In the worksheet the data on MVA and GDP are reported in two different rows, respectively, for each country and for the years selected. In order to calculate the Economic Structural Change indicator we need to divide MVA by GDP.

One quick way to do this within the same Excel worksheet is to establish a new table with the country names reported in the rows and the years reported in the columns (see below screen shot for an example). To calculate the Economic Structural Change indicator in this Excel worksheet by dividing MVA by GDP, just follow these steps:

- Click on the cell where you want to report the Economic Structural Change indicator for a given country for the first year of the time period of interest. In below example, this is cell E12 which will give the value of the Economic Structural Change indicator for Egypt in the year 2000;
- As a next step, type an equal sign (i.e. "**=**") in the formula bar;

- Then click on the cell that contains the selected country's MVA value for a given year (in our case it's Egypt's MVA in the year 2000, which is reported in cell E2);
- Type in a division sign (i.e. "/");
- Then select the cell reporting the country's GDP value for that year (i.e. Egypt's GDP in the year 2000, reported in cell E3) which will complete the formula for calculating the Economic Structural Change indicator for Egypt for the year 2000 (i.e. **=E2/E3**),
- Finally press **ENTER**.

Shortcut: To determine the share for all years, simply click on the cell reporting the figure for the first year (in the example below this would be cell E12) and drag across (in our case below drag to the right until you reach cell K12)! With this trick, the formula for calculating MVA over GDP will be replicate.



	A	B	C	D	E	F	G	H	I	J	K
1	Country N	Country C	Series Name	Series Coc	2000 [YR2000]	2008 [YR2008]	2009 [YR2009]	2010 [YR2010]	2011 [YR2011]	2012 [YR2012]	2013 [YR2013]
2	Egypt, Ara	EGY	Manufacturing, value added (constant	NV.IND.M/	12135545583	17613785959	18344725219	19321910988	19275100341	19466771210	19877033653
3	Egypt, Ara	EGY	GDP (constant 2005 US$)	NY.GDP.M	75403498185	1.09959E+11	1.15112E+11	1.21036E+11	1.23169E+11	1.25895E+11	1.28536E+11
4	Ethiopia	ETH	Manufacturing, value added (constant	NV.IND.M/	463099013.9	795668493.2	864294772.1	943876365.5	1031075376	1152796152	..
5	Ethiopia	ETH	GDP (constant 2005 US$)	NY.GDP.M	8911851185	16661124577	18127717314	20402844450	22683533174	24662742422	27218401246
6	Malawi	MWI	Manufacturing, value added (constant	NV.IND.M/	305578570.2	347391541.9	363948887.4	371811472.3	371811472.3	348015538.1	369592501.4
7	Malawi	MWI	GDP (constant 2005 US$)	NY.GDP.M	2505954305	3335412862	3636795274	3874400290	4042839656	4119079507	4323776331
8	Kenya	KEN	Manufacturing, value added (constant	NV.IND.M/	1697586292	2308570608	2338756367	2444602753	2525245994	2606230510	..
9	Kenya	KEN	GDP (constant 2005 US$)	NY.GDP.M	15672664146	21642980382	22234977835	23525253226	24565223323	25683568303	26887431998
10											
11					2000	2008	2009	2010	2011	2012	2103
12	Egypt, Arab Rep.				=E2/E3						
13	Ethiopia										
14	Malawi										
15	Kenya										
16											
17											
18	Data from database: World Development Indicators										
19	Last Updated: 11/06/2014										

2) Repeat the same procedure for each additional country to finish up the table and to get the MVA/GDP of each country.

3) To make the table more reader-friendly we can highlight all the values and press the %-button (which is available in the HOME menu of Excel); we now know the percentage share of MVA in total GDP.

Your resulting table will look something like this:

E12 =E2/E3

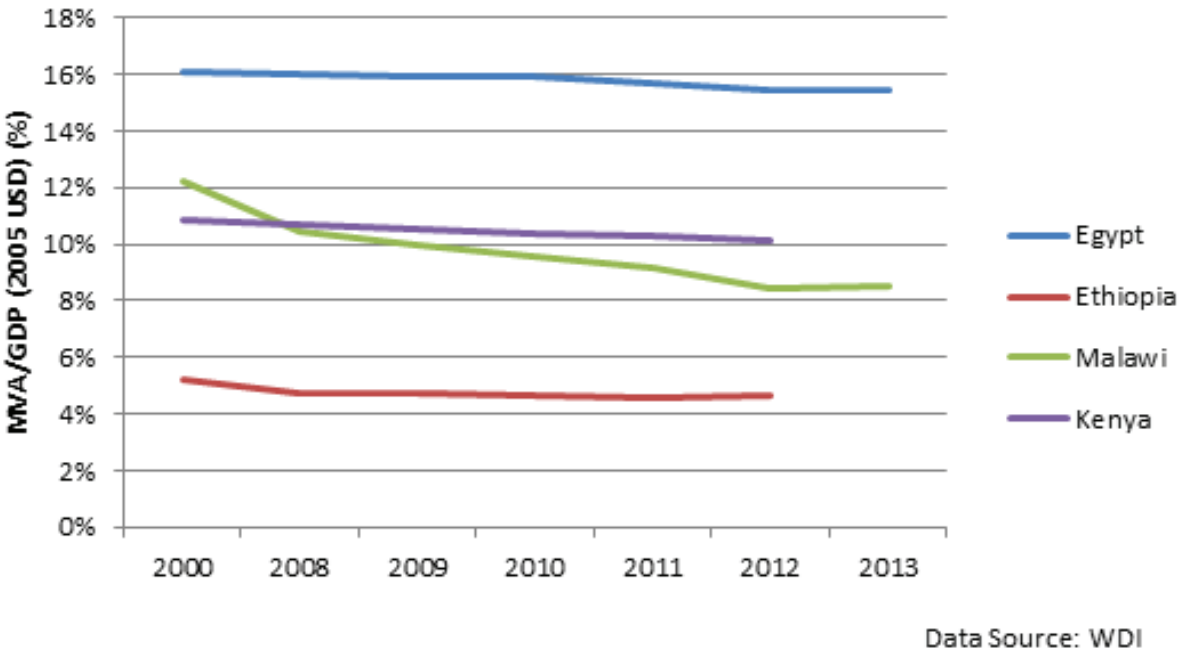
	A	B	C	D	E	F	G	H	I	J	K
1	Country N	Country C	Series Name	Series Coc	2000 [YR2000]	2008 [YR2008]	2009 [YR2009]	2010 [YR2010]	2011 [YR2011]	2012 [YR2012]	2013 [YR2013]
2	Egypt, Ara	EGY	Manufacturing, value added (constant	NV.IND.M	12135545583	17613785959	18344725219	19321910988	19275100341	19466771210	19877033653
3	Egypt, Ara	EGY	GDP (constant 2005 US$)	NY.GDP.M	75403498185	1.09959E+11	1.15112E+11	1.21036E+11	1.23169E+11	1.25895E+11	1.28536E+11
4	Ethiopia	ETH	Manufacturing, value added (constant	NV.IND.M	463099013.9	795668493.2	864294772.1	943876365.5	1031075376	1152796152	..
5	Ethiopia	ETH	GDP (constant 2005 US$)	NY.GDP.M	8911851185	16661124577	18127717314	20402844450	22683533174	24662742422	27218401246
6	Malawi	MWI	Manufacturing, value added (constant	NV.IND.M	305578570.2	347391541.9	363948887.4	371811472.3	371811472.3	348015538.1	369592501.4
7	Malawi	MWI	GDP (constant 2005 US$)	NY.GDP.M	2505954305	3335412862	3636795274	3874400290	4042839656	4119079507	4323776331
8	Kenya	KEN	Manufacturing, value added (constant	NV.IND.M	1697586292	2308570608	2338756367	2444602753	2525245994	2606230510	..
9	Kenya	KEN	GDP (constant 2005 US$)	NY.GDP.M	15672664146	21642980382	22234977835	23525253226	24565223323	25683568303	26887431998
10											
11					2000	2008	2009	2010	2011	2012	2103
12	Egypt, Arab Rep.				16%	16%	16%	16%	16%	15%	15%
13	Ethiopia				5%	5%	5%	5%	5%	5%	
14	Malawi				12%	10%	10%	10%	9%	8%	9%
15	Kenya				11%	11%	11%	10%	10%	10%	
16											
17											
18	Data from database: World Development Indicators										
19	Last Updated: 11/06/2014										

Data | Series - Metadata | Country - Metadata

c. ***Data Interpretation/ Illustration***

We can easily transform our calculations into a line graph which allows us to see the changes in MVA/GDP over time or, in other words, the extent to which these countries are undergoing a structural change process towards manufacturing (see Figure 1).

Figure 1: Economic structural change in selected countries, 2000-2013



From this graph we can see that all countries in our sample are deindustrialising as the share of MVA in GDP has been decreasing between 2000 and 2013. However, if we look at the raw data (see, for example, the screen shot above) we can see that in all cases MVA has actually been

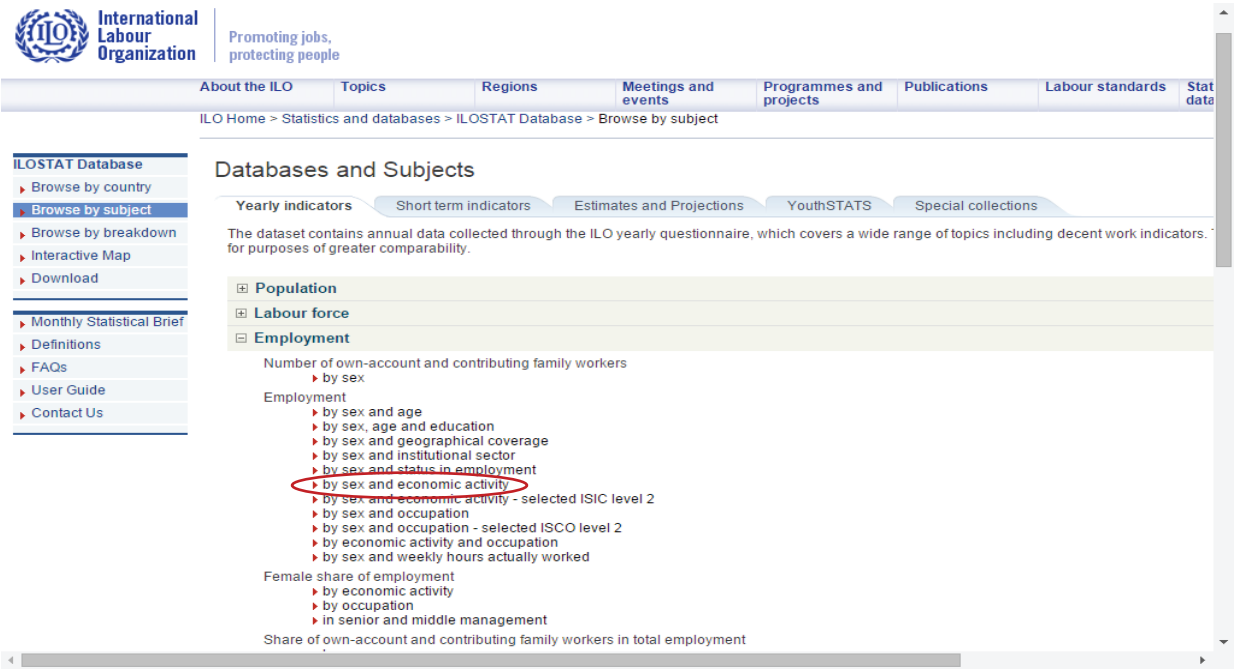
increasing over time, but just not as fast as GDP (which means that growth is being driven by other sectors). Therefore, none of these countries is undergoing the most desirable structural change path but at least they have not experienced absolute declines in MVA over time, which would have been worse. Ethiopia is performing particularly poorly compared with other countries as its share of MVA in GDP is very low (5%) which indicates a need for industrial policy to stimulate the manufacturing sector's growth and expansion.

3) **Indicator: Employment Structural Change (ML/L)**

a. ***Data Selection***

In order to calculate the Employment Structural Change indicator, which, as you will recall, is defined as the share of manufacturing employment (ML) in total employment (L), we will want to use the International Labour Organization's statistical database (ILOSTAT) to obtain and download the necessary data.

Go to the ILO Database (ILOSTAT) at www.ilo.org/ilostat. The screen will look like this:

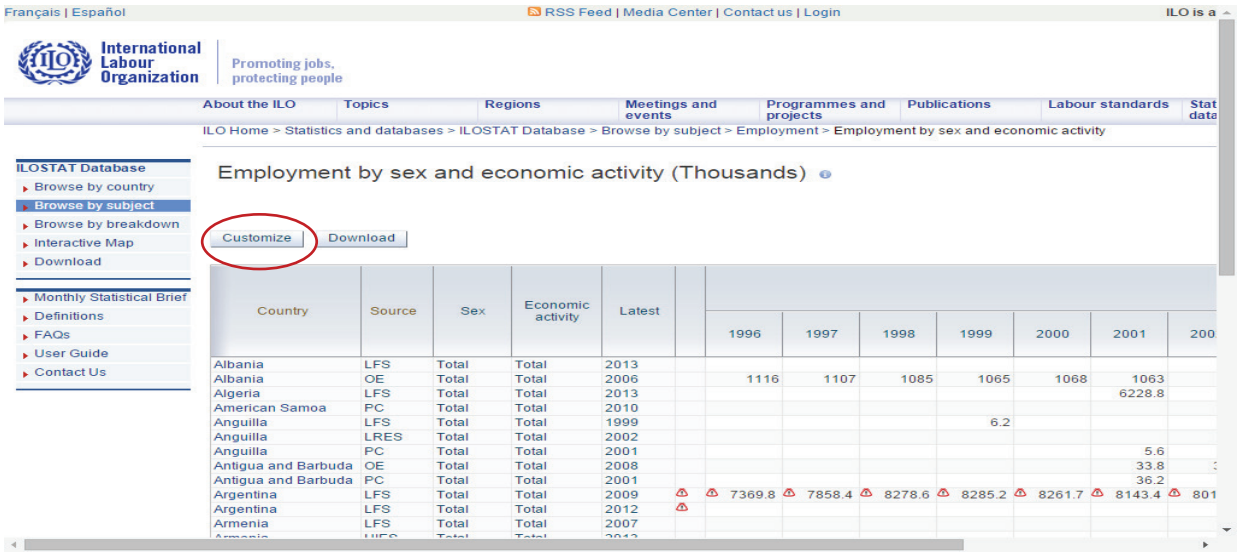


1) In the menu on the left-hand side, you will see the item **Browse by Subject**; click it.

2) In the centre of the screen you will then see a variety of topics, under the **Yearly Indicators** tab click on **Employment**.

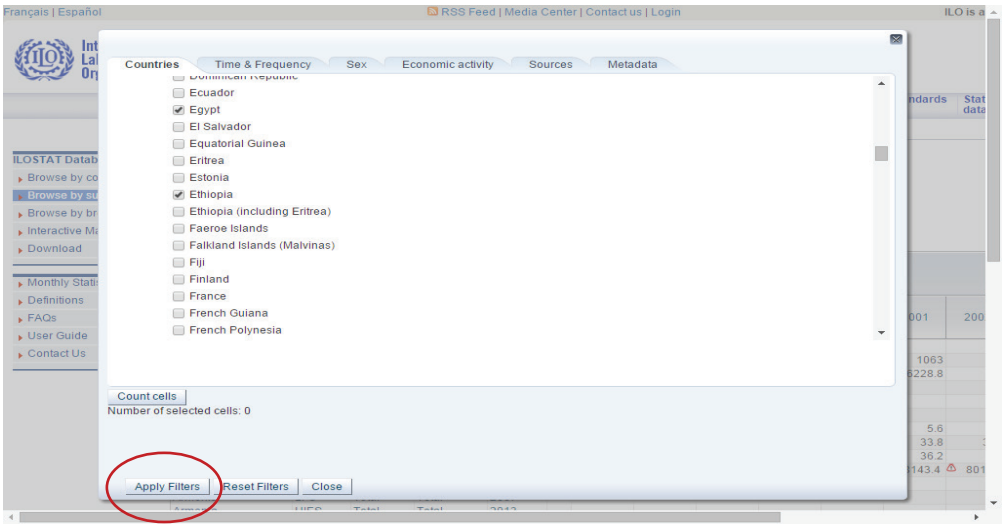
3) From the drop-down menu click on **"by sex and economic activity"**

A new screen will not pop up, which should look something like this:



4) Click on the **Customise** button

A new screen will pop up which will look like this:



5) Choose your **Countries** (*shortcut: click on "Countries A-Z" twice to clear country selections so you can choose your countries of interest*).

6) Choose your **Time & Frequency** (the years that you want to examine)

Note: In this case we will choose all years from 2000 to 2013

7) Under **Economic Activity,** leave the default setting that will download data for all sectors (including manufacturing). *We want to select all activities because we are not only interested in understanding the share of manufacturing employment in total employment but also the employment flows across sectors (e.g. are people moving out of agricultural employment into manufacturing over time?) so we will want to examine the employment shares of agriculture and services as well.*

8) Press, **Apply Filters** and then **Download** (next to the customise button) to get your datasheet!

b. ***Data Analysis***

Once you have downloaded the data, you will get a spreadsheet that looks something like this:

A7 | Country

Downloaded on TUE, 18 NOV 2014 16:12 +0100 from ILOSTAT

Dataset: Annual indicators
Indicator: Employment by sex and economic activity_Aggregate categories of economic activity_ILOSTAT
Description: The employed comprise all persons of working age who, during a specified brief period, were in the following categories: a) paid employment (whether at work or with a job but not at work); or b) self-empl

Country	Sex	Economic activity	Source	Series footnotes	2000	2001	2002	2003
Egypt	Total (Sex)	Total (Aggregate activities)	LFS - Labour force sample survey		17203.3	17556.7	17856.2	18118.6
Egypt	Total (Sex)	Agriculture (Aggregate activities)	LFS - Labour force sample survey		5097.2	5010.6	4913.8	5411.3
Egypt	Total (Sex)	Manufacturing (Aggregate activities)	LFS - Labour force sample survey		2048.2	2115	2070.7	1976.9
Egypt	Total (Sex)	Construction (Aggregate activities)	LFS - Labour force sample survey		1358.6	1348.4	1315.1	134
Egypt	Total (Sex)	Mining and quarrying; Electricity, gas a	LFS - Labour force sample survey		256.6	269.7	286.3	260.7
Egypt	Total (Sex)	Trade, Transportation, Accommodati	LFS - Labour force sample survey		3900.9	4129.8	4334.8	4144.8
Egypt	Total (Sex)	Public Administration, Community, Sc	LFS - Labour force sample survey		4539.7	4679.8	4934.1	4982.4
Egypt	Total (Sex)	Not classified (Aggregate activities)	LFS - Labour force sample survey		1.9	3.4	1.4	1.9
Ethiopia	Total (Sex)	Total (Aggregate activities)	LFS - National Labor Force Survey					
Ethiopia	Total (Sex)	Agriculture (Aggregate activities)	LFS - National Labor Force Survey					
Ethiopia	Total (Sex)	Manufacturing (Aggregate activities)	LFS - National Labor Force Survey					
Ethiopia	Total (Sex)	Construction (Aggregate activities)	LFS - National Labor Force Survey					
Ethiopia	Total (Sex)	Mining and quarrying; Electricity, gas a	LFS - National Labor Force Survey					
Ethiopia	Total (Sex)	Trade, Transportation, Accommodati	LFS - National Labor Force Survey					
Ethiopia	Total (Sex)	Public Administration, Community, Sc	LFS - National Labor Force Survey					
Ethiopia	Total (Sex)	Not classified (Aggregate activities)	LFS - National Labor Force Survey	[2]				
Ethiopia	Total (Sex)	Total (Aggregate activities)	LFS - Urban employment-unemploym	[1]				
Ethiopia	Total (Sex)	Agriculture (Aggregate activities)	LFS - Urban employment-unemploym	[1]				
Ethiopia	Total (Sex)	Manufacturing (Aggregate activities)	LFS - Urban employment-unemploym	[1]				
Ethiopia	Total (Sex)	Construction (Aggregate activities)	LFS - Urban employment-unemploym	[1]				
Ethiopia	Total (Sex)	Mining and quarrying; Electricity, gas a	LFS - Urban employment-unemploym	[1]				
Ethiopia	Total (Sex)	Trade, Transportation, Accommodati	LFS - Urban employment-unemploym	[1]				
Ethiopia	Total (Sex)	Public Administration, Community, Sc	LFS - Urban employment-unemploym	[1]				
Ethiopia	Total (Sex)	Not classified (Aggregate activities)	LFS - Urban employment-unemploym	[1]				

Legend:
[1] Geographical coverage : Urban areas only
[2] Break in series : Methodology revised

EMP_TEMP_SEX_ECO_NB | Table

As we can see, data is not available for Kenya or Malawi and only for select years for Ethiopia. In order to deal with this limitation, we decide to simply analyse 2005 and 2013 (as these are the years for which data is available for Ethiopia) and to compare Ethiopia with Egypt to get a better understanding of employment structural change in these countries.

1) We can then clean up our dataset (possibly in a new, separate Excel work sheet) to make it easier to read and analyse. Below is an example of what this "cleaned up" dataset could look like:

B16

Downloaded on TUE, 18 NOV 2014 16:12 +0100 from ILOSTAT

Dataset: Annual indicators
Indicator: Employment by sex and economic activity_Aggregate categories of economic activity_ILOSTAT
Description: The employed comprise all persons of working age who, during a specified brief period, were in the following categories: a) paid emp

Economic activity	Egypt - 2005	Egypt - 2013	Ethiopia - 2005	Ethiopia - 2013
Total (Aggregate activities)	19341.7	23973.6	31435.1	42403.9
Agriculture (Aggregate activities)	5974	6702.5	25208.2	30817.1
Manufacturing (Aggregate activities)	2229.7	2570.6	1529.4	1902.2
Construction (Aggregate activities)	1649.8	2727.9	445.6	824.8
Mining and quarrying; Electricity, gas and water supply (Aggregate a	274.3	481.7	115	407
Trade, Transportation, Accommodation and Food, and Business and	4400	5813.7	2642.9	3619.3
Public Administration, Community, Social and other Services and Acti	4781.1	5677.3	1483.7	4833.6
Not classified (Aggregate activities)	34.3	0	0	0

Source:
LFS - Labour force sample survey

EMP_TEMP_SEX_ECO_NB | Table

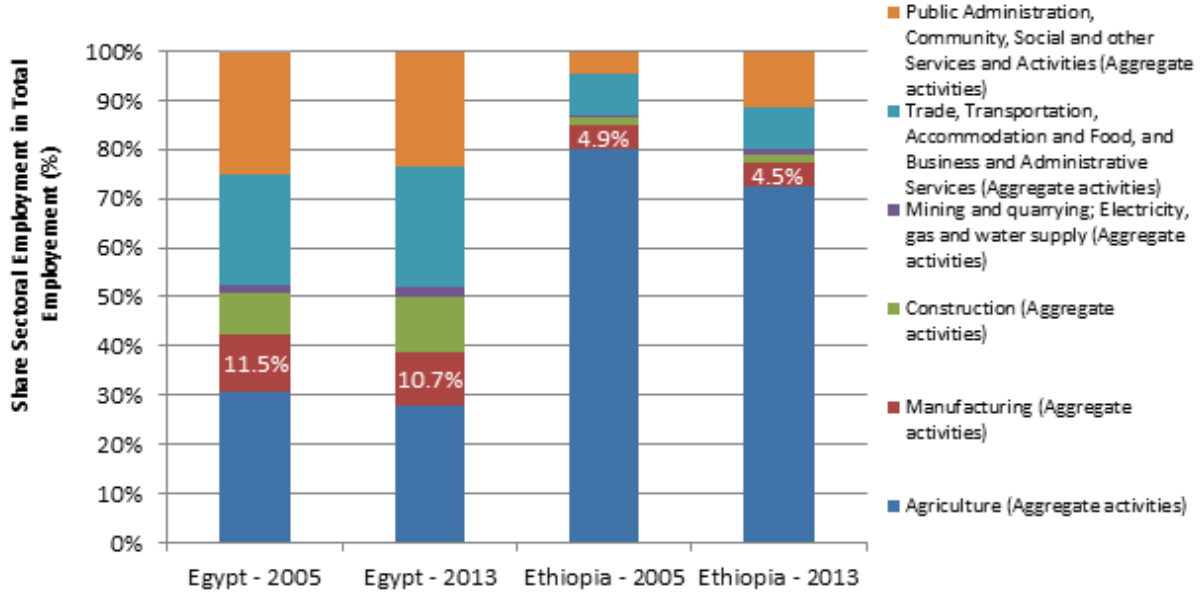
2) In order to calculate the relative share of ML/L, we simply need to divide **Manufacturing** by **Total** employment for each year and country. To do these calculations in Excel, simply use the formula and follow the process described above for the Economic Structural Change indicator.

3) Alternatively, through the process of making a stacked bar chart (see below), Excel will automatically calculate the relative shares of each activity.

c. ***Data Interpretation/Illustration***

We can easily illustrate the Employment Structural Change indicator in a 100% stacked bar chart (Note: make sure to exclude **Total** Employment when highlighting the area relevant for the graph) to see how employment shares have changed over time and whether we are seeing people moving out of agriculture and into manufacturing employment. Figure 2 gives an example.

Figure 2: Employment structural change in selected countries, 2005-2013



From this graph, we can clearly see that, relative to Egypt, Ethiopia is still at the very early stages of structural change with employment being dominated by the agricultural sector. Comparing the years 2005 and 2013, we can see that there has been a movement of labour out of agriculture but they are mostly being absorbed by service sectors but not manufacturing. This indicates that while there is rural-to-urban migration underway, there are not sufficient manufacturing employment opportunities being generated to absorb these working populations. This trend can be interpreted to suggest that a more labour-intensive industrialisation strategy would be appropriate to ensure productive employment opportunities are generated for workers who are currently trapped in agricultural and informal activities.

4) **Indicator: Growth Rates of MVA and Manufacturing Employment (ML)**

a. ***Data Selection***

Obtaining the data to calculate the MVA and ML growth rates is easy. We simply need to go back to the data sheets we used for our structural change analyses and choose two years where MVA and employment data are both available (this is necessary as we will need comparable years for the Employment Elasticity analysis which we will do next).

In the case of Egypt and Ethiopia, this would be 2005 and 2013. So we will use these two years to calculate our MVA and ML growth rates. As there is no MVA data for 2013 reported, we will use the 2012 data instead for comparison.

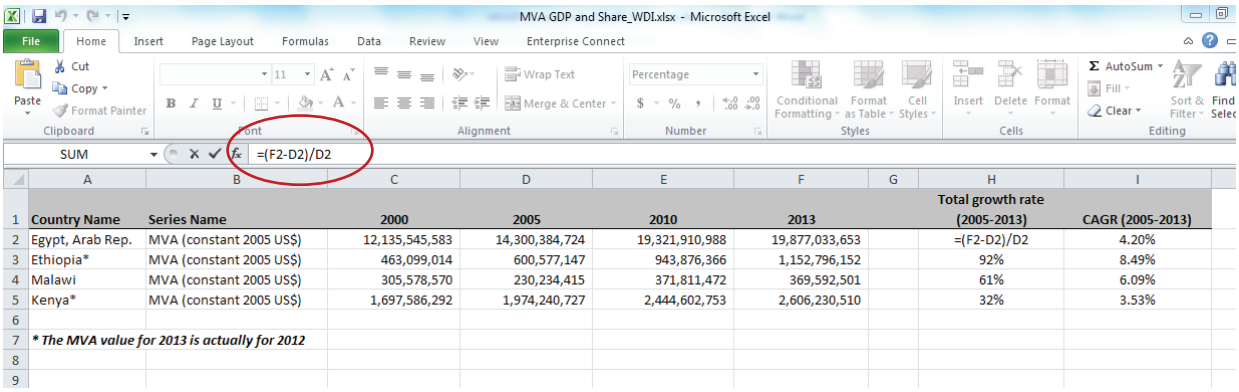
b. ***Data Analysis***

MVA Growth Rate (ΔMVA)

There are two options for calculating the growth rate. If we are interested in understanding how much MVA grew over the entire 2005-2013 period, we can use the following simple equation:

ΔMVA = (End value – Beginning value) / Beginning value

1) Total growth rate of MVA (over the entire period observed, i.e. in our case: 2005-2013)



Country Name	Series Name	2000	2005	2010	2013	Total growth rate (2005-2013)	CAGR (2005-2013)
Egypt, Arab Rep.	MVA (constant 2005 US$)	12,135,545,583	14,300,384,724	19,321,910,988	19,877,033,653	=(F2-D2)/D2	4.20%
Ethiopia*	MVA (constant 2005 US$)	463,099,014	600,577,147	943,876,366	1,152,796,152	92%	8.49%
Malawi	MVA (constant 2005 US$)	305,578,570	230,234,415	371,811,472	369,592,501	61%	6.09%
Kenya*	MVA (constant 2005 US$)	1,697,586,292	1,974,240,727	2,444,602,753	2,606,230,510	32%	3.53%

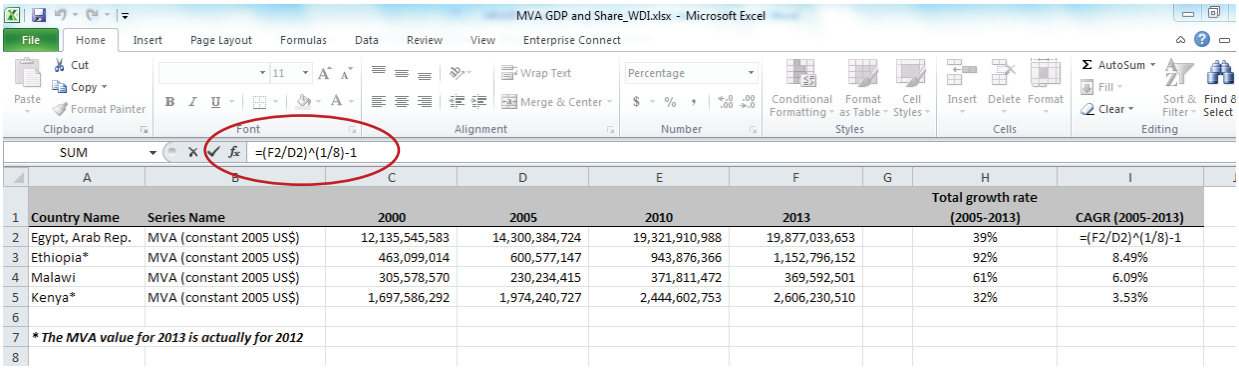
** The MVA value for 2013 is actually for 2012*

However, as indicated in Part I, we will use the Compound Annual Growth Rate (CAGR) equation throughout this analysis to understand the year-on-year growth rate of MVA:

$$CAGR = \left(\frac{End\ Value}{Beginning\ Value}\right)^{\left(\frac{1}{no.\ of\ years}\right)} - 1$$

In order to calculate the CAGR, we will take the MVA value for 2013 and divide it by the MVA value for 2005. We will then put this number to the power of 1/8 (since we are looking at a period of 8 years, from 2005 to 2013) and finally subtract 1. The example below shows how to enter this equation into Excel so that you can calculate the CAGR for all years quickly and easily. As you can see there, to compute the CAGR for Egypt between 2005 and 2013, you have to type in the following in the corresponding formula bar: =(F2/D2)^(1/8)-1

2) CAGR – Compound annual growth rate of MVA (gives the annual average over the period observed, i.e. in this case: 2005-2013)



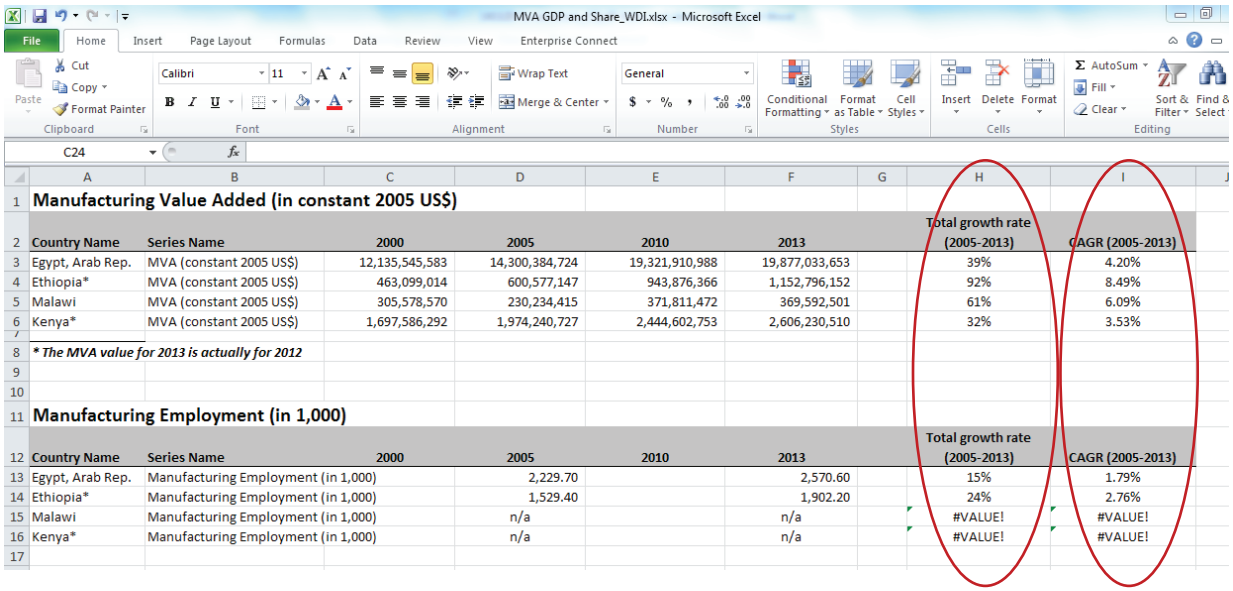
Country Name	Series Name	2000	2005	2010	2013	Total growth rate (2005-2013)	CAGR (2005-2013)
Egypt, Arab Rep.	MVA (constant 2005 US$)	12,135,545,583	14,300,384,724	19,321,910,988	19,877,033,653	39%	=(F2/D2)^(1/8)-1
Ethiopia*	MVA (constant 2005 US$)	463,099,014	600,577,147	943,876,366	1,152,796,152	92%	8.49%
Malawi	MVA (constant 2005 US$)	305,578,570	230,234,415	371,811,472	369,592,501	61%	6.09%
Kenya*	MVA (constant 2005 US$)	1,697,586,292	1,974,240,727	2,444,602,753	2,606,230,510	32%	3.53%

** The MVA value for 2013 is actually for 2012*

Manufacturing Employment Growth Rate (ΔML):

In order to calculate the manufacturing employment growth rates, we can just add the employment data into the same datasheet that we have been using to compute the MVA growth rates. We can then use the exact same equations as above to calculate the total growth rate and CAGR.

1) Total growth rate and CAGR for Manufacturing Employment (2005-2013)



	A	B	C	D	E	F	G	H	I
1	**Manufacturing Value Added (in constant 2005 US$)**								
2	Country Name	Series Name	2000	2005	2010	2013		Total growth rate (2005-2013)	CAGR (2005-2013)
3	Egypt, Arab Rep.	MVA (constant 2005 US$)	12,135,545,583	14,300,384,724	19,321,910,988	19,877,033,653		39%	4.20%
4	Ethiopia*	MVA (constant 2005 US$)	463,099,014	600,577,147	943,876,366	1,152,796,152		92%	8.49%
5	Malawi	MVA (constant 2005 US$)	305,578,570	230,234,415	371,811,472	369,592,501		61%	6.09%
6	Kenya*	MVA (constant 2005 US$)	1,697,586,292	1,974,240,727	2,444,602,753	2,606,230,510		32%	3.53%
7									
8	** The MVA value for 2013 is actually for 2012*								
9									
10									
11	**Manufacturing Employment (in 1,000)**								
12	Country Name	Series Name	2000	2005	2010	2013		Total growth rate (2005-2013)	CAGR (2005-2013)
13	Egypt, Arab Rep.	Manufacturing Employment (in 1,000)		2,229.70		2,570.60		15%	1.79%
14	Ethiopia*	Manufacturing Employment (in 1,000)		1,529.40		1,902.20		24%	2.76%
15	Malawi	Manufacturing Employment (in 1,000)		n/a		n/a		#VALUE!	#VALUE!
16	Kenya*	Manufacturing Employment (in 1,000)		n/a		n/a		#VALUE!	#VALUE!
17									

c. ***Data Illustration/Interpretation***

In this instance, it does not make a lot of sense to graphically represent the growth rates so we may just want to place the figures in a table for analysis. In the case of Ethiopia, we can see that, although in above analysis it was shown to be significantly behind in terms of the level of structural change, its MVA is actually growing very rapidly and nearly doubled between 2005 and 2013 (the total growth rate for this period is 92%). However, employment growth has been much more modest in comparison with only a 24% total growth rate over the full period, indicating that there might be a disjunction between the MVA and employment trends, which we can examine further in the next step. The CAGRs for MVA and manufacturing employment were 8.49% and 2.76%, respectively, in the case of Ethiopia.

It is important to note that when a country begins with very low MVA or ML values it is much easier to show high growth rates (relative to countries with large initial values).

5) Indicator: Employment Elasticity of MVA (ΔML/ΔMVA)

a. ***Data Selection***

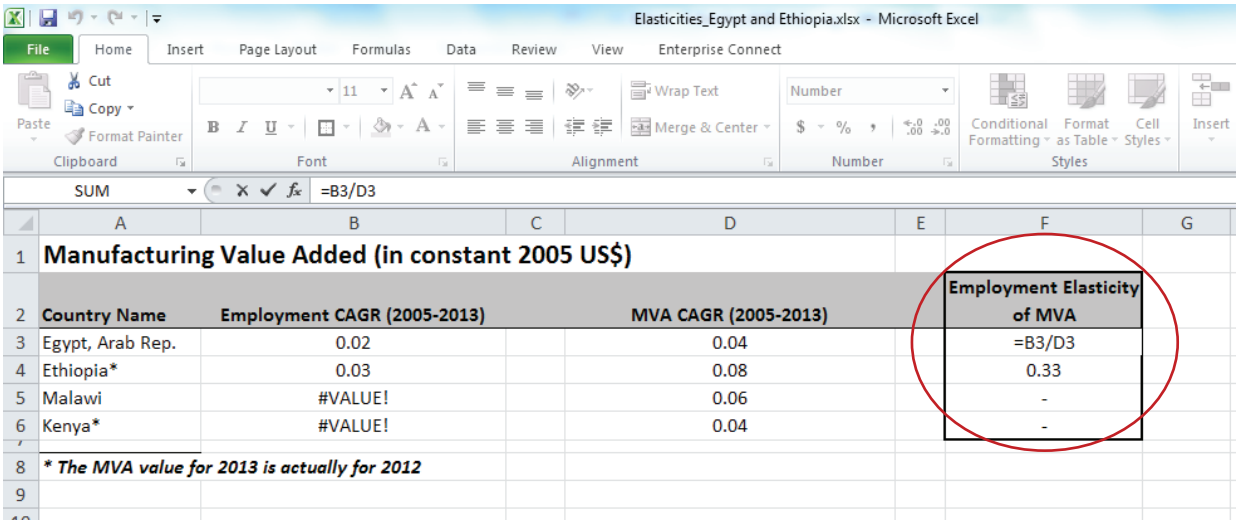
The employment elasticity of MVA can be calculated by dividing the manufacturing employment (ML) growth rate by the MVA growth rate. Here, it is more accurate and intuitive to use the CAGRs, as this will tell us how much employment was generated, on average, per year from MVA expansion.

b. ***Data Analysis***

1) We can create a new datasheet to calculate the employment elasticity of MVA and simply cut and paste the values from our growth analysis above.

Note: If you want to copy & paste the CAGR values obtained from the calculations above, you will need to use the "Paste special" option in Excel which is available by right-clicking when you paste. The "Paste special" menu offers various options; choose "Values" in the "Paste" tab to copy just the resulting values. Otherwise (i.e. by doing simple copy & paste) the underlying equations will still be copied, which will result in an "Error" being reported when trying to calculate the Employment Elasticity.

2) We can then calculate the Employment Elasticity by dividing the manufacturing employment CAGR by the MVA CAGR.



Elasticities_Egypt and Ethiopia.xlsx - Microsoft Excel

SUM =B3/D3

	A	B	C	D	E	F	G
1	**Manufacturing Value Added (in constant 2005 US$)**						
2	**Country Name**	**Employment CAGR (2005-2013)**		**MVA CAGR (2005-2013)**		**Employment Elasticity of MVA**	
3	Egypt, Arab Rep.	0.02		0.04		=B3/D3	
4	Ethiopia*	0.03		0.08		0.33	
5	Malawi	#VALUE!		0.06		-	
6	Kenya*	#VALUE!		0.04		-	
8	**** The MVA value for 2013 is actually for 2012***						
9							

c. *Data Illustration/Interpretation*

From our calculations we find that Ethiopia has an employment elasticity of 0.33 and Egypt has an employment elasticity of 0.5. We can use Conceptual Device 1 presented above to interpret these elasticities:

	Manufacturing Value Added (MVA) Growth	
Employment Elasticity	**Positive MVA Growth**	**Negative MVA Growth**
$\varepsilon < 0$	(-) Employment growth (+) Productivity growth **Jobless Growth**	(+) Employment growth (-) Productivity growth **Unproductive Employment Growth**
$0 \leq \varepsilon \leq .5$	(+) Employment growth (+) Productivity growth **Productivity-Led Growth**	(-) Employment growth (-) Productivity growth **Declining Sector**
$.5 \leq \varepsilon \leq 1$	(+) Employment growth (+) Productivity growth **Employment-Led Growth**	(-) Employment growth (-) Productivity growth **Declining Sectors**
$\varepsilon > 1$	(+) Employment growth (-) Productivity growth **Unproductive Employment Growth**	(-) Employment growth (+) Productivity growth **Declining Sector**

We can see from our analysis that Ethiopia has only generated 0.33% employment for every 1% increase in MVA per year, indicating that it has a fairly low employment elasticity and that its manufacturing sector is not on an employment-intensive growth trajectory.

6) **Indicator: Labour Productivity (MVA/ML) and Growth Rate (Δ[MVA/ML])**

a. ***Data Selection:***

In order to calculate the Labour Productivity in a country's manufacturing sector, we can once again use the manufacturing employment (ML) and MVA data from our earlier analyses. This time, however, we need to divide MVA by ML in order to determine how many US dollars of MVA are generated by the average manufacturing worker.

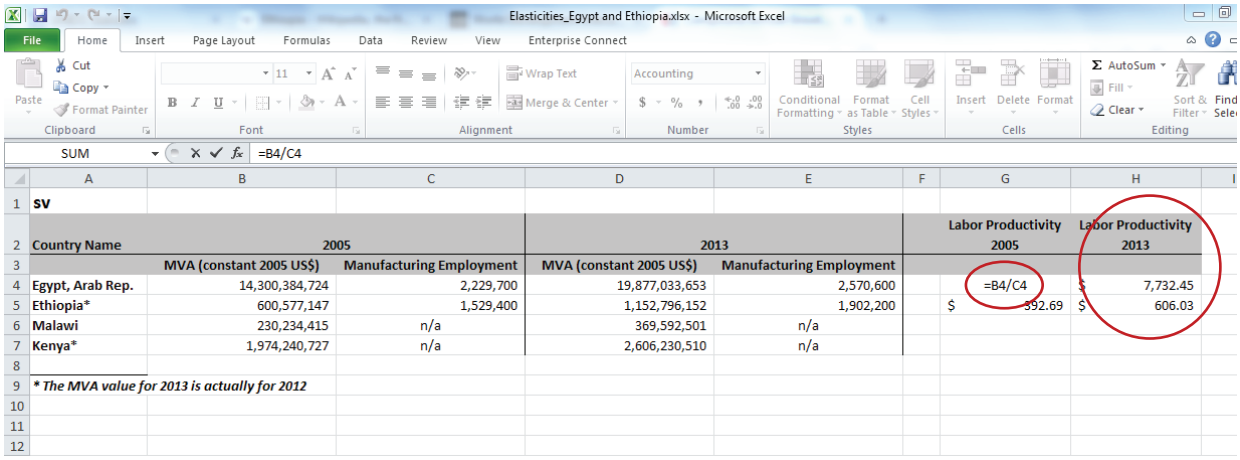
b. ***Data Analysis:***

Labour Productivity (MVA/ML)

1) The employment figures we have been used so far are reported in 1,000s. Therefore we will need to first multiply our employment figures by 1,000 (to obtain the actual absolute employment figures) before we can calculate the employment elasticity.

Since we were calculating and using growth rates in our prior analyses, we did not need to determine the real numbers. But since labour productivity will tell us how much MVA is generated per worker, we need the real employment figures for this indicator.

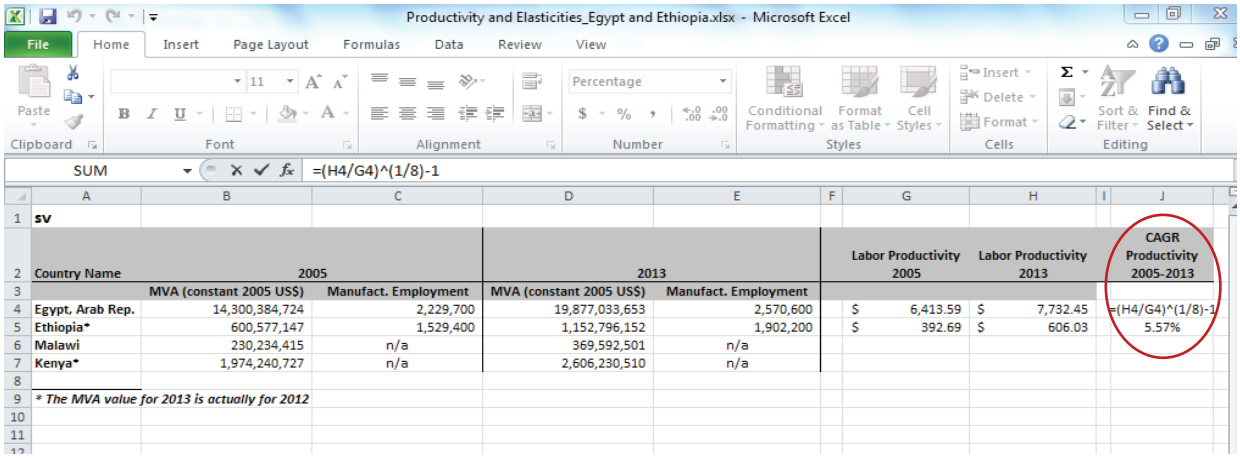
2) Divide the MVA figures by manufacturing employment for each country and for your select years:



Country Name	2005		2013		Labor Productivity 2005	Labor Productivity 2013
	MVA (constant 2005 US$)	Manufacturing Employment	MVA (constant 2005 US$)	Manufacturing Employment		
Egypt, Arab Rep.	14,300,384,724	2,229,700	19,877,033,653	2,570,600	=B4/C4	$ 7,732.45
Ethiopia*	600,577,147	1,529,400	1,152,796,152	1,902,200	$ 392.69	$ 606.03
Malawi	230,234,415	n/a	369,592,501	n/a		
Kenya*	1,974,240,727	n/a	2,606,230,510	n/a		

** The MVA value for 2013 is actually for 2012*

3) Calculate the CAGR of labour productivity, using the CAGR formula from above:



Country Name	2005		2013		Labor Productivity 2005	Labor Productivity 2013	CAGR Productivity 2005-2013
	MVA (constant 2005 US$)	Manufact. Employment	MVA (constant 2005 US$)	Manufact. Employment			
Egypt, Arab Rep.	14,300,384,724	2,229,700	19,877,033,653	2,570,600	$ 6,413.59	$ 7,732.45	=(H4/G4)^(1/8)-1
Ethiopia*	600,577,147	1,529,400	1,152,796,152	1,902,200	$ 392.69	$ 606.03	5.57%
Malawi	230,234,415	n/a	369,592,501	n/a			
Kenya*	1,974,240,727	n/a	2,606,230,510	n/a			

** The MVA value for 2013 is actually for 2012*

c. ***Data Illustration/Interpretation***

From our calculations and the screen shots above we can clearly see that Egypt has a much higher labour productivity than Ethiopia with the average Egyptian manufacturing worker generating over US$ 7,700 of MVA per year, while the average Ethiopian manufacturing worker is only generating US$ 606 of MVA per year. This is despite the fact that Ethiopian manufacturing labour productivity has doubled over the time period 2005-2013. From our calculations of the productivity growth rate, we can see that Ethiopia's labour productivity is growing much faster than Egypt's with a year-on-year growth rate of 5.57% vs. 2.37%. This growth rate could indicate that Ethiopia's manufacturing firms have been utilising more innovative techniques which will allow for more output per worker, which is why we have been seeing such rapid increases in MVA over time. As mentioned above, MVA can be approximated by profits + wages + taxes; as MVA grows we would expect to also see rising wages (as long as not all increments are going to taxes and profits) that can contribute to rising incomes in the country.

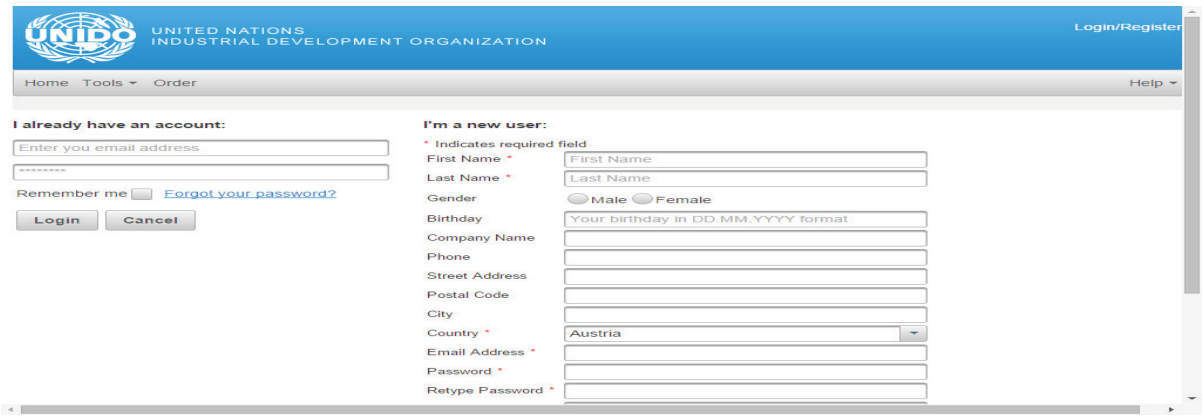
7) **Indicator: Average Manufacturing Wages (Wage Bill/ML) and Growth Rate**

a. ***Data Selection***

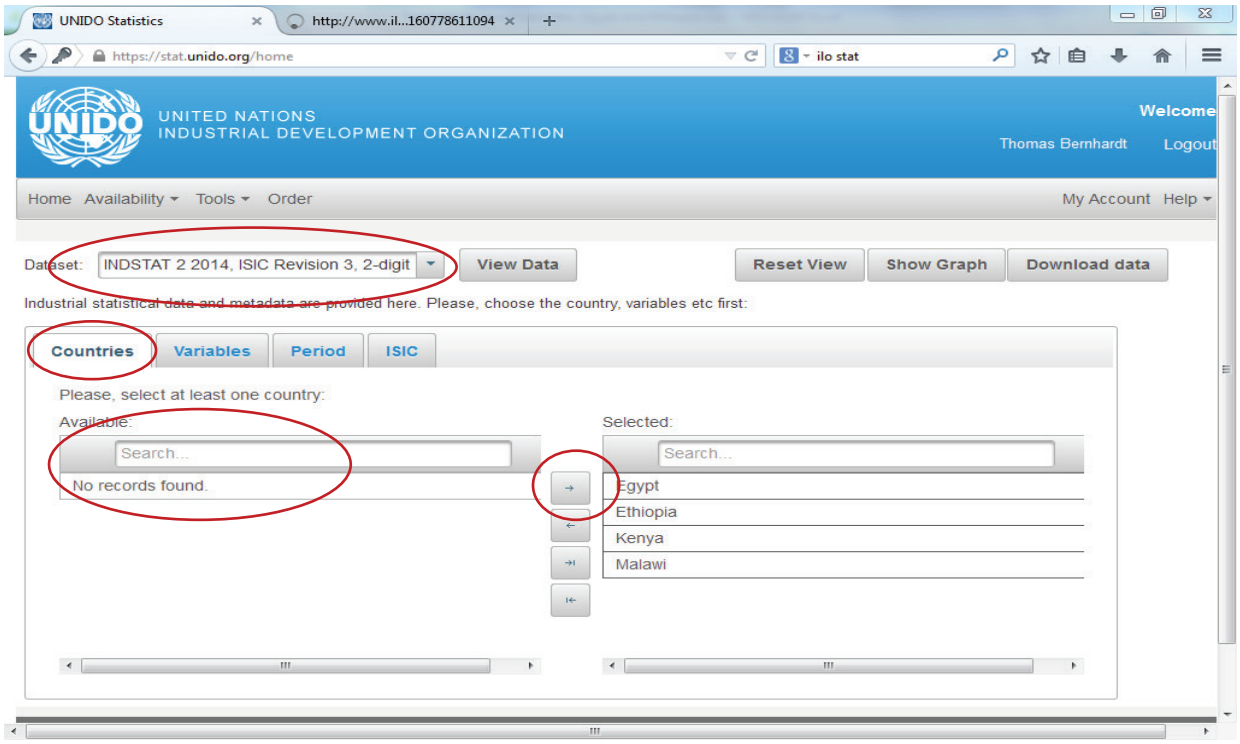
In order to calculate the Average Manufacturing Wages and their Growth Rate, we can use the United Nations Industrial Development Organization (UNIDO's) Database (INDSTAT), which collects data based on industrial surveys to approximate manufacturing wages and employment for countries.

Note: Depending on the country, these industrial surveys cover only firms with 5 or more / 10 or more employees. Since in many low-income countries the number of micro and small enterprises is quite large, you may want to instead (or additionally) use national data based on industry censuses or labour surveys to allow for a more accurate analysis of wage and employment trends in the manufacturing sector.

1) You will first need to register for UNIDO's INDSTAT database through https://stat.unido.org/ or https://stat.unido.org/register. Registration is for free but full access needs to be granted (separately) by UNIDO's Statistics Unit. This is what the registration form looks like.



2) Once you have registered and access to the full database, you can login and you will see the full menu as in below screen shot. Make sure to choose **INDSTAT 2 2014, ISIC Revision, 2-digit** as dataset in the selection bar at the top left. Then you can choose your **Countries** by searching for the country name in the search bar. Once you have found and selected the country in the left-hand menu, click on the arrow "→" to move the country into the "Selected" area at the right-hand side.

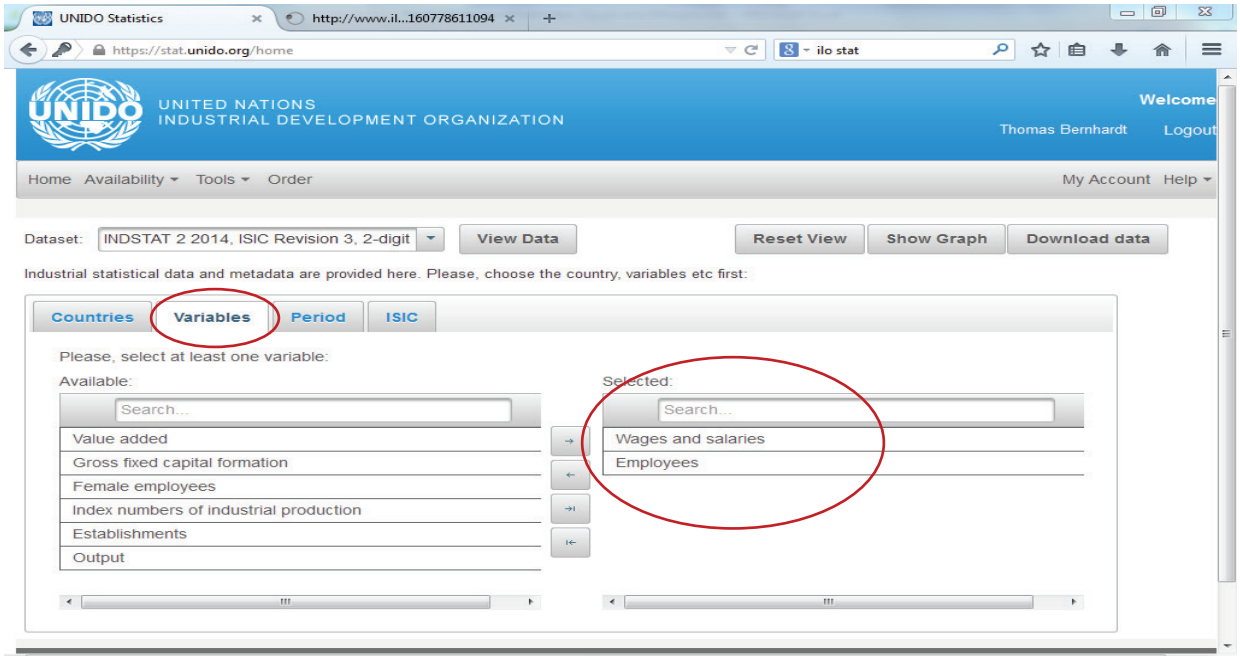


3) Choose your **Variables** (i.e. topics for analysis). In this case we will want to choose:

- **Wages and salaries**

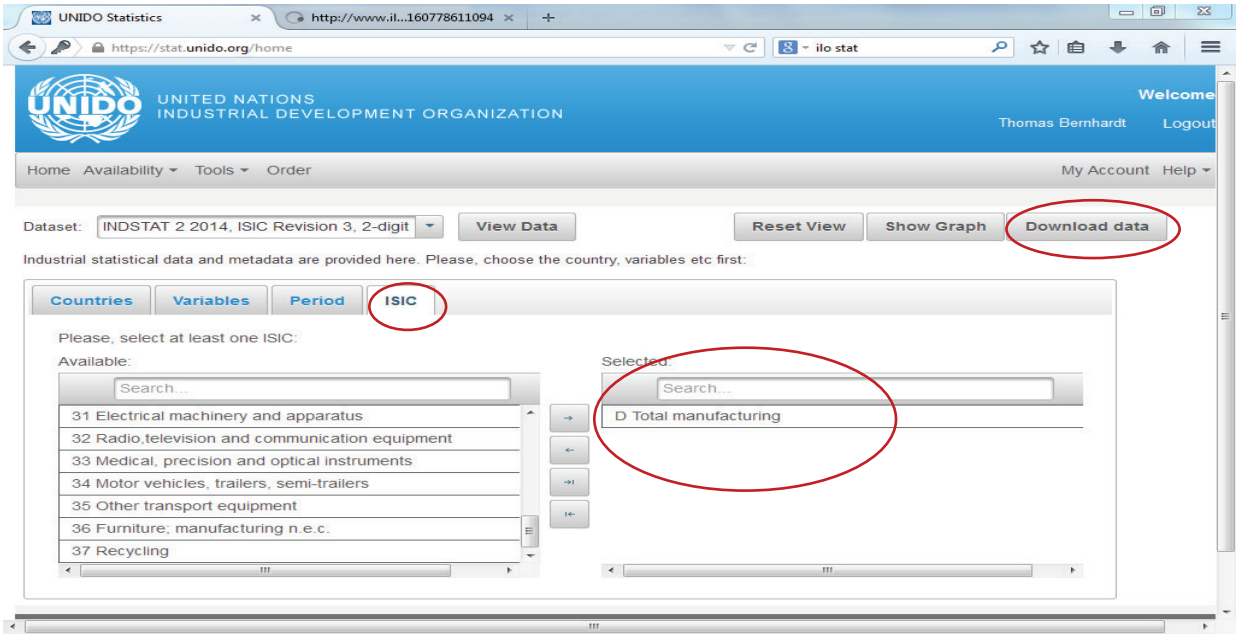
- **Employees**

In order to ensure comparability, we will not want to use the employment data we downloaded from the ILO. Since INDSTAT data is based on industrial surveys (while ILO data is mainly based on labour surveys or censuses) it will only represent a select group of firms. For consistency and comparability between wage data and employment data, it is better to get all data from one source only.



4) Choose your **Period** (e.g. the years you want to analyse)

5) Click on **ISIC** (ISIC stands for the International Standard Industrial Classification of economic activities). In this case we will choose **D Total Manufacturing** (and not any of the different manufacturing sub-sectors that are also available for selection in the menu on the left-hand side), because we are interested in understanding the wage and employment trends for the whole manufacturing sector.

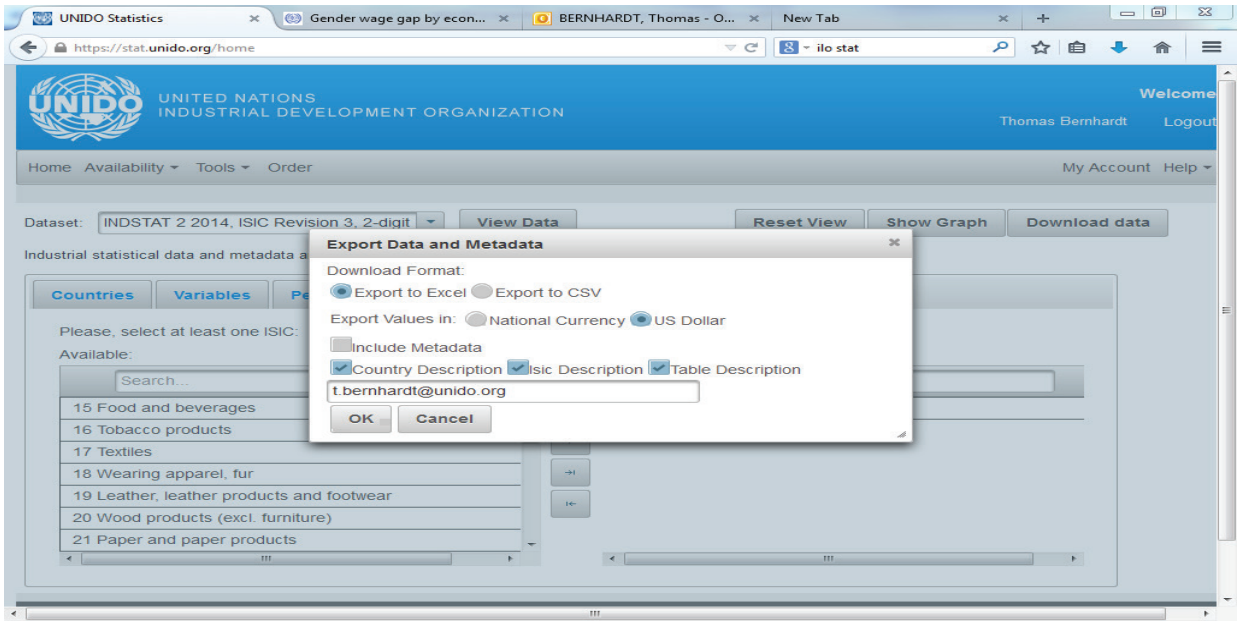


6) Once you have selected your Countries, Variables, Period and ISIC you will press **Download data** (which is in the upper right hand of the screen).

7) You will see a new window pop up (see below screen shot) when you download the data and you will want to select all of the boxes shown below:

- Export to Excel
- US dollar
- Country Description
- ISIC Description
- Table Description

- Optional: Select "Include Metadata" if you will be writing up a report from this analysis, as it will include more information on the data sources and collection methods.

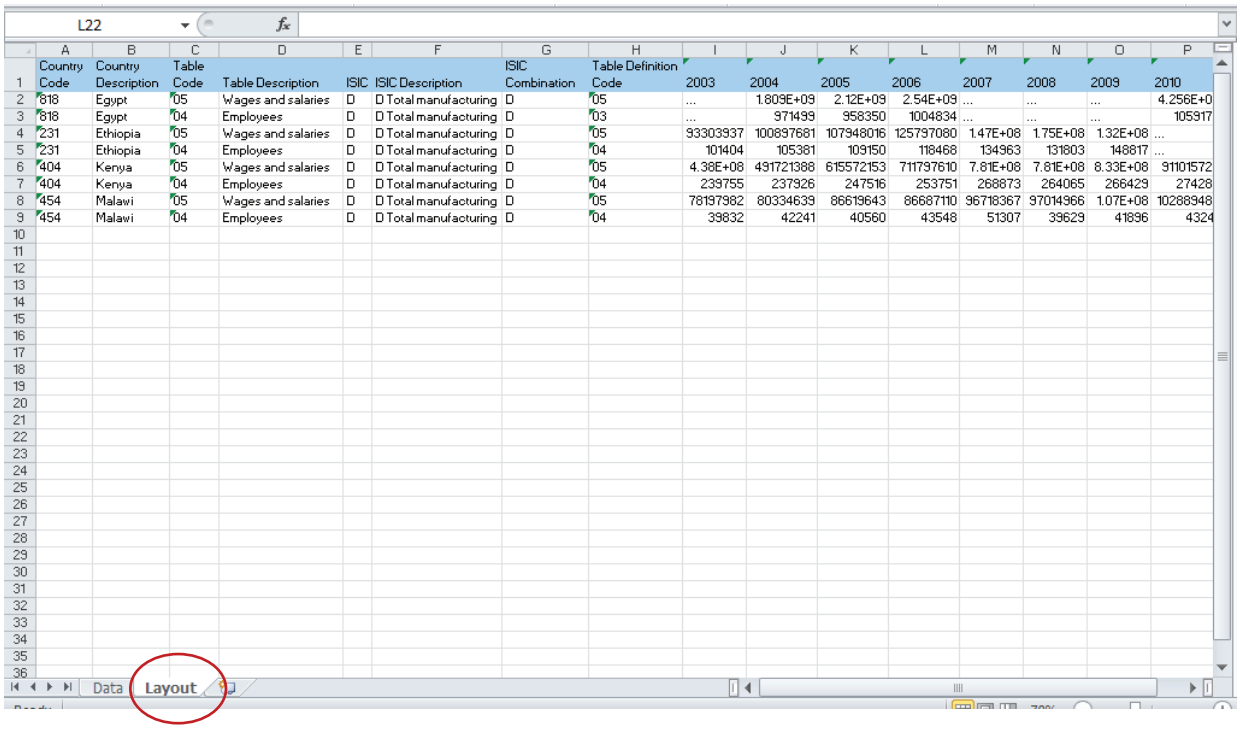


8) In order to access your datasheet you will need to then check your email account (the address you used for registration). You should receive an email with a web link, which you will need to click on (or copy & paste it into your web browser) in order to download your data.

b. ***Data Analysis***

Average Wages:

Once you open your datasheet, it will look something like this:



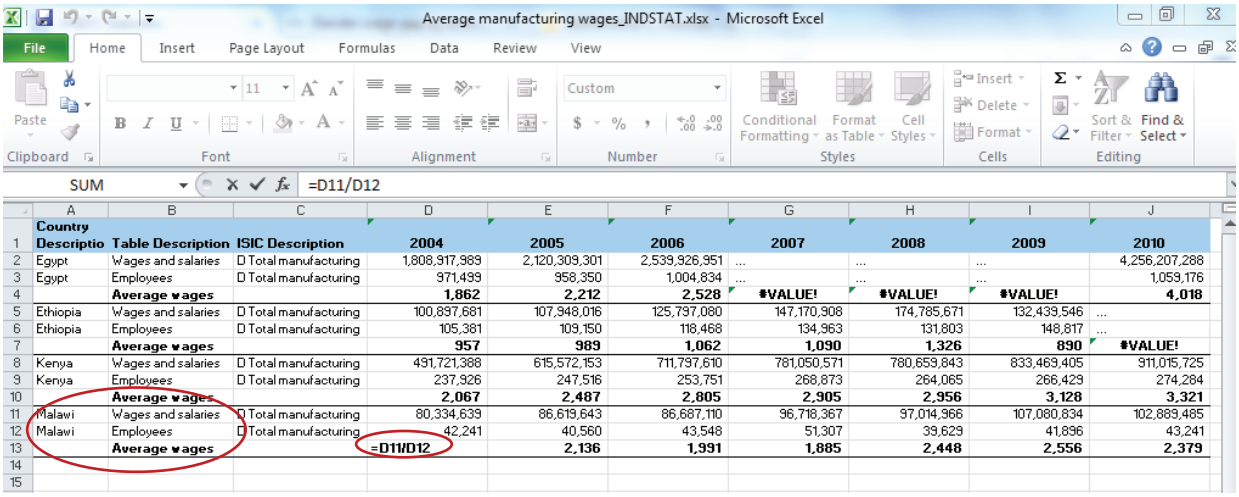
Country Code	Country Description	Table Code	Table Description	ISIC	ISIC Description	ISIC Combination	Table Definition Code	2003	2004	2005	2006	2007	2008	2009	2010
818	Egypt	05	Wages and salaries	D	D Total manufacturing	D	05	...	1.809E+09	2.12E+09	2.54E+09	...	...	...	4.256E+0
818	Egypt	04	Employees	D	D Total manufacturing	D	03	...	971499	958350	1004834	...	...	...	105317
231	Ethiopia	05	Wages and salaries	D	D Total manufacturing	D	05	93303937	100897681	107948016	125797080	1.47E+08	1.75E+08	1.32E+08	...
231	Ethiopia	04	Employees	D	D Total manufacturing	D	04	101404	105381	109150	118468	134963	131803	148817	...
404	Kenya	05	Wages and salaries	D	D Total manufacturing	D	05	4.38E+08	491721388	615572153	711797610	7.81E+08	7.81E+08	8.33E+08	91101572
404	Kenya	04	Employees	D	D Total manufacturing	D	04	239755	237926	247516	253751	268873	264065	266429	27428
454	Malawi	05	Wages and salaries	D	D Total manufacturing	D	05	78197982	80334639	86619643	86687110	96718367	97014966	1.07E+08	10288948
454	Malawi	04	Employees	D	D Total manufacturing	D	04	39832	42241	40560	43548	51307	39629	41896	4324

1) When you open your data sheet you will see that you have two worksheets (Data and Layout). You will want to select the **Layout** worksheet, as it is generally easier to read and work with since the countries are in a row and the years are in the column.

2) We are interested in finding out the AVERAGE wage so we will need to divide the total wage bill

(i.e. the “Wages and salaries”) by the number of employees.

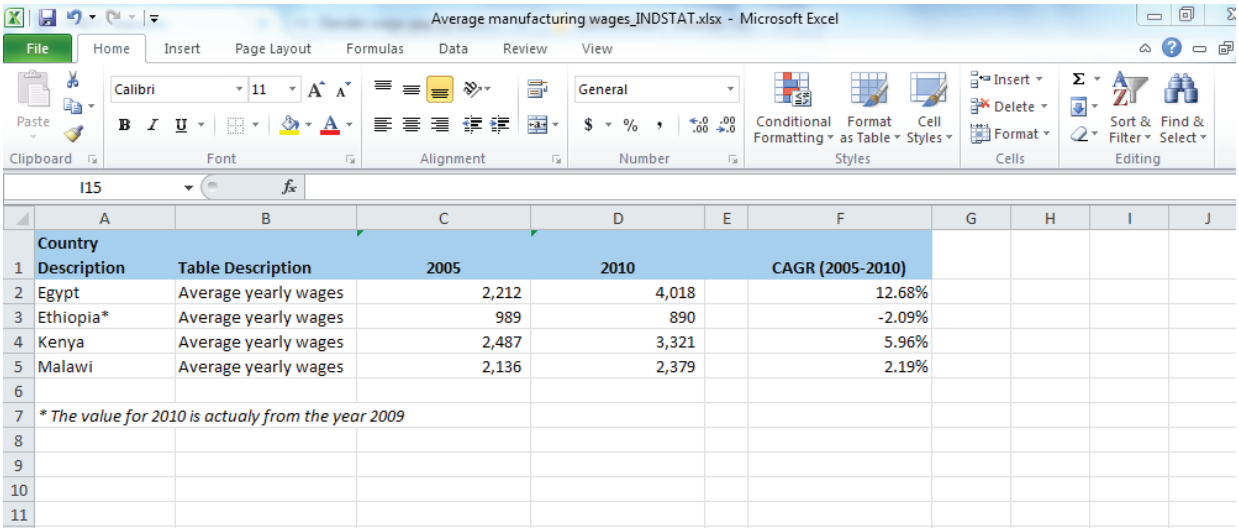
One easy way to do this in the same worksheet is to simply insert new rows below each of the countries and then calculate the average wages, as shown below:



	A	B	C	D	E	F	G	H	I	J
1	Country Descriptio	Table Description	ISIC Description	2004	2005	2006	2007	2008	2009	2010
2	Egypt	Wages and salaries	D Total manufacturing	1,808,917,989	2,120,309,301	2,539,926,951	...	...	...	4,256,207,288
3	Egypt	Employees	D Total manufacturing	971,499	958,350	1,004,834	...	...	...	1,059,176
4		**Average wages**		**1,862**	**2,212**	**2,528**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**4,018**
5	Ethiopia	Wages and salaries	D Total manufacturing	100,897,681	107,948,016	125,797,080	147,170,908	174,785,671	132,439,546	...
6	Ethiopia	Employees	D Total manufacturing	105,381	109,150	118,468	134,963	131,803	148,817	...
7		**Average wages**		**957**	**989**	**1,062**	**1,090**	**1,326**	**890**	**#VALUE!**
8	Kenya	Wages and salaries	D Total manufacturing	491,721,388	615,572,153	711,797,610	781,050,571	780,659,843	833,469,405	911,015,725
9	Kenya	Employees	D Total manufacturing	237,926	247,516	253,751	268,873	264,065	266,429	274,284
10		**Average wages**		**2,067**	**2,487**	**2,805**	**2,905**	**2,956**	**3,128**	**3,321**
11	Malawi	Wages and salaries	D Total manufacturing	80,334,639	86,619,643	86,687,110	96,718,367	97,014,966	107,080,834	102,889,485
12	Malawi	Employees	D Total manufacturing	42,241	40,560	43,548	51,307	39,629	41,896	43,241
13		**Average wages**		**=D11/D12**	**2,136**	**1,991**	**1,885**	**2,448**	**2,556**	**2,379**
14										
15										

Wage Growth Rate:

We can then compute the wage growth rate using the same CAGR formula as in our earlier analyses to determine the average annual growth rate of wages:

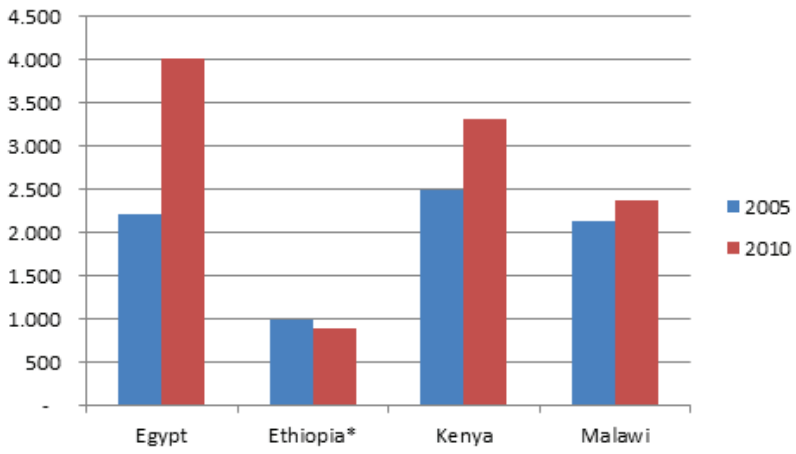


	A	B	C	D	E	F	G	H	I	J
1	Country Description	Table Description	2005	2010		CAGR (2005-2010)				
2	Egypt	Average yearly wages	2,212	4,018		12.68%				
3	Ethiopia*	Average yearly wages	989	890		-2.09%				
4	Kenya	Average yearly wages	2,487	3,321		5.96%				
5	Malawi	Average yearly wages	2,136	2,379		2.19%				
6										
7	** The value for 2010 is actualy from the year 2009*									
8										
9										
10										
11										

c. ***Data Illustration/ Interpretation:***

We can illustrate the wage trends for each of the countries in the form of a bar graph. See Figure 3 for an example.

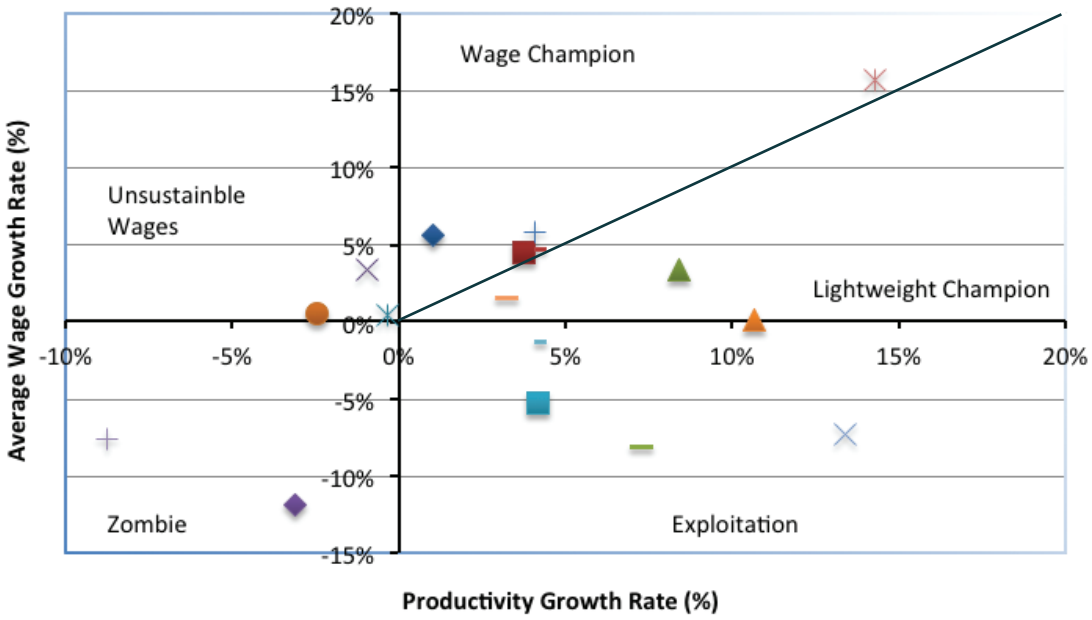
Figure 3: Average annual manufacturing wages (in US$) in selected countries, 2005-2010



What we immediately become aware of is the fact that despite rapidly increasing productivity and MVA in Ethiopia (which is something we found in our earlier analyses) we are actually seeing a decline in average Ethiopian manufacturing wages. By comparison, Egypt has had rapidly increasing wages despite a more moderate increase in productivity. We can use Conceptual Devise 2, which was presented above and is replicated below, to look at the two countries' relative performances.

From our prior analysis we know that Egypt had a an average annual productivity growth rate of 2.37% and now we see it has experienced an average annual wage growth rate of 12.68%, placing it clearly within the "Wage Champion" range. This indicates that the returns to labour (in the form of wages and salaries) are developing in line with productivity as the country industrialises.

Conceptual Device 2: Growth rate of labour productivity vs. growth rate of average wages



Ethiopia, on the other hand, has been experiencing a productivity growth rate of 5.57% per year while average wages have declined by an average -2.09% per year. This locates Ethiopia within the "exploitation" region in the Conceptual Device 2 graph. This indicates that wages have been suppressed in the manufacturing sector.

Up to this point of our analysis we know that Ethiopia is at very early stages of structural change but that its manufacturing sector has been experiencing fairly rapid productivity and MVA growth. Yet, the growth of the manufacturing sector is not contributing very much to poverty alleviation through direct employment or wage generation. However, the rising productivity of the manufacturing sector could still have positive employment spill over effects for the rest of the economy. We will therefore be interested in understanding how diversified the manufacturing sector is, as this will increase the chances for linkages with the rest of the economy.

8) **Indicator: Diversification of Manufacturing Production (Mnf. HHI)**

a. ***Data Selection:***

In order to evaluate the degree of diversification of the manufacturing sector in different countries, we can once again use the INDSTAT database.

1) Choose your **Countries**

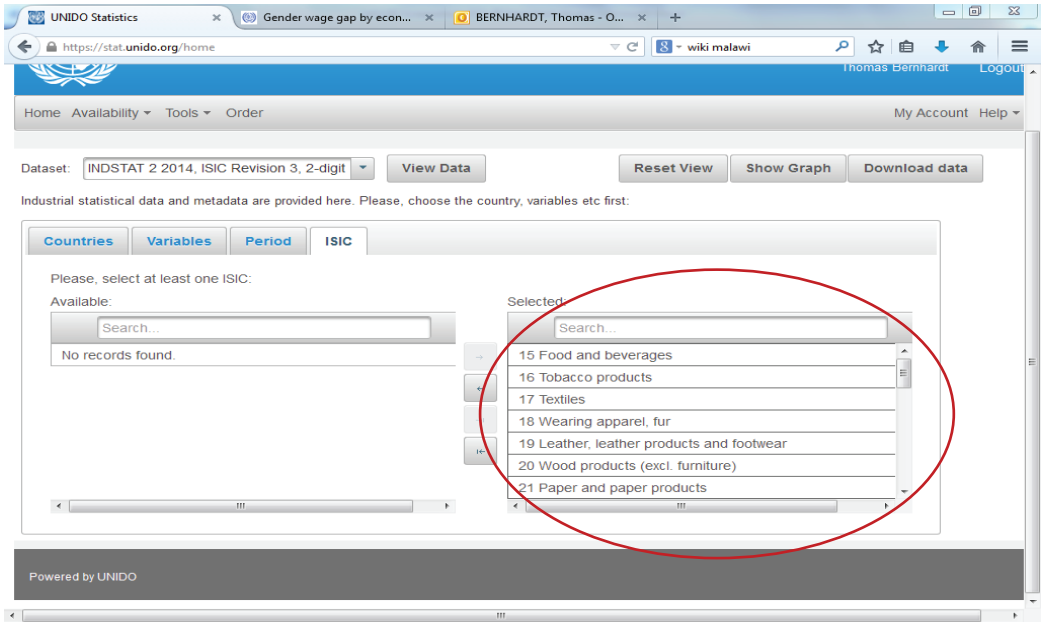
2) Choose your **Variables**

- *In this case, we will choose **Value Added***

3) Choose your **Period**

4) Choose your **ISIC**

- *This time we will want to choose all the manufacturing activities for the ISIC 2-digit, as per the below screen shot:*



5) Click **Download Data** and access the datasheet through the message that is sent to your email account.

b. ***Data Analysis***

Once you have downloaded the data it will look like in the following screen shot, which can be a bit overwhelming but we can clean up the datasheet to make it easier to work with. For easier data processing you might want to divide up the data by country so you are calculating the HHI for each country in separate worksheets.

G7 | 20

	A	B	C	D	E	F	G	H	I	J	K	L
1	Country	Country Description	Table Code	Table Description	ISIC	ISIC Description	ISIC Combination	Table Definition Code	2000	2002	2009	2010
2	818	Egypt	20	Value added	15	15 Food and beverages	15	18,19	...	1152450513	...	2609976094
3	818	Egypt	20	Value added	16	16 Tobacco products	16	18,19	...	159235233	...	694427546
4	818	Egypt	20	Value added	17	17 Textiles	17	18,19	...	415981839	...	660033191
5	818	Egypt	20	Value added	18	18 Wearing apparel, fur	18	18,19	...	201850580	...	467480087
6	818	Egypt	20	Value added	19	19 Leather, leather products	19	18,19	...	39042196	...	32186932
7	818	Egypt	20	Value added	20	20 Wood products (excl. furr	20	18,19	...	13555439	...	20792822
8	818	Egypt	20	Value added	21	21 Paper and paper product	21	18,19	...	159713712	...	325275794
9	818	Egypt	20	Value added	22	22 Printing and publishing	22	18,19	...	-61720748	...	196288470
10	818	Egypt	20	Value added	23	23 Coke,refined petroleum	23	18,19	...	1408177711	...	6284315379
11	818	Egypt	20	Value added	24	24 Chemicals and chemical	24	18,19	...	1432936193	...	3004065856
12	818	Egypt	20	Value added	25	25 Rubber and plastics proc	25	18,19	...	78659768	...	374024091
13	818	Egypt	20	Value added	26	26 Non-metallic mineral pro	26	18,19	...	504169195	...	2425991028
14	818	Egypt	20	Value added	27	27 Basic metals	27	18,19	...	140057826	...	1083936862
15	818	Egypt	20	Value added	28	28 Fabricated metal product	28	18,19	...	174089878	...	332674130
16	818	Egypt	20	Value added	29	29 Machinery and equipmer	29	18,19	...	72384419	...	216941127
17	818	Egypt	20	Value added	30	30 Office, accounting and co	30,30F	18,19	...	4781240	...	135907889
18	818	Egypt	20	Value added	31	31 Electrical machinery and	31	18,19	...	180596133	...	687243905
19	818	Egypt	20	Value added	32	32 Radio,television and con	32,30F	18,19	...	102306169	...	...
20	818	Egypt	20	Value added	33	33 Medical, precision and o	33,30F	18,19	...	64327606	...	...
21	818	Egypt	20	Value added	34	34 Motor vehicles, trailers, s	34	18,19	...	272935571	...	396086938
22	818	Egypt	20	Value added	35	35 Other transport equipme	35	18,19	...	395140	...	100603173
23	818	Egypt	20	Value added	36	36 Furniture; manufacturing	36	18,19	...	42606013	...	104489376
24	818	Egypt	20	Value added	37	37 Recycling	37	18,19	...	119564	...	...
25	818	Egypt	20	Value added	D	D Total manufacturing	D	18,19	...	6558651190	...	20152740691
26	231	Ethiopia	20	Value added	15	15 Food and beverages	15	19	230831202	223841732	400591632	...
27	231	Ethiopia	20	Value added	16	16 Tobacco products	16	19	21996018	18749847	40150965	...
28	231	Ethiopia	20	Value added	17	17 Textiles	17	19	28846964	27070118	45248438	...
29	231	Ethiopia	20	Value added	18	18 Wearing apparel, fur	18	19	3372657	3251145	6423125	...
30	231	Ethiopia	20	Value added	19	19 Leather, leather products	19	19	22012082	26214234	26700601	...
31	231	Ethiopia	20	Value added	20	20 Wood products (excl. furr	20	19	2440838	2801436	3665602	...
32	231	Ethiopia	20	Value added	21	21 Paper and paper product	21	19	5779664	4976219	17404055	...
33	231	Ethiopia	20	Value added	22	22 Printing and publishing	22	19	15050881	18863996	32850326	...
34	231	Ethiopia	20	Value added	23	23 Coke,refined petroleum	23	19	0	0	0	...
35	231	Ethiopia	20	Value added	24	24 Chemicals and chemical	24	19	22010622	23944443	77488283	...
36	231	Ethiopia	20	Value added	25	25 Rubber and plastics proc	25	19	20872529	26656590	59534285	...
37	231	Ethiopia	20	Value added	26	26 Non-metallic mineral pro	26	19	36654554	42264305	144016947	...
38	231	Ethiopia	20	Value added	27	27 Basic metals	27	19	9706398	15771585	35472762	...
39	231	Ethiopia	20	Value added	28	28 Fabricated metal product	28	19	6411505	8619182	47068248	...
40	231	Ethiopia	20	Value added	29	29 Machinery and equipmer	29	19	345006	305564	796342	...
41	231	Ethiopia	20	Value added	30	30 Office, accounting and co	30	19	0	0	0	...
42	231	Ethiopia	20	Value added	31	31 Electrical machinery and	31	19	9614	6770	4670	...
43	231	Ethiopia	20	Value added	32	32 Radio,television and con	32	19	0	0	0	...
44	231	Ethiopia	20	Value added	33	33 Medical, precision and o	33	19	0	0	0	...
45	231	Ethiopia	20	Value added	34	34 Motor vehicles, trailers, s	34	19	32340220	9367454	12650965	...
46	231	Ethiopia	20	Value added	35	35 Other transport equipme	35	19	0	0	509866	...
47	231	Ethiopia	20	Value added	36	36 Furniture; manufacturing	36	19	7462707	8130606	21328454	...
48	231	Ethiopia	20	Value added	37	37 Recycling	37	19	0	0	0	...

Data | Layout | Metadata | Table 1

1) We are interested in understanding whether a country's manufacturing sector is becoming more or less diversified over time. This means that we will want to choose two years for comparison.

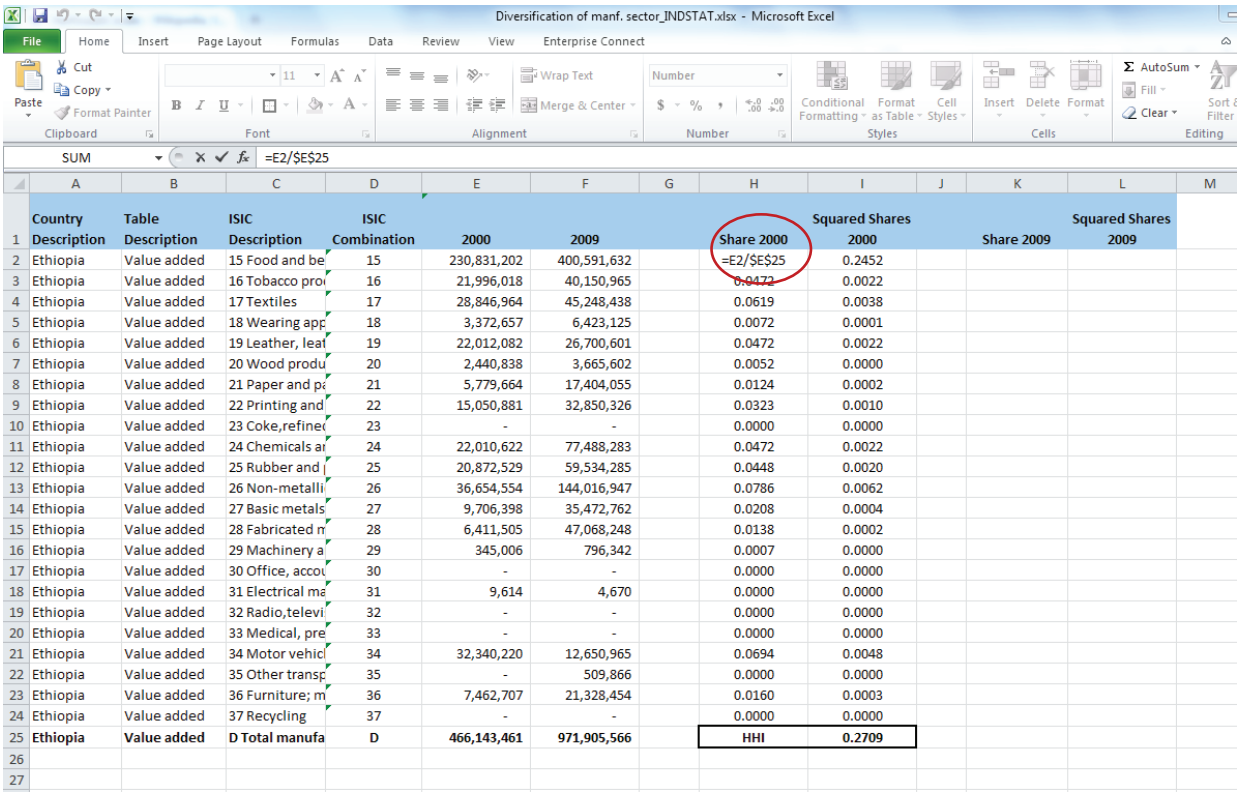
In the case of Ethiopia and its comparator countries we chose 2000 and 2009.

From Part I above we know that the HHI equation can be written as follows:

Although this equation may look quite scary the process is fairly straightforward: We first need to determine the shares of each manufacturing sub-sector in total MVA (e.g. what is the share of Textiles in total MVA?).

2) To do so, we will divide the value added reported for each individual sub-sector by the total MVA (i.e. category **D Total manufacturing**). We can see the calculation of these shares in column H in below screen shot:

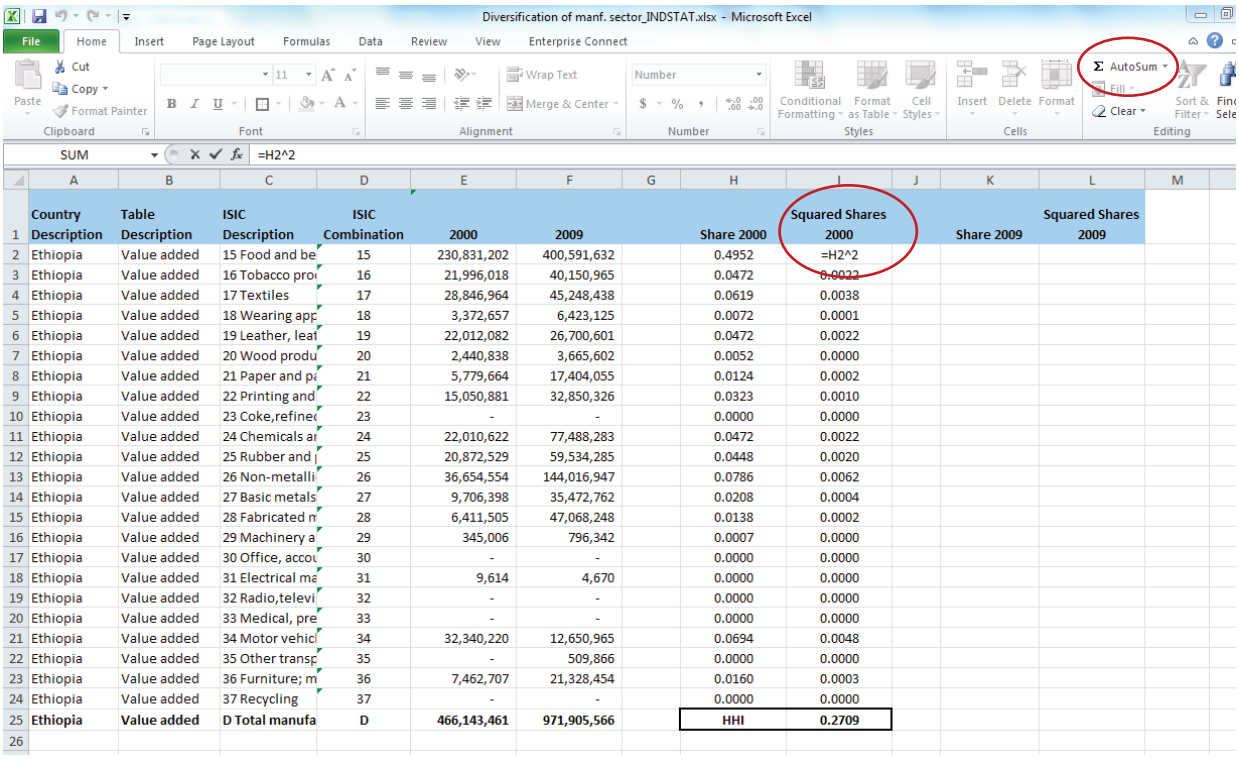
Shortcut: Since the denominator will be the same for the calculation of all shares (i.e. it will always be the MVA value reported for **D Total manufacturing***), we can "freeze" this reference cell in Excel. To do so, we have to type in two dollar signs ($), one before the row number and one before the column number of the cell that reports the* **D Total manufacturing** *MVA value. In the screen shot below, this was done by typing in E25 in the formula in cell H2. Once we have done that, we can simply drag the formula down from cell H2 to cell H24 in order to get the shares for all the other sub-sectors.*



	Country Description	Table Description	ISIC Description	ISIC Combination	2000	2009	Share 2000	Squared Shares 2000	Share 2009	Squared Shares 2009
2	Ethiopia	Value added	15 Food and be	15	230,831,202	400,591,632	=E2/E25	0.2452		
3	Ethiopia	Value added	16 Tobacco pro	16	21,996,018	40,150,965	0.0472	0.0022		
4	Ethiopia	Value added	17 Textiles	17	28,846,964	45,248,438	0.0619	0.0038		
5	Ethiopia	Value added	18 Wearing app	18	3,372,657	6,423,125	0.0072	0.0001		
6	Ethiopia	Value added	19 Leather, leat	19	22,012,082	26,700,601	0.0472	0.0022		
7	Ethiopia	Value added	20 Wood produ	20	2,440,838	3,665,602	0.0052	0.0000		
8	Ethiopia	Value added	21 Paper and pa	21	5,779,664	17,404,055	0.0124	0.0002		
9	Ethiopia	Value added	22 Printing and	22	15,050,881	32,850,326	0.0323	0.0010		
10	Ethiopia	Value added	23 Coke,refine	23	-	-	0.0000	0.0000		
11	Ethiopia	Value added	24 Chemicals ar	24	22,010,622	77,488,283	0.0472	0.0022		
12	Ethiopia	Value added	25 Rubber and	25	20,872,529	59,534,285	0.0448	0.0020		
13	Ethiopia	Value added	26 Non-metalli	26	36,654,554	144,016,947	0.0786	0.0062		
14	Ethiopia	Value added	27 Basic metals	27	9,706,398	35,472,762	0.0208	0.0004		
15	Ethiopia	Value added	28 Fabricated m	28	6,411,505	47,068,248	0.0138	0.0002		
16	Ethiopia	Value added	29 Machinery a	29	345,006	796,342	0.0007	0.0000		
17	Ethiopia	Value added	30 Office, accou	30	-	-	0.0000	0.0000		
18	Ethiopia	Value added	31 Electrical ma	31	9,614	4,670	0.0000	0.0000		
19	Ethiopia	Value added	32 Radio,televi	32	-	-	0.0000	0.0000		
20	Ethiopia	Value added	33 Medical, pre	33	-	-	0.0000	0.0000		
21	Ethiopia	Value added	34 Motor vehic	34	32,340,220	12,650,965	0.0694	0.0048		
22	Ethiopia	Value added	35 Other transp	35	-	509,866	0.0000	0.0000		
23	Ethiopia	Value added	36 Furniture; m	36	7,462,707	21,328,454	0.0160	0.0003		
24	Ethiopia	Value added	37 Recycling	37	-	-	0.0000	0.0000		
25	**Ethiopia**	**Value added**	**D Total manufa**	**D**	**466,143,461**	**971,905,566**	**HHI**	**0.2709**		

3) The next step is to square the entire share (which means multiplying the share by itself). The mathematical reason for doing this is that the larger the number is, the less it will be reduced when it is squared which means that once you sum up all the squared shares you will end up with a smaller number ultimately. This is in line with the logic of the HHI where a smaller number is better (from a diversification or competitiveness perspective).

We can do this easily in Excel by simply creating the equation = (sub-sector share)^2 and then drag it down the column to calculate all the sub-sector shares.



	Country Description	Table Description	ISIC Description	ISIC Combination	2000	2009	Share 2000	Squared Shares 2000	Share 2009	Squared Shares 2009
2	Ethiopia	Value added	15 Food and be	15	230,831,202	400,591,632	0.4952	=H2^2		
3	Ethiopia	Value added	16 Tobacco pro	16	21,996,018	40,150,965	0.0472	0.0022		
4	Ethiopia	Value added	17 Textiles	17	28,846,964	45,248,438	0.0619	0.0038		
5	Ethiopia	Value added	18 Wearing app	18	3,372,657	6,423,125	0.0072	0.0001		
6	Ethiopia	Value added	19 Leather, leat	19	22,012,082	26,700,601	0.0472	0.0022		
7	Ethiopia	Value added	20 Wood produ	20	2,440,838	3,665,602	0.0052	0.0000		
8	Ethiopia	Value added	21 Paper and pa	21	5,779,664	17,404,055	0.0124	0.0002		
9	Ethiopia	Value added	22 Printing and	22	15,050,881	32,850,326	0.0323	0.0010		
10	Ethiopia	Value added	23 Coke,refine	23	-	-	0.0000	0.0000		
11	Ethiopia	Value added	24 Chemicals ar	24	22,010,622	77,488,283	0.0472	0.0022		
12	Ethiopia	Value added	25 Rubber and	25	20,872,529	59,534,285	0.0448	0.0020		
13	Ethiopia	Value added	26 Non-metalli	26	36,654,554	144,016,947	0.0786	0.0062		
14	Ethiopia	Value added	27 Basic metals	27	9,706,398	35,472,762	0.0208	0.0004		
15	Ethiopia	Value added	28 Fabricated m	28	6,411,505	47,068,248	0.0138	0.0002		
16	Ethiopia	Value added	29 Machinery a	29	345,006	796,342	0.0007	0.0000		
17	Ethiopia	Value added	30 Office, accou	30	-	-	0.0000	0.0000		
18	Ethiopia	Value added	31 Electrical ma	31	9,614	4,670	0.0000	0.0000		
19	Ethiopia	Value added	32 Radio,televi	32	-	-	0.0000	0.0000		
20	Ethiopia	Value added	33 Medical, pre	33	-	-	0.0000	0.0000		
21	Ethiopia	Value added	34 Motor vehic	34	32,340,220	12,650,965	0.0694	0.0048		
22	Ethiopia	Value added	35 Other transp	35	-	509,866	0.0000	0.0000		
23	Ethiopia	Value added	36 Furniture; m	36	7,462,707	21,328,454	0.0160	0.0003		
24	Ethiopia	Value added	37 Recycling	37	-	-	0.0000	0.0000		
25	**Ethiopia**	**Value added**	**D Total manufa**	**D**	**466,143,461**	**971,905,566**	**HHI**	**0.2709**		

4) To get the HHI we will then simply add up all the shares (you can do this quickly by using the **AutoSum button** in the **Home** menu of Excel).

From the example above, we can see that Ethiopia has an HHI of 0.27 in 2000, which is indicative of a fairly diversified industrial structure. We will remember from Part I above that if there was only one manufacturing activity or sub-sector in the county we would see an HHI value of 1, which would mean there was no diversification but total concentration in one single activity.

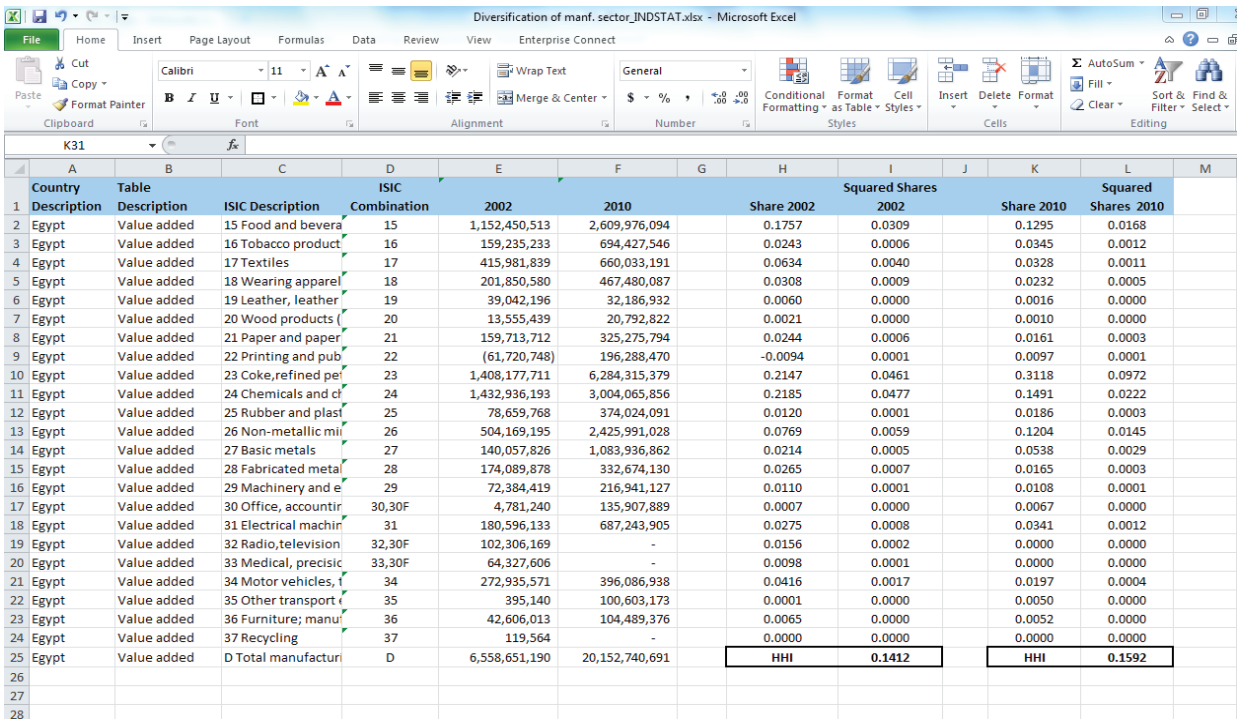
5) In order to determine if Ethiopia's manufacturing sector has become more diversified over time, we will simply repeat the process above for the 2009 data.

	A	B	C	D	E	F	G	H	I	J	K	L
1	Country Description	Table Description	ISIC Description	ISIC Combination	2000	2009		Share 2000	Squared Shares 2000		Share 2009	Squared Shares 2009
2	Ethiopia	Value added	15 Food and beve	15	230,831,202	400,591,632		0.4952	0.2452		0.4122	0.1699
3	Ethiopia	Value added	16 Tobacco produ	16	21,996,018	40,150,965		0.0472	0.0022		0.0413	0.0017
4	Ethiopia	Value added	17 Textiles	17	28,846,964	45,248,438		0.0619	0.0038		0.0466	0.0022
5	Ethiopia	Value added	18 Wearing appar	18	3,372,657	6,423,125		0.0072	0.0001		0.0066	0.0000
6	Ethiopia	Value added	19 Leather, leathe	19	22,012,082	26,700,601		0.0472	0.0022		0.0275	0.0008
7	Ethiopia	Value added	20 Wood product	20	2,440,838	3,665,602		0.0052	0.0000		0.0038	0.0000
8	Ethiopia	Value added	21 Paper and pap	21	5,779,664	17,404,055		0.0124	0.0002		0.0179	0.0003
9	Ethiopia	Value added	22 Printing and pu	22	15,050,881	32,850,326		0.0323	0.0010		0.0338	0.0011
10	Ethiopia	Value added	23 Coke,refined p	23	-	-		0.0000	0.0000		0.0000	0.0000
11	Ethiopia	Value added	24 Chemicals and	24	22,010,622	77,488,283		0.0472	0.0022		0.0797	0.0064
12	Ethiopia	Value added	25 Rubber and pla	25	20,872,529	59,534,285		0.0448	0.0020		0.0613	0.0038
13	Ethiopia	Value added	26 Non-metallic m	26	36,654,554	144,016,947		0.0786	0.0062		0.1482	0.0220
14	Ethiopia	Value added	27 Basic metals	27	9,706,398	35,472,762		0.0208	0.0004		0.0365	0.0013
15	Ethiopia	Value added	28 Fabricated me	28	6,411,505	47,068,248		0.0138	0.0002		0.0484	0.0023
16	Ethiopia	Value added	29 Machinery and	29	345,006	796,342		0.0007	0.0000		0.0008	0.0000
17	Ethiopia	Value added	30 Office, accoun	30	-	-		0.0000	0.0000		0.0000	0.0000
18	Ethiopia	Value added	31 Electrical mach	31	9,614	4,670		0.0000	0.0000		0.0000	0.0000
19	Ethiopia	Value added	32 Radio,televisio	32	-	-		0.0000	0.0000		0.0000	0.0000
20	Ethiopia	Value added	33 Medical, preci	33	-	-		0.0000	0.0000		0.0000	0.0000
21	Ethiopia	Value added	34 Motor vehicles	34	32,340,220	12,650,965		0.0694	0.0048		0.0130	0.0002
22	Ethiopia	Value added	35 Other transpo	35	-	509,866		0.0000	0.0000		0.0005	0.0000
23	Ethiopia	Value added	36 Furniture; mar	36	7,462,707	21,328,454		0.0160	0.0003		0.0219	0.0005
24	Ethiopia	Value added	37 Recycling	37	-	-		0.0000	0.0000		0.0000	0.0000
25	Ethiopia	Value added	D Total manufact	D	466,143,461	971,905,566		HHI	0.2709		HHI	0.2124
26												

We can see from our calculations that the HHI in Ethiopia declined from 0.27 in 2000 to 0.21 in 2009, indicating that the industrial structure has become more diversified (i.e. less concentrated over that time period).

6) Calculate the HHI for all comparator countries using the same methodology as above.

See example below for Egypt:



	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Country Description	Table Description	ISIC Description	ISIC Combination	2002	2010		Share 2002	Squared Shares 2002		Share 2010	Squared Shares 2010	
2	Egypt	Value added	15 Food and bevera	15	1,152,450,513	2,609,976,094		0.1757	0.0309		0.1295	0.0168	
3	Egypt	Value added	16 Tobacco product	16	159,235,233	694,427,546		0.0243	0.0006		0.0345	0.0012	
4	Egypt	Value added	17 Textiles	17	415,981,839	660,033,191		0.0634	0.0040		0.0328	0.0011	
5	Egypt	Value added	18 Wearing apparel	18	201,850,580	467,480,087		0.0308	0.0009		0.0232	0.0005	
6	Egypt	Value added	19 Leather, leather	19	39,042,196	32,186,932		0.0060	0.0000		0.0016	0.0000	
7	Egypt	Value added	20 Wood products (	20	13,555,439	20,792,822		0.0021	0.0000		0.0010	0.0000	
8	Egypt	Value added	21 Paper and paper	21	159,713,712	325,275,794		0.0244	0.0006		0.0161	0.0003	
9	Egypt	Value added	22 Printing and pub	22	(61,720,748)	196,288,470		-0.0094	0.0001		0.0097	0.0001	
10	Egypt	Value added	23 Coke,refined pe	23	1,408,177,711	6,284,315,379		0.2147	0.0461		0.3118	0.0972	
11	Egypt	Value added	24 Chemicals and ch	24	1,432,936,193	3,004,065,856		0.2185	0.0477		0.1491	0.0222	
12	Egypt	Value added	25 Rubber and plast	25	78,659,768	374,024,091		0.0120	0.0001		0.0186	0.0003	
13	Egypt	Value added	26 Non-metallic mi	26	504,169,195	2,425,991,028		0.0769	0.0059		0.1204	0.0145	
14	Egypt	Value added	27 Basic metals	27	140,057,826	1,083,936,862		0.0214	0.0005		0.0538	0.0029	
15	Egypt	Value added	28 Fabricated metal	28	174,089,878	332,674,130		0.0265	0.0007		0.0165	0.0003	
16	Egypt	Value added	29 Machinery and e	29	72,384,419	216,941,127		0.0110	0.0001		0.0108	0.0001	
17	Egypt	Value added	30 Office, accountir	30,30F	4,781,240	135,907,889		0.0007	0.0000		0.0067	0.0000	
18	Egypt	Value added	31 Electrical machir	31	180,596,133	687,243,905		0.0275	0.0008		0.0341	0.0012	
19	Egypt	Value added	32 Radio,television	32,30F	102,306,169	-		0.0156	0.0002		0.0000	0.0000	
20	Egypt	Value added	33 Medical, precisic	33,30F	64,327,606	-		0.0098	0.0001		0.0000	0.0000	
21	Egypt	Value added	34 Motor vehicles, t	34	272,935,571	396,086,938		0.0416	0.0017		0.0197	0.0004	
22	Egypt	Value added	35 Other transport e	35	395,140	100,603,173		0.0001	0.0000		0.0050	0.0000	
23	Egypt	Value added	36 Furniture; manu	36	42,606,013	104,489,376		0.0065	0.0000		0.0052	0.0000	
24	Egypt	Value added	37 Recycling	37	119,564	-		0.0000	0.0000		0.0000	0.0000	
25	Egypt	Value added	D Total manufactur	D	6,558,651,190	20,152,740,691		HHI	0.1412		HHI	0.1592	
26													
27													
28													

c. ***Data Illustration/Interpretation:***

Depending on the number of countries you will be comparing, you may want to use a bar graph to illustrate relative country trends in terms of their levels of diversification over time. When we compare Ethiopia with Egypt, we find that Egypt is more diversified with an HHI of 0.14 in 2002 but that it became slightly more concentrated over time, with the HHI increasing to 0.16 in 2010.

Note: This could be due to the fact that Egypt did not report any data for three of the sectors in 2010, which means that, by definition, you would see an increased concentration as there are fewer real sectors being analysed.

From the calculation of sector shares, we can see that Ethiopia's industrial structure is dominated by agro-processing activities (which account for over 40% of MVA). This however, is a fairly natural industrial structure at early stages of development and, depending on the level of local embeddedness of the local agro-processing industry, can be a good sign since an expansion of agro-processing activities will increase demand for agriculture goods, thereby increasing the incomes of the rural poor.

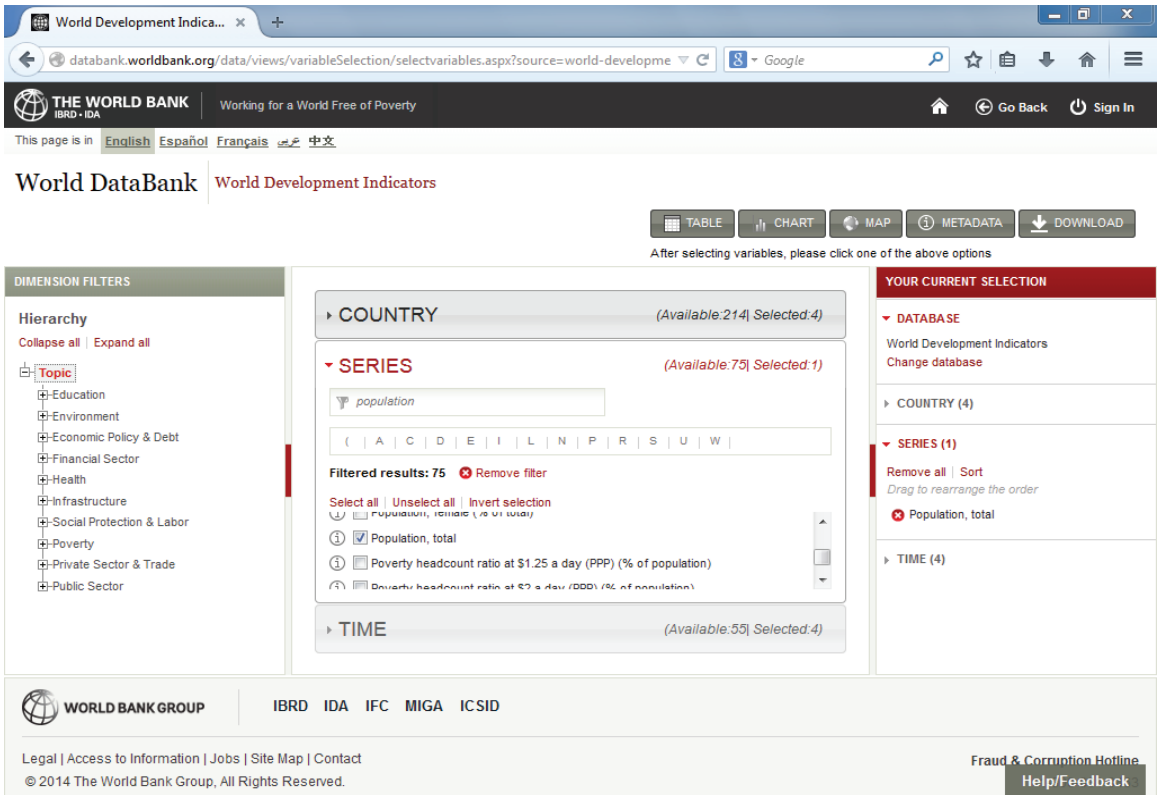
9) **Indicator: Export Capacity (Mnf. Exports/ Capita)**

a. ***Data Selection***

In order to calculate the export capacity of countries, we will need to use WDI databank to get the data on country population and the World Integrated Trade Solutions (WITS) database to get the data on exports.

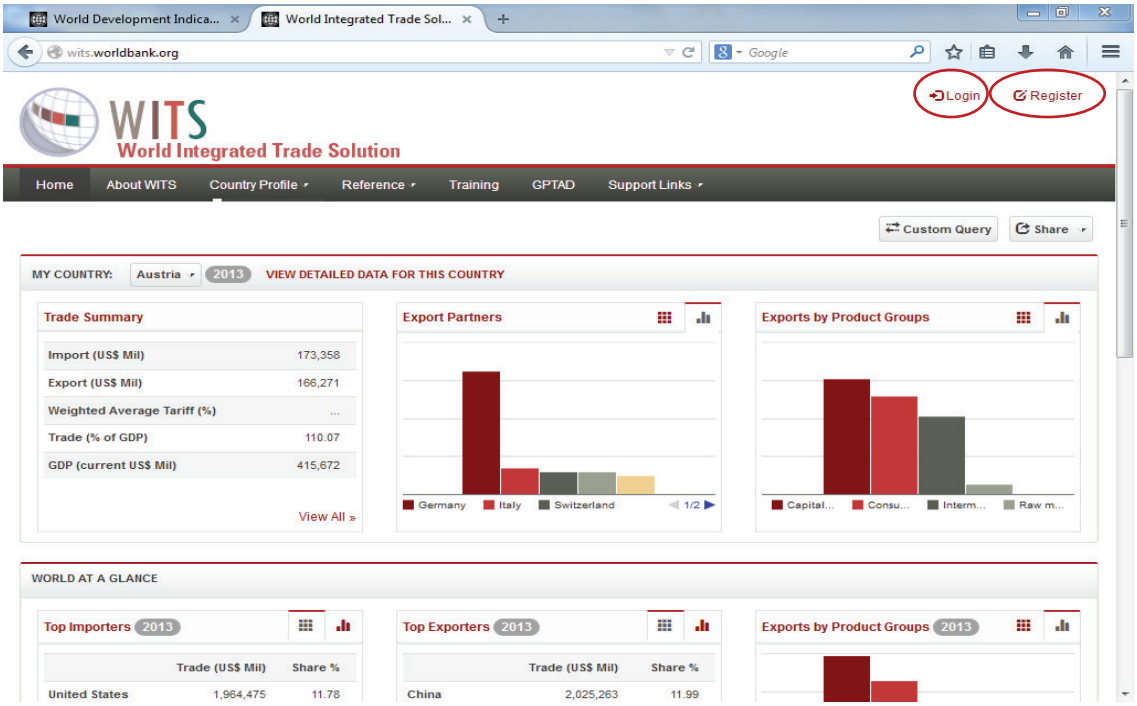
1) Get population data from WDI:

To get the population data you will select your COUNTRYs, YEARS and under SERIES check the **"Population, total"** box. Then download the data.



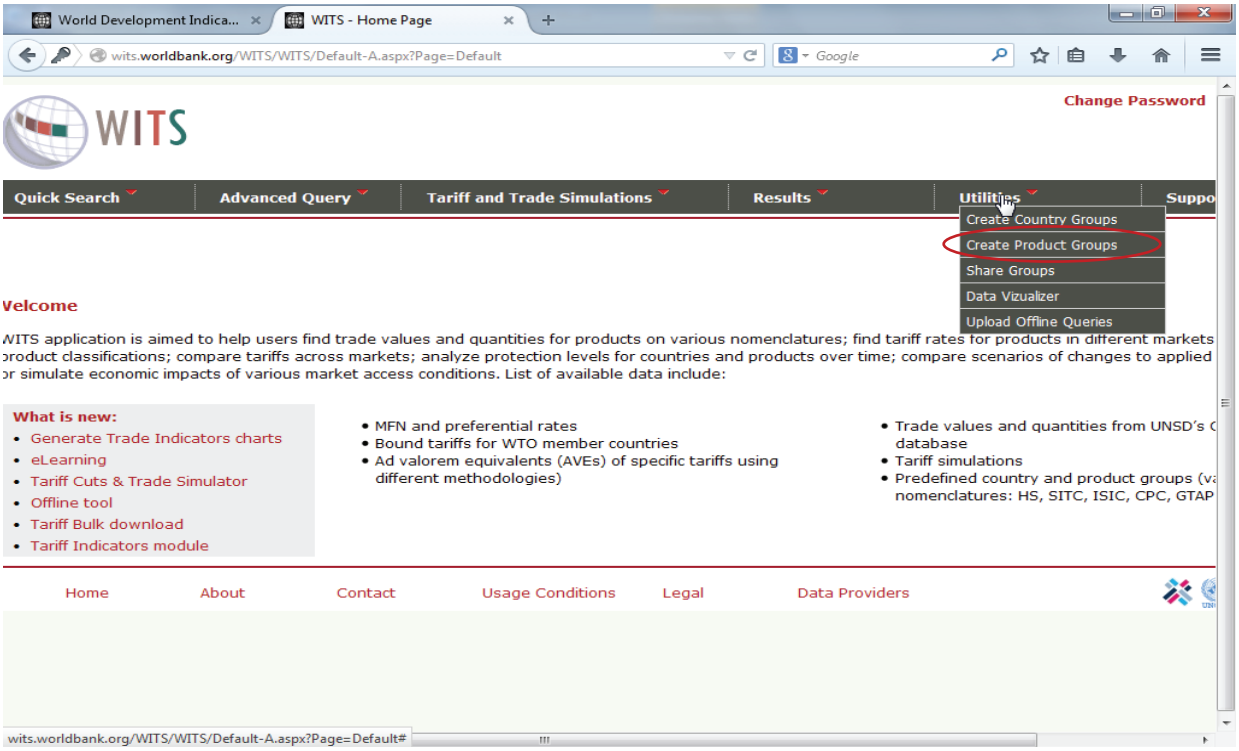
2) To get manufactured export data we will need to use a new database, WITS. You can access the database by going to: http://wits.worldbank.org

You will first need to **register**:

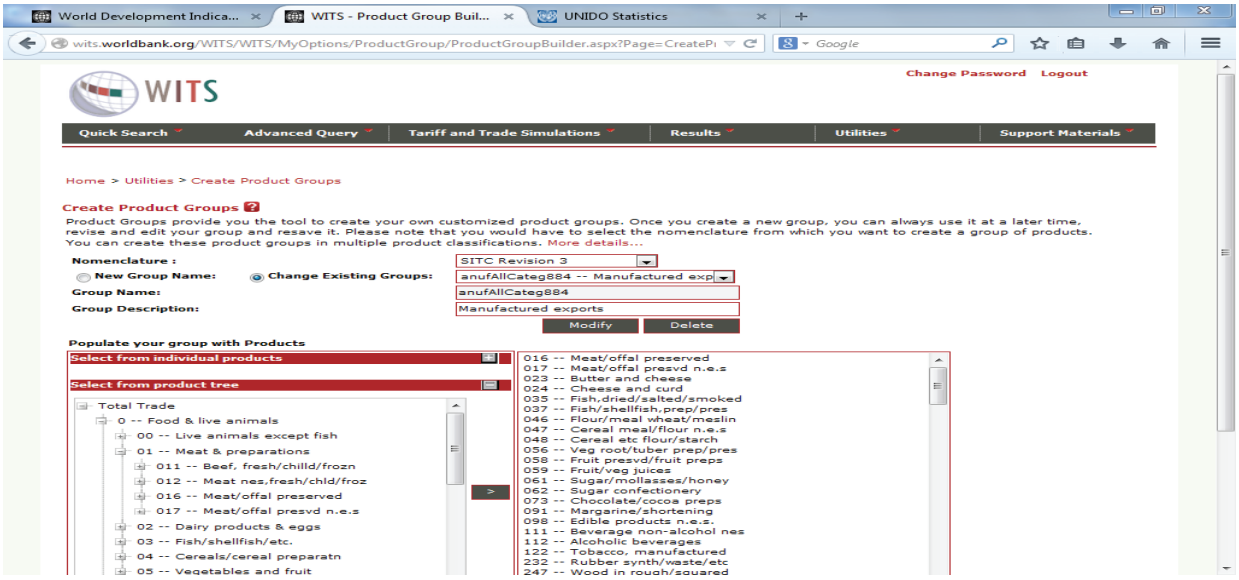


3) Once you have registered you will receive your login credentials via email. You can use these login credentials to log in to WITS through the **Login button** at the top right (see above screenshot) and you will be taken to a new page that looks like the one below. Trade data are categorised according to different classification schemes. At UNIDO, we typically use the Standard International Trade Classification, Revision 3 (SITC Rev. 3). UNIDO also has its own definition of which SITC chapters and codes make up manufactured exports; please see Table 1 in Tool 2 on "sub-sector competitive performance" for a full list. WITS allows you to create your own product groups; for example, you can create a product group called "manufactured products" which is defined to comprise those SITC chapters that are listed in said Table 1 of Tool 2.

To do so, you need to click on **Utilities**, then on **Create Product Groups** from the drop down menu, and then select the relevant SITC chapters.

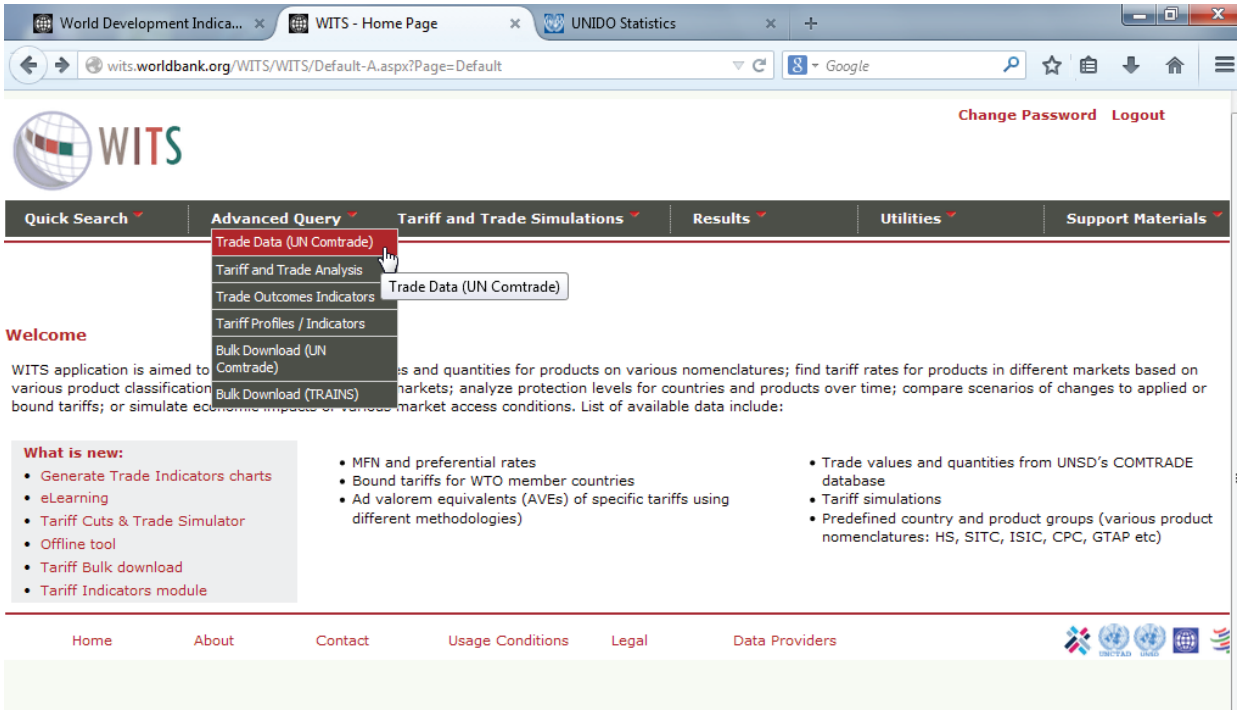


4) However, WITS allows its users to share product groups that they have created with other users. In our trainings, we will therefore send you a product group that UNIDO staff has created which includes all manufactured exports. It will look like the following:

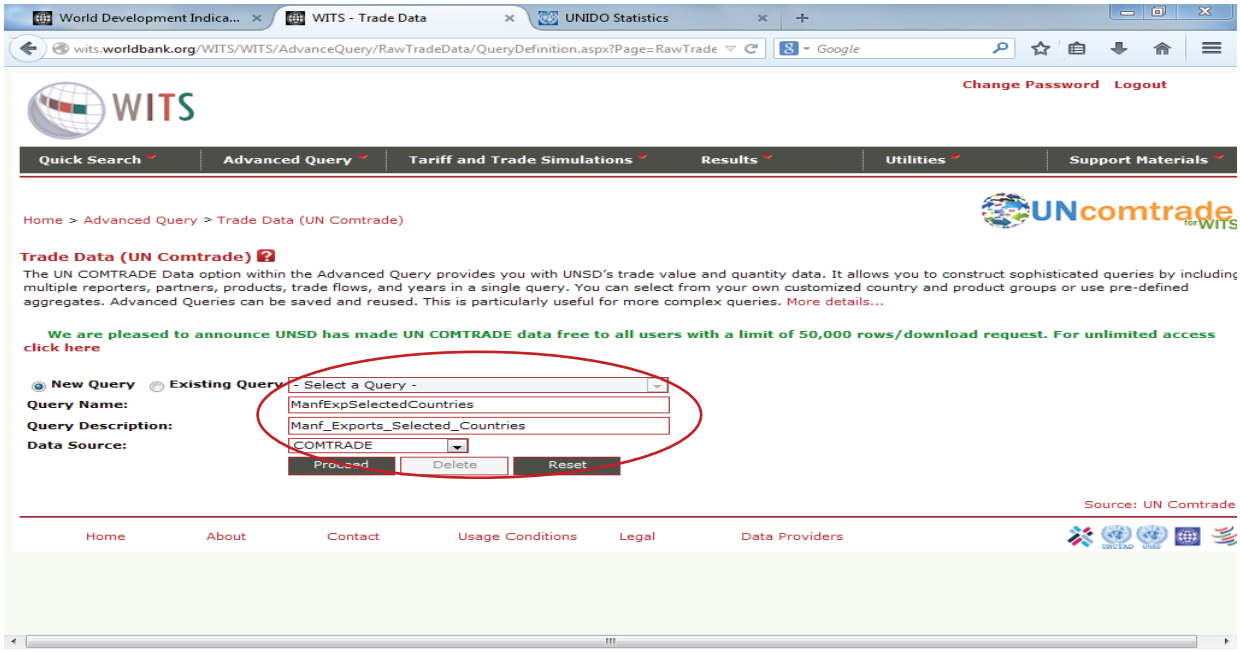


Note: If you do not attend a UNIDO training on this toolkit you can alternatively select the item "Manufacturing" under the Standard Product Groups in the data query menu. It will be less refined than UNIDO's but still a good approximation for determining countries export capacity.

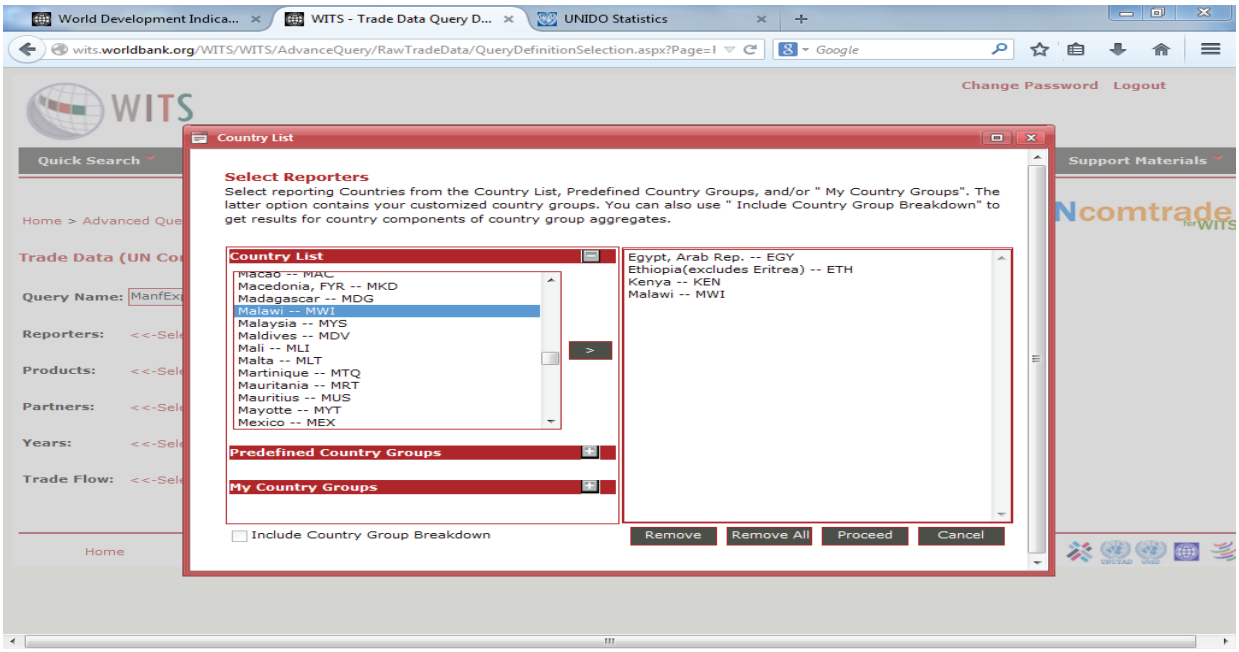
5) Now we are ready to get the data. Go to **Advanced Query** and select **Trade Data (UN Comtrade)**, as per below screen shot:



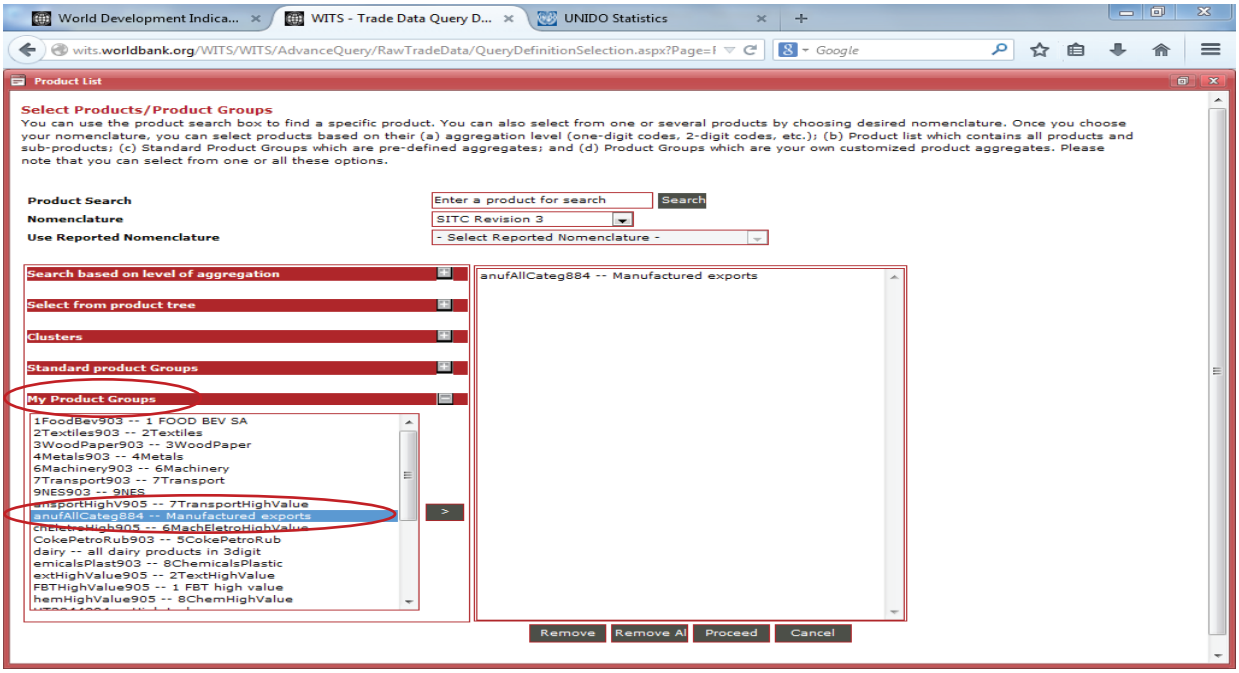
6) Give a name to the Query, which meaningfully describes the data that you are analysing (e.g. manufactured exports):



7) Once you click on the **Proceed button**, a new window will open where you will be asked to define various dimensions of your data query. In a first step, you need to **Select Reporters** (e.g. countries you want to examine) by selecting each country under the Country List an then clicking on the **› button** to move them into the right side box.

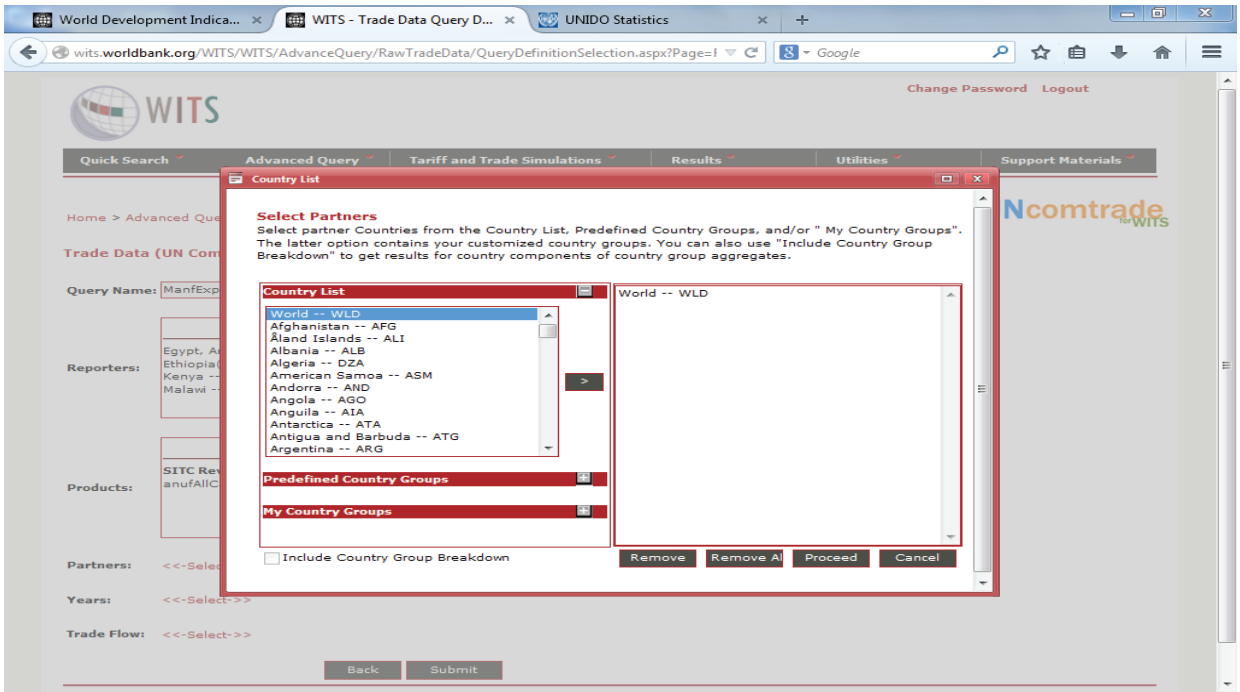


8) Under **Products,** we can select our predefined manufactured exports group under **My Product Group**



9) Select your **Partners** (e.g. the destination countries of your exports).

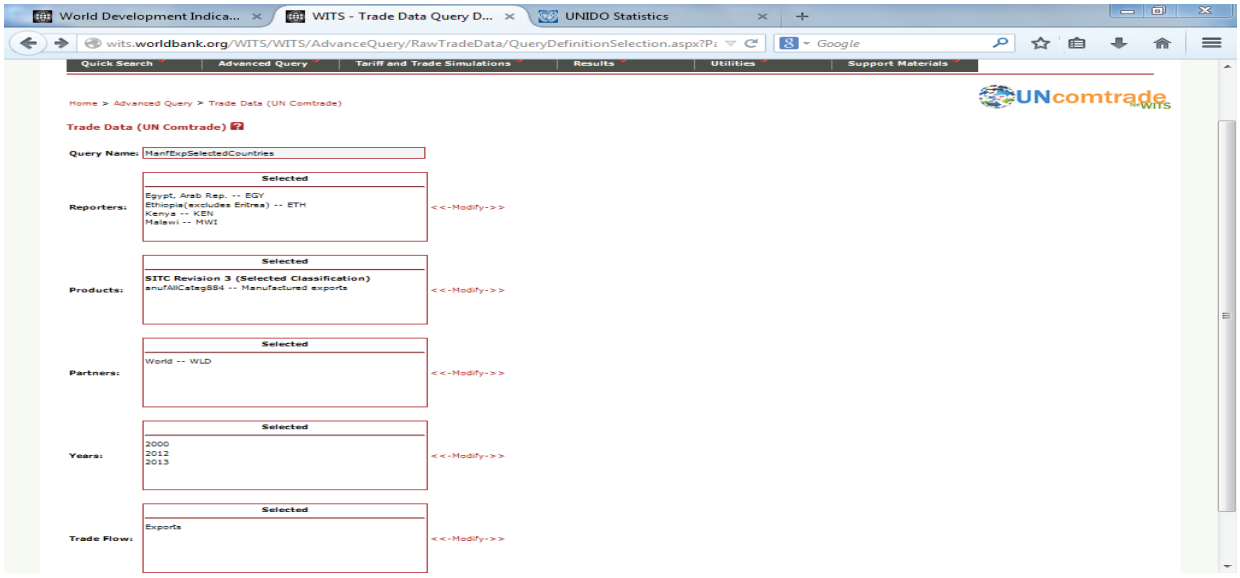
In this case we will choose **"World"** because we are interested in knowing the total value of all manufactured exports from the selected countries.



10) Choose the **Years** you want to examine (e.g. 2000, 2012, and 2013).

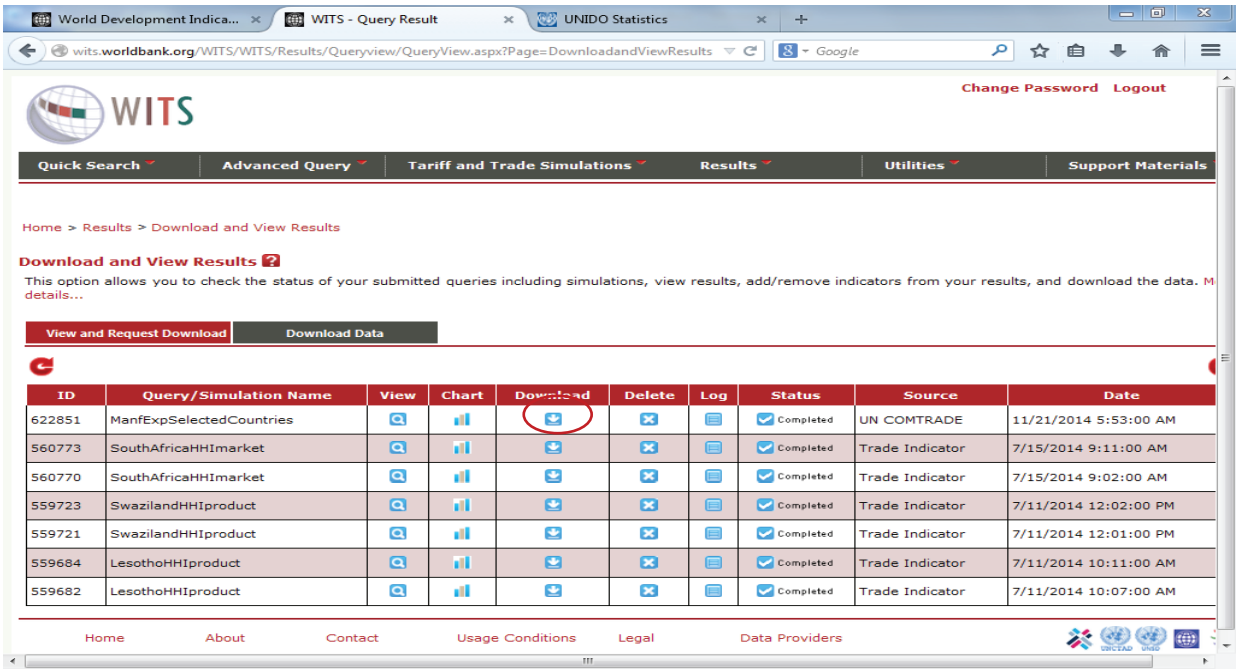
11) Finally, under **Trade Flows** we will select **Export.**

Once you have selected all the variables, the final window will look something like this:



12) Click **Submit**

13) A new window will pop up:



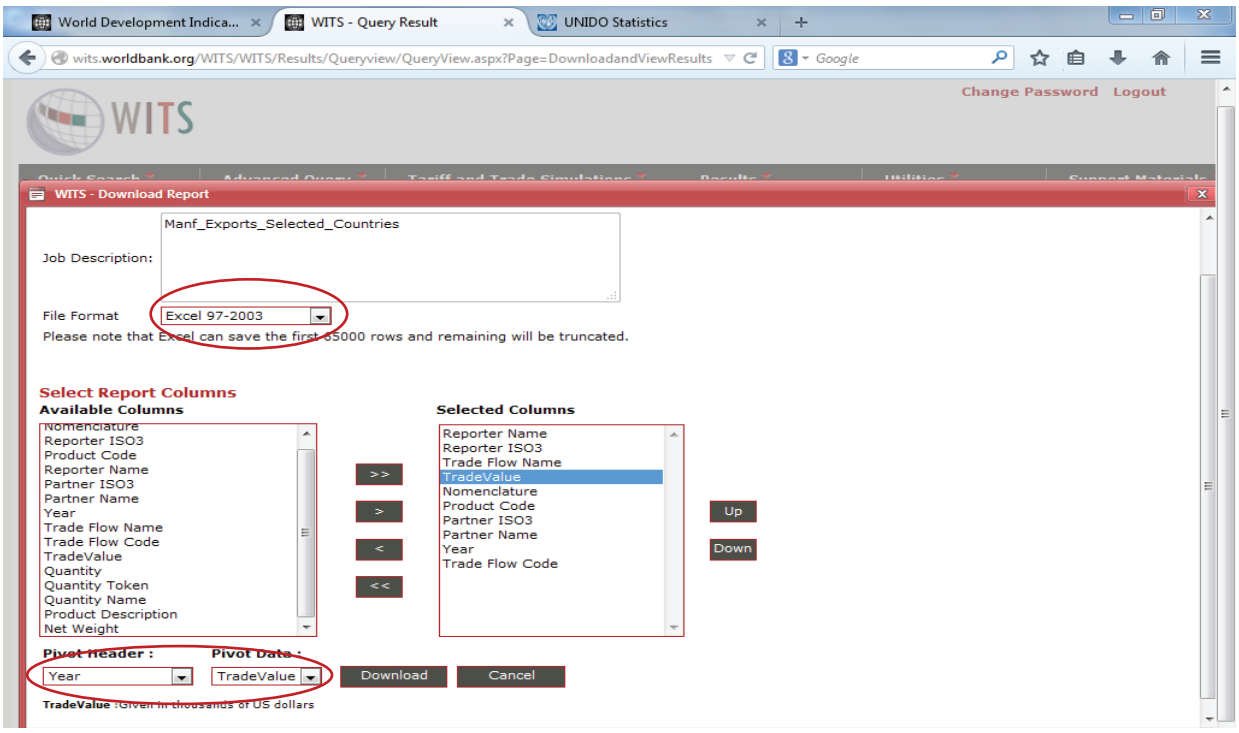
14) Select **Download** and a new window will show up where you will need to select the following:

- File Format: **Excel 97-2003**

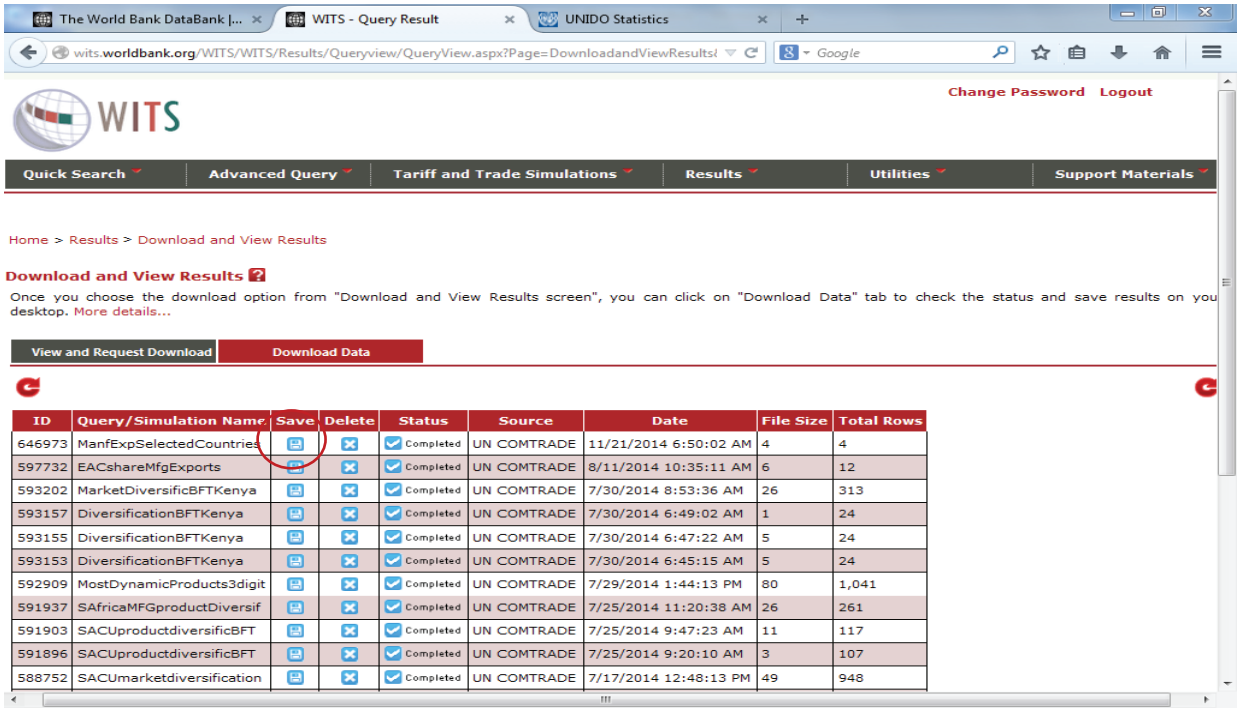
- Pivot Header: **Year**

- Pivot Data: **Trade Value**

*Note: In the **Selected Columns** box to the right you can determine in which order the selected parameters/variables will show up in the Excel file you download. It's usually recommendable to have "Reporter Name" as the first item on this list. You can add additional parameters/variables from the **Available Columns** box at the left-hand side. It is often useful to select and add the "Product Description" item from that list.*



15) Select **Download** and you will be taken to a new page. Now select your dataset under the menu **Download Data** by pressing the **Save button.**



ID	Query/Simulation Name	Save	Delete	Status	Source	Date	File Size	Total Rows
646973	ManfExpSelectedCountries			Completed	UN COMTRADE	11/21/2014 6:50:02 AM	4	4
597732	EACshareMfgExports			Completed	UN COMTRADE	8/11/2014 10:35:11 AM	6	12
593202	MarketDiversificBFTKenya			Completed	UN COMTRADE	7/30/2014 8:53:36 AM	26	313
593157	DiversificationBFTKenya			Completed	UN COMTRADE	7/30/2014 6:49:02 AM	1	24
593155	DiversificationBFTKenya			Completed	UN COMTRADE	7/30/2014 6:47:22 AM	5	24
593153	DiversificationBFTKenya			Completed	UN COMTRADE	7/30/2014 6:45:15 AM	5	24
592909	MostDynamicProducts3digit			Completed	UN COMTRADE	7/29/2014 1:44:13 PM	80	1,041
591937	SAfricaMFGproductDiversif			Completed	UN COMTRADE	7/25/2014 11:20:38 AM	26	261
591903	SACUproductdiversificBFT			Completed	UN COMTRADE	7/25/2014 9:47:23 AM	11	117
591896	SACUproductdiversificBFT			Completed	UN COMTRADE	7/25/2014 9:20:10 AM	3	107
588752	SACUmarketdiversification			Completed	UN COMTRADE	7/17/2014 12:48:13 PM	49	948

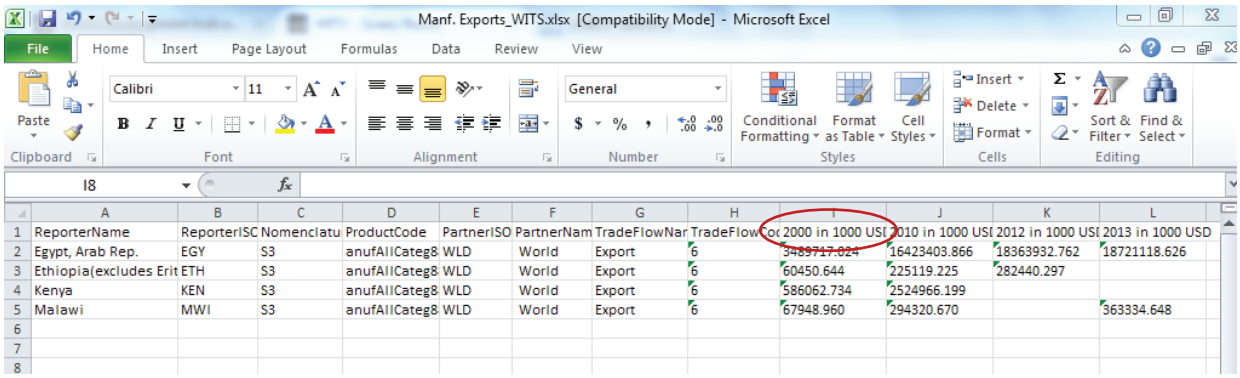
Note: If you don't see your dataset simply press the refresh button until it shows up.

b. ***Data Analysis***

Now that we have the population and export data for our countries and for the years in question, we simply divide the export values by the population to determine the countries' respective manufactured export capacity.

To ensure comparability across countries we chose 2000 and 2010 as those are the years where all data is complete for all countries.

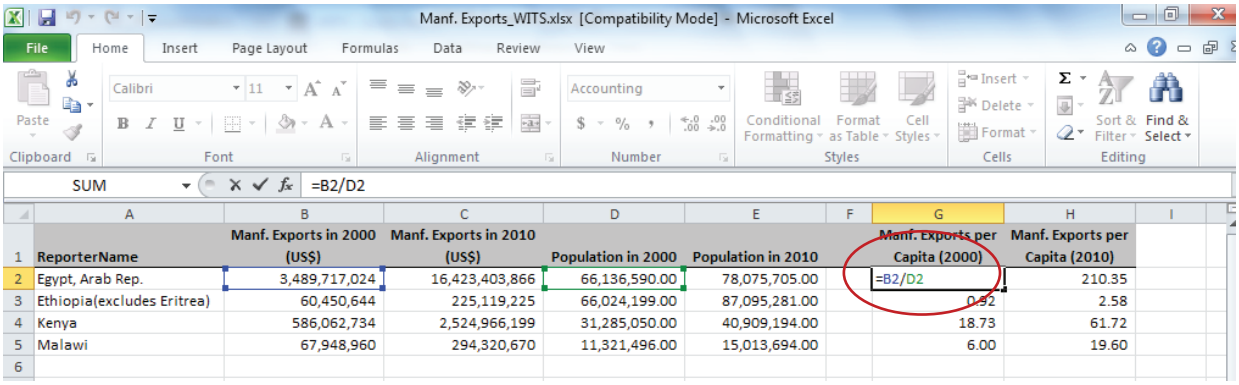
1) Since exports are reported in US$ 1,000 you have to multiply the values you get from WITS by 1,000 in order for you to have the exports in absolute numbers.



	A	B	C	D	E	F	G	H	I	J	K	L
1	ReporterName	ReporterISC	Nomenclatu	ProductCode	PartnerISO	PartnerNam	TradeFlowNar	TradeFlowCo	2000 in 1000 US	2010 in 1000 US	2012 in 1000 US	2013 in 1000 USD
2	Egypt, Arab Rep.	EGY	S3	anufAllCateg8	WLD	World	Export	6	3489717.024	16423403.866	18363932.762	18721118.626
3	Ethiopia(excludes Erit	ETH	S3	anufAllCateg8	WLD	World	Export	6	60450.644	225119.225	282440.297	
4	Kenya	KEN	S3	anufAllCateg8	WLD	World	Export	6	586062.734	2524966.199		
5	Malawi	MWI	S3	anufAllCateg8	WLD	World	Export	6	67948.960	294320.670		363334.648
6												
7												
8												

2) Create a new data sheet and copy both the export and the population data for all countries and years you want to analyse into this new work sheet.

3) Divide manufactured exports by population to get each country's manufactured export capacity, as seen below:



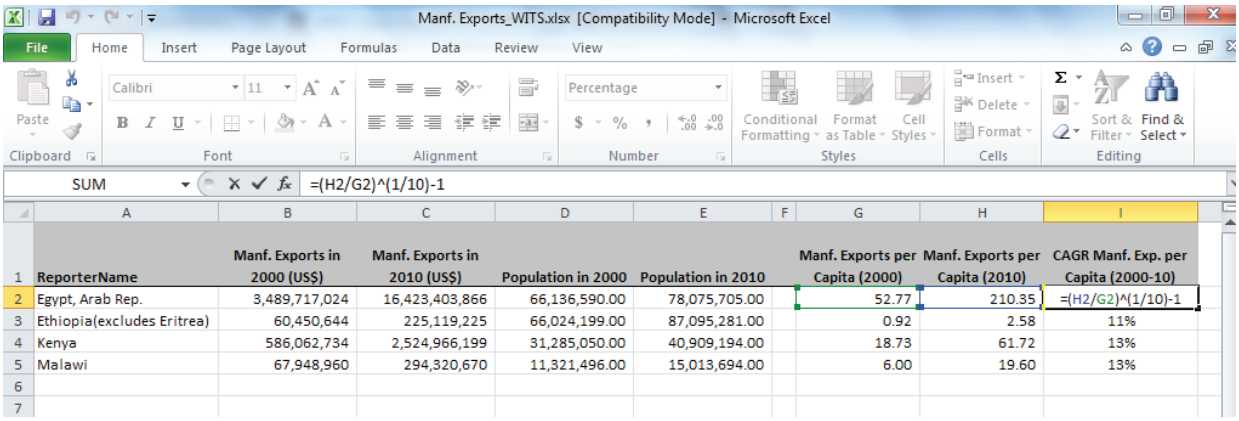
Manf. Exports_WITS.xlsx [Compatibility Mode] - Microsoft Excel

SUM =B2/D2

	A	B	C	D	E	F	G	H	I
1	ReporterName	Manf. Exports in 2000 (US$)	Manf. Exports in 2010 (US$)	Population in 2000	Population in 2010		Manf. Exports per Capita (2000)	Manf. Exports per Capita (2010)	
2	Egypt, Arab Rep.	3,489,717,024	16,423,403,866	66,136,590.00	78,075,705.00		=B2/D2	210.35	
3	Ethiopia(excludes Eritrea)	60,450,644	225,119,225	66,024,199.00	87,095,281.00		0.92	2.58	
4	Kenya	586,062,734	2,524,966,199	31,285,050.00	40,909,194.00		18.73	61.72	
5	Malawi	67,948,960	294,320,670	11,321,496.00	15,013,694.00		6.00	19.60	
6									

We now know how many US dollars of value are generated by the average citizen via manufacturing exports.

4) Calculate the CAGR for the export capacity for each country.



Manf. Exports_WITS.xlsx [Compatibility Mode] - Microsoft Excel

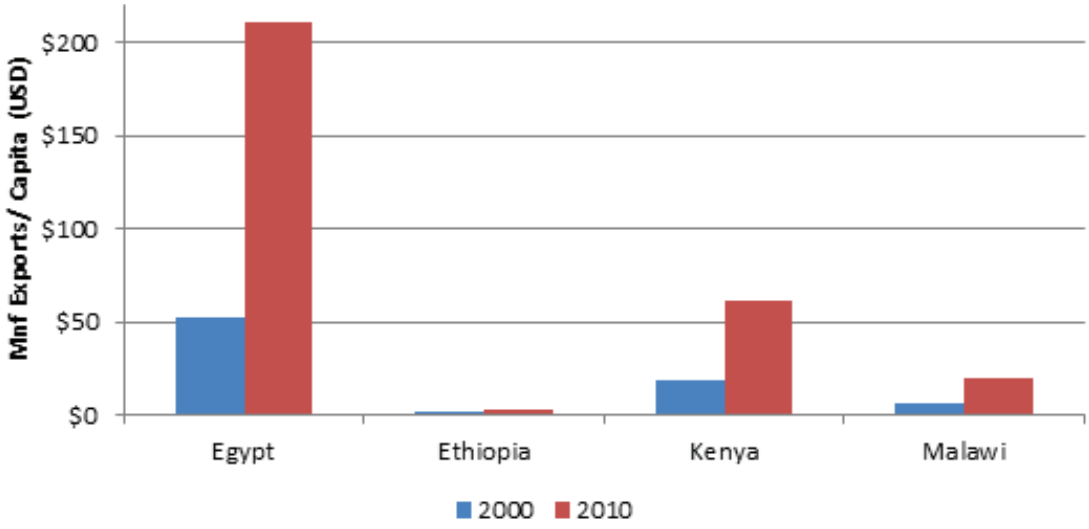
SUM =(H2/G2)^(1/10)-1

	A	B	C	D	E	F	G	H	I
1	ReporterName	Manf. Exports in 2000 (US$)	Manf. Exports in 2010 (US$)	Population in 2000	Population in 2010		Manf. Exports per Capita (2000)	Manf. Exports per Capita (2010)	CAGR Manf. Exp. per Capita (2000-10)
2	Egypt, Arab Rep.	3,489,717,024	16,423,403,866	66,136,590.00	78,075,705.00		52.77	210.35	=(H2/G2)^(1/10)-1
3	Ethiopia(excludes Eritrea)	60,450,644	225,119,225	66,024,199.00	87,095,281.00		0.92	2.58	11%
4	Kenya	586,062,734	2,524,966,199	31,285,050.00	40,909,194.00		18.73	61.72	13%
5	Malawi	67,948,960	294,320,670	11,321,496.00	15,013,694.00		6.00	19.60	13%
6									
7									

c. ***Data Illustration/Interpretation:***

We can illustrate countries' relative manufactured export capacity performance by using a bar graph. See Figure 4 for an example.

Figure 4: Manufactured export capacity (in US$) of selected countries, 2000-2010



What we can clearly see from this graph is that Ethiopia not only has the lowest value of manufactured exports per capita but also has seen the smallest growth rate from 2000-2010. Egypt has seen the highest export growth overt this time period, but this could also be due to their higher level of development. At earlier stages of development, for lack of international capacity the manufacturing sector is often more domestically oriented and only as the manufacturing sector grows and matures becomes more export-oriented.

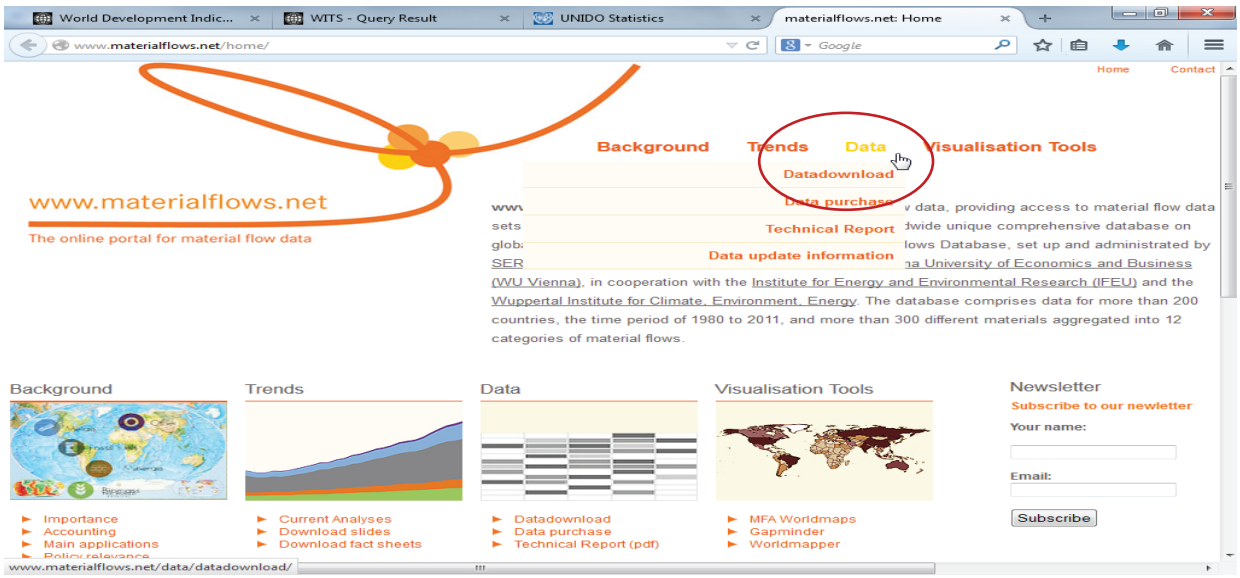
10) **Indicator: Resource Transformation (MVA/DMC)**

a. ***Data selection:***

In order to calculate our Resource Transformation indicator we can use the MVA data we have from earlier analyses and additionally download data for Domestic Material Consumption (DMC) from the Material Flows Database.

1) Go to www.materialflows.net

2) Under the **Data** item in the menu select **Datadownload**



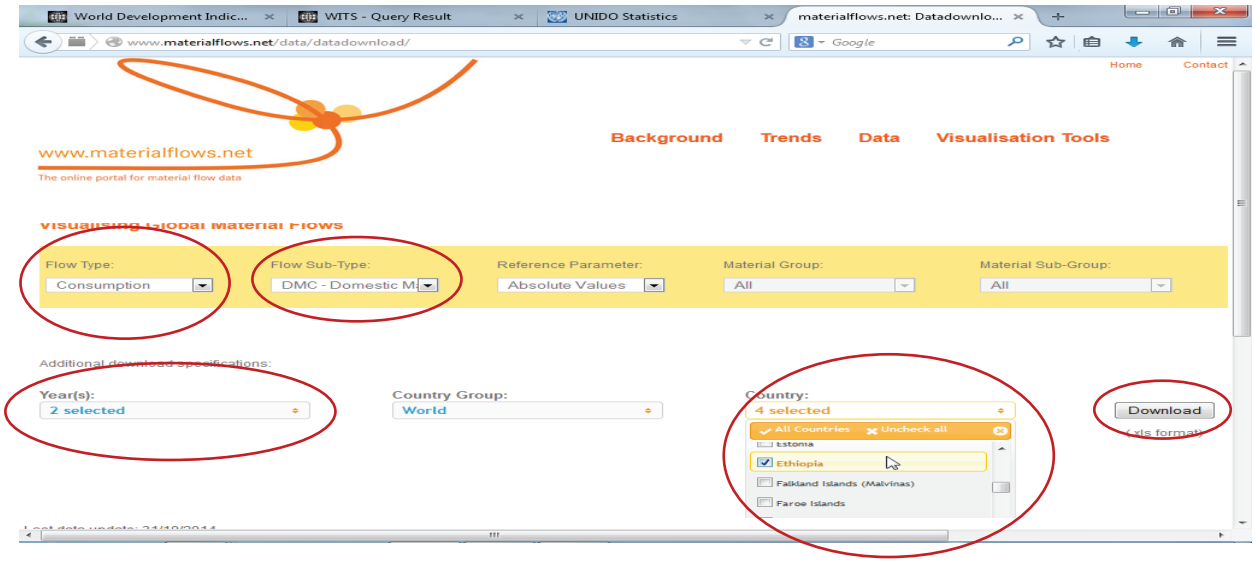
3) A new window will open where you will need to select the following:

- Flow Type: **Consumption**

- Flow Sub-Type: **DMC- Domestic Material Consumption**

- Years: The years you want to analyse, in our case 2000 and 2010

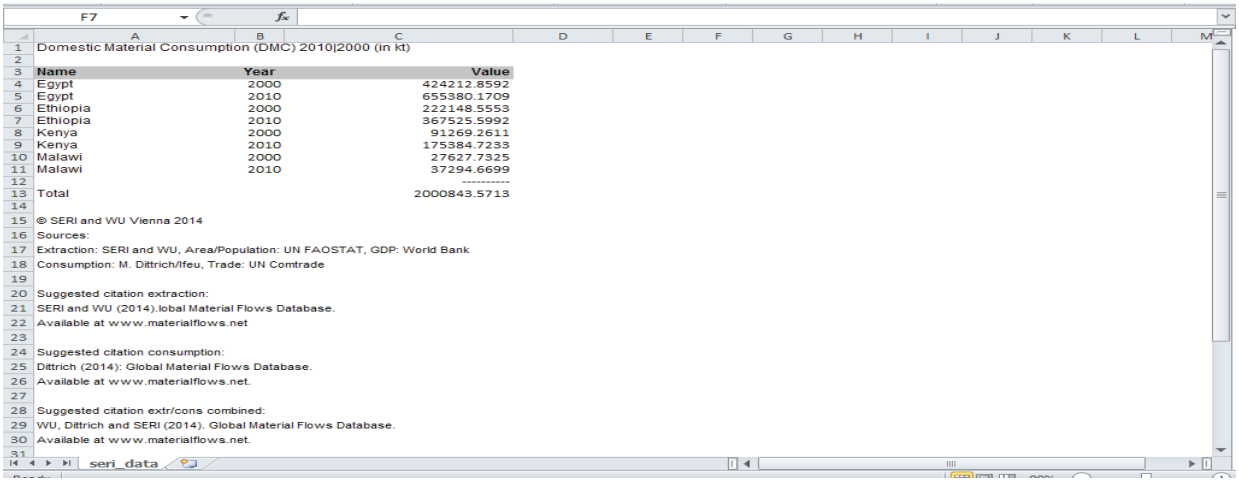
- Country: Select countries



4) Click **Download**

b. ***Data Analysis***

Once you have downloaded your data you should end up with a worksheet that looks something like this:



Domestic Material Consumption (DMC) 2010|2000 (in kt)

Name	Year	Value
Egypt	2000	424212.8592
Egypt	2010	655380.1709
Ethiopia	2000	222148.5553
Ethiopia	2010	367525.5992
Kenya	2000	91269.2611
Kenya	2010	175384.7233
Malawi	2000	27627.7325
Malawi	2010	37294.6699

Total		2000843.5713

© SERI and WU Vienna 2014
Sources:
Extraction: SERI and WU, Area/Population: UN FAOSTAT, GDP: World Bank
Consumption: M. Dittrich/Ifeu, Trade: UN Comtrade

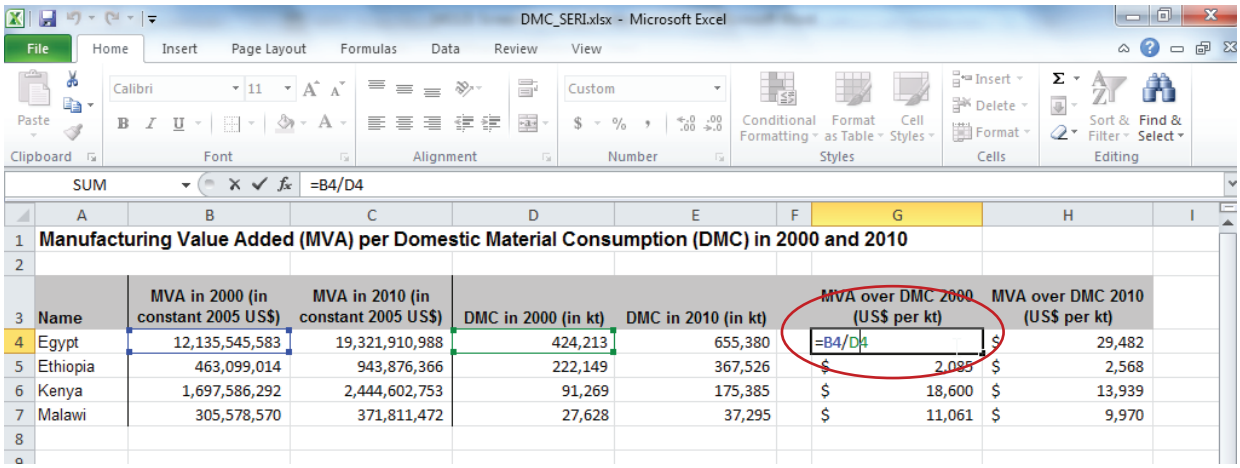
Suggested citation extraction:
SERI and WU (2014).lobal Material Flows Database.
Available at www.materialflows.net

Suggested citation consumption:
Dittrich (2014): Global Material Flows Database.
Available at www.materialflows.net.

Suggested citation extr/cons combined:
WU, Dittrich and SERI (2014). Global Material Flows Database.
Available at www.materialflows.net.

1) As we can see, DMC is reported in kilo tons (kt). We then will want to create a new Excel spreadsheet that has both MVA and DMV data in it so that we can calculate our Resource Transformation indicator.

2) We will then divide MVA by DMC to determine how much manufacturing value added is generated from all of the raw materials consumed in the economy.



DMC_SERI.xlsx - Microsoft Excel

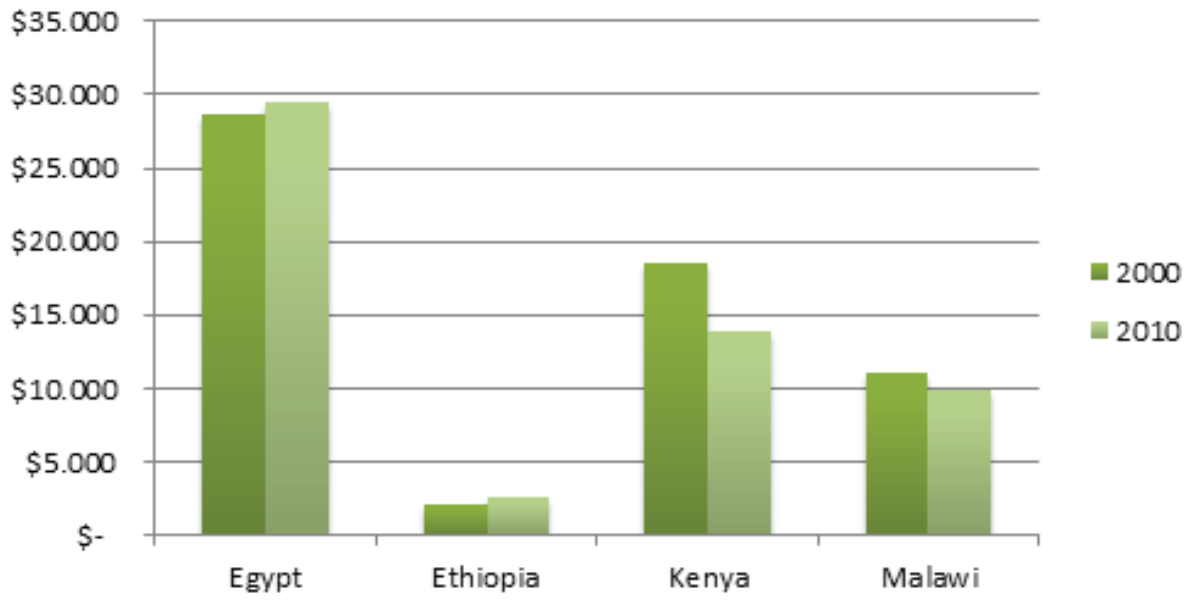
SUM =B4/D4

	A	B	C	D	E	F	G	H	I
1	Manufacturing Value Added (MVA) per Domestic Material Consumption (DMC) in 2000 and 2010								
2									
3	Name	MVA in 2000 (in constant 2005 US$)	MVA in 2010 (in constant 2005 US$)	DMC in 2000 (in kt)	DMC in 2010 (in kt)		MVA over DMC 2000 (US$ per kt)	MVA over DMC 2010 (US$ per kt)	
4	Egypt	12,135,545,583	19,321,910,988	424,213	655,380		=B4/D4	$ 29,482	
5	Ethiopia	463,099,014	943,876,366	222,149	367,526		$ 2,085	$ 2,568	
6	Kenya	1,697,586,292	2,444,602,753	91,269	175,385		$ 18,600	$ 13,939	
7	Malawi	305,578,570	371,811,472	27,628	37,295		$ 11,061	$ 9,970	
8									

c. ***Data Illustration/Interpretation:***

We can illustrate our Resource Transformation indicators by using a bar chart, see Figure 5 for an example.

Figure 5: Resource transformation efficiency (MVA/DMC in US$ per kt.), selected countries, 2000-2010



What we can see in Figure 5 is that Ethiopia is doing very poorly relative to its comparator countries in terms of generating manufacturing value added from all of the resources consumed in the economy. However, it has improved slightly over this period. By contrast, in Kenya and Malawi the resource transformation indicator has deteriorated which means that in 2010 their economies generated less MVA per kilo ton of materials consumed than in 2000, indicating declining performance.

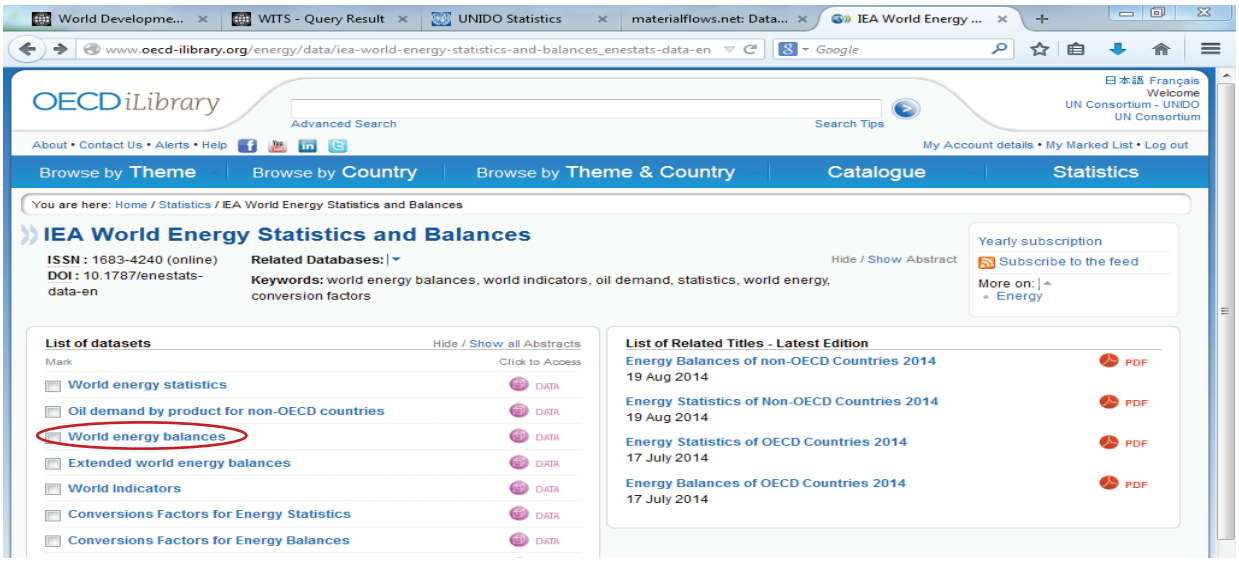
11) **Indicator: Energy Efficiency (MVA/Manufacturing Energy Consumption)**

a. ***Data Selection:***

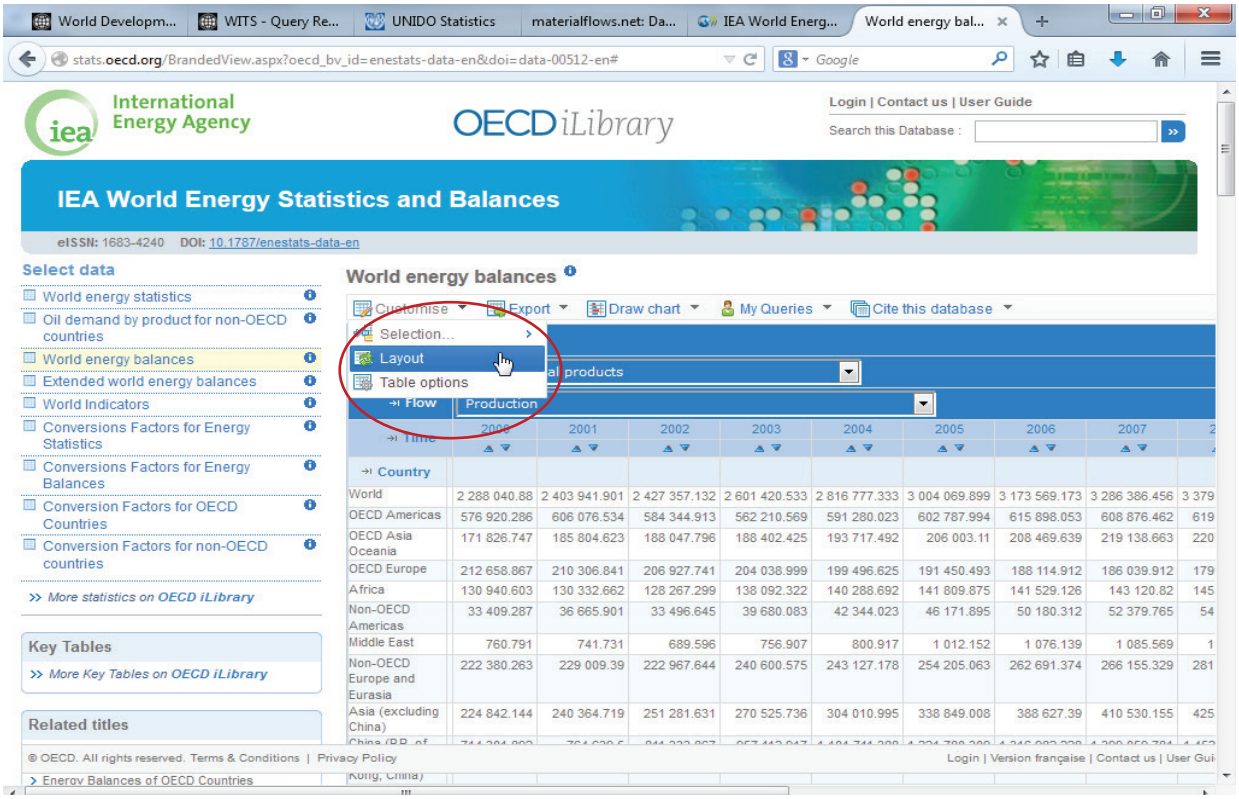
We can once again use the MVA data from our preceding analyses but we will need to additionally draw on the International Energy Agencies (IEA) database to get data on the energy consumption of the manufacturing sector. This IEA data is available through the OECD ilibrary.

1) Go to www.oecd-ilibrary.org/energy/data/iea-world-energy-statisics-and-balances_enestats-data-en

2) Click on **World Energy Balances**



3) Adjust the table layout using the **"Customise"** button and then click on **"Layout"**.

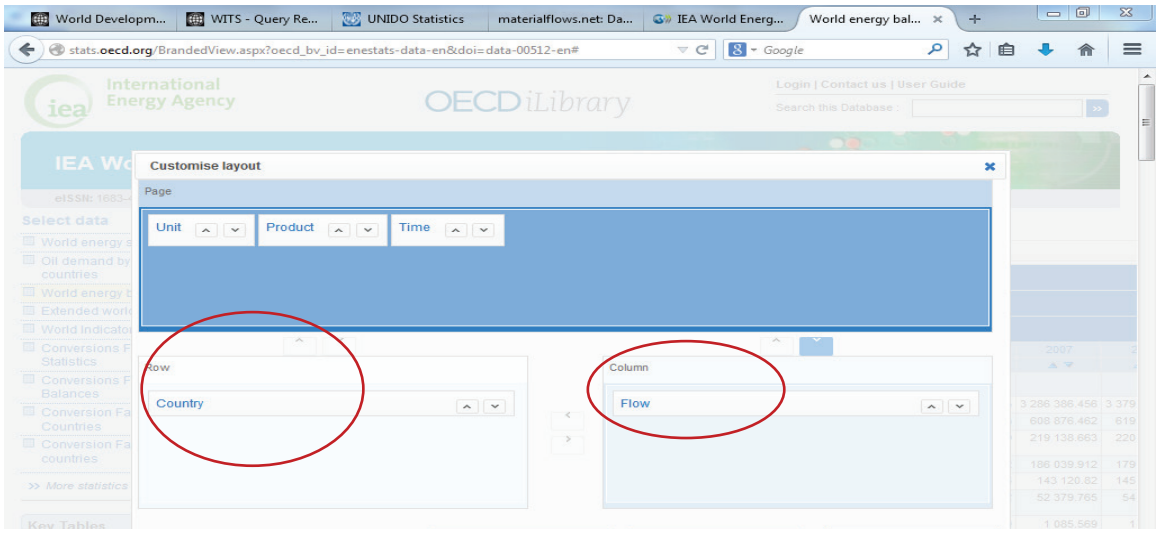


4) Select the following:

- Row: **Country**

- Column: **Flow**

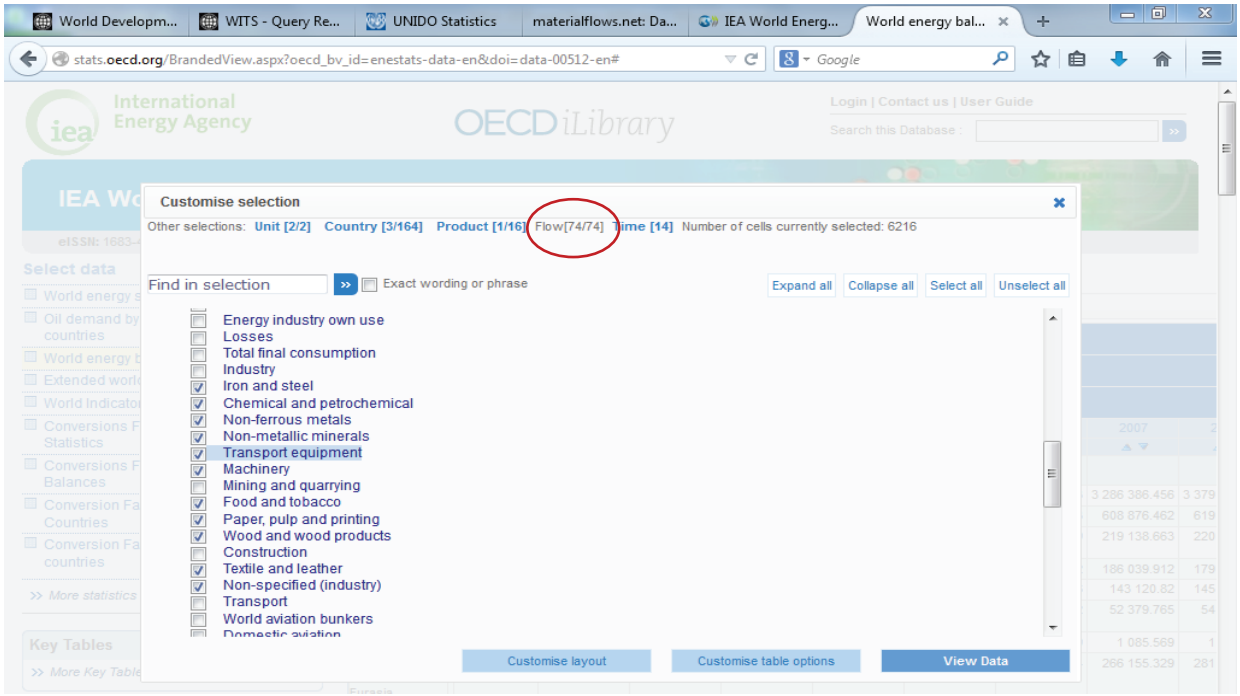
5) Then Press **"Customise Selection"**



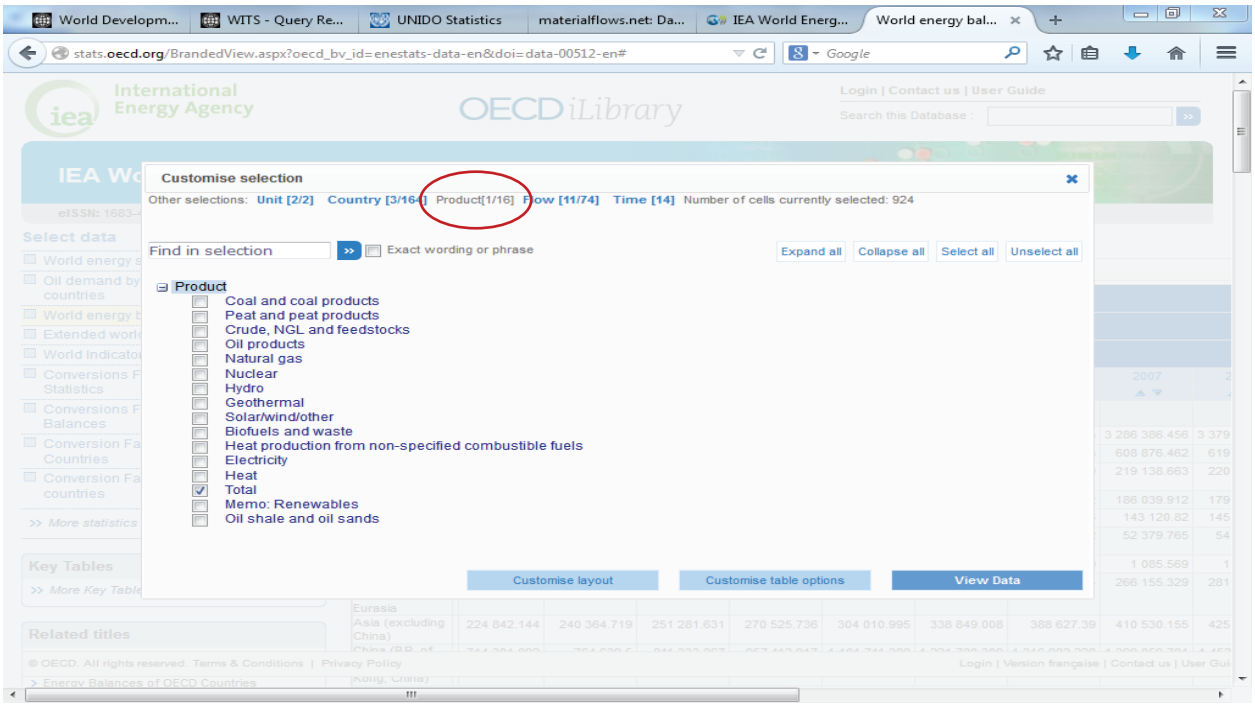
6) Go to **Country** and choose your select countries

7) Go to **Flow**: We do not want to get data for the industry sector because in addition to manufacturing it also includes mining & quarrying and construction. We therefore want to choose only those activities that are classified as manufacturing, so that energy consumption data is comparable with MVA data:

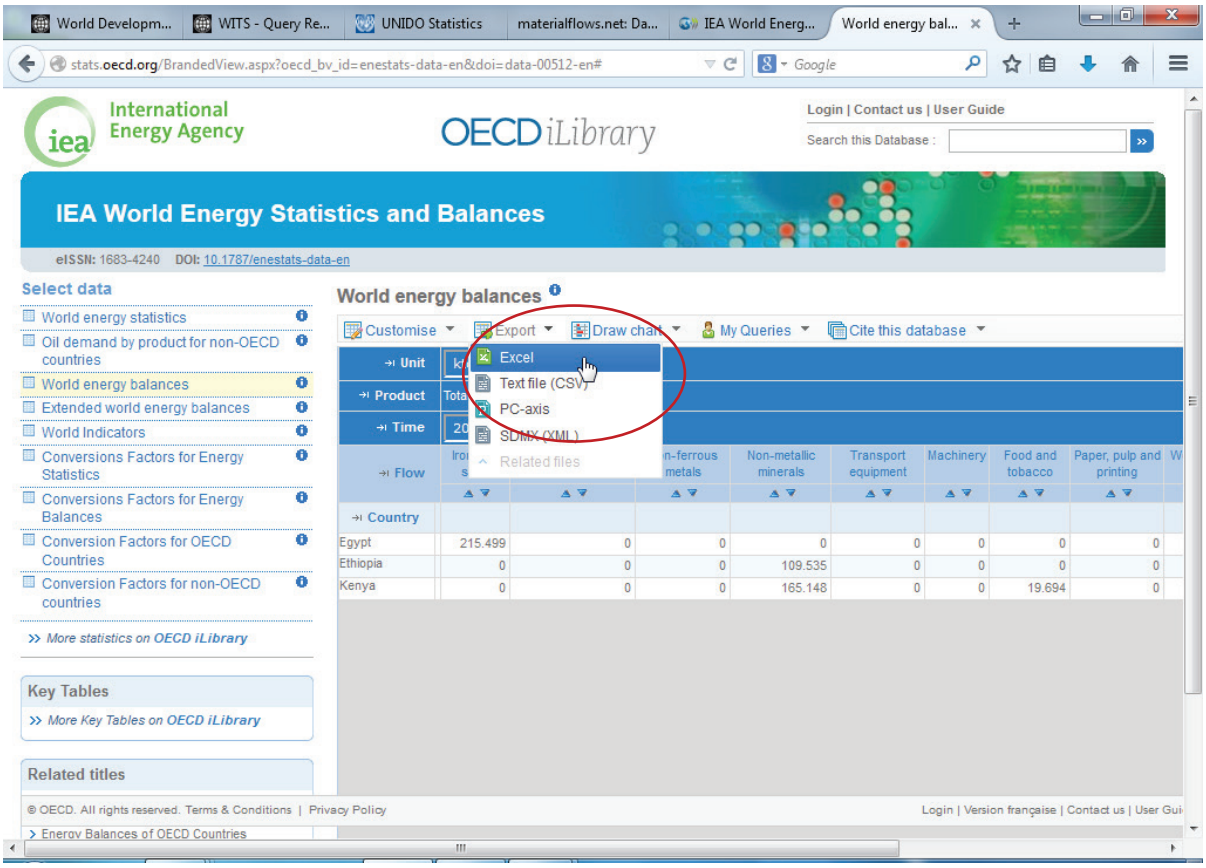
Under industry select all activities that come before Transport EXCEPT for mining and quarrying and construction.



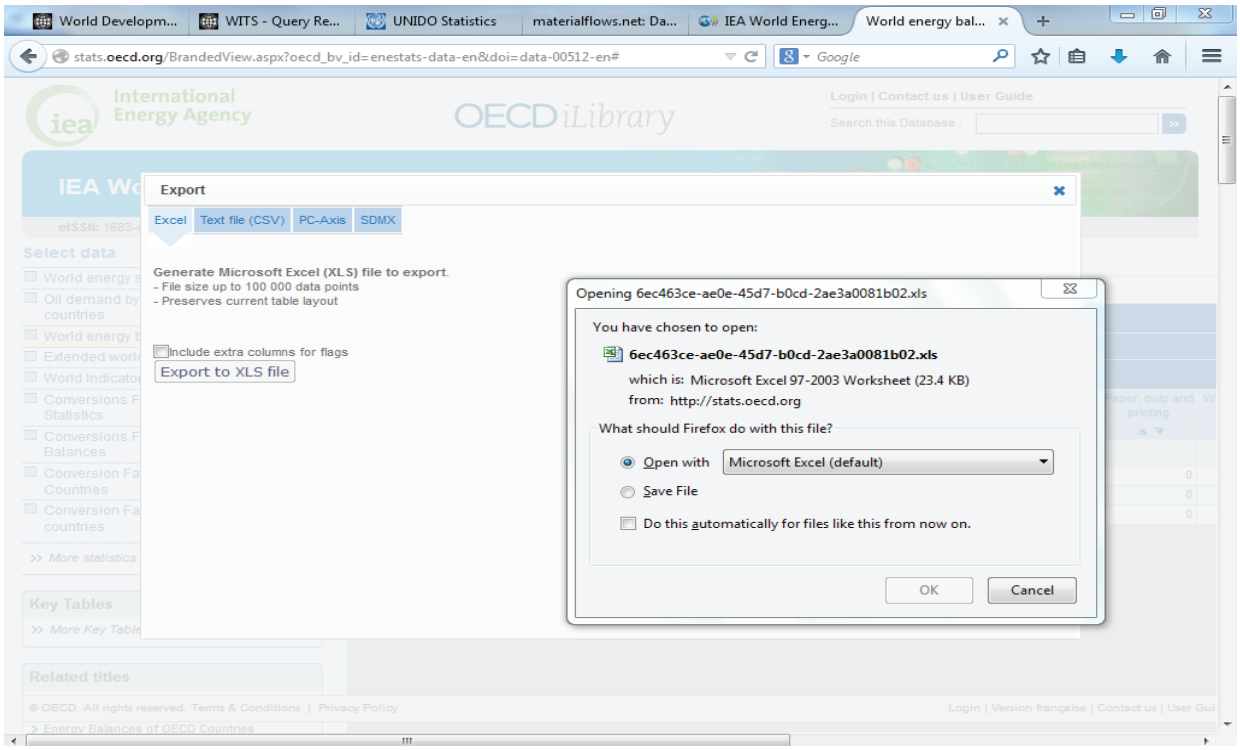
8) Product: Check **Total**



9) Click on **Export** and then **Excel** to download your datasheet.

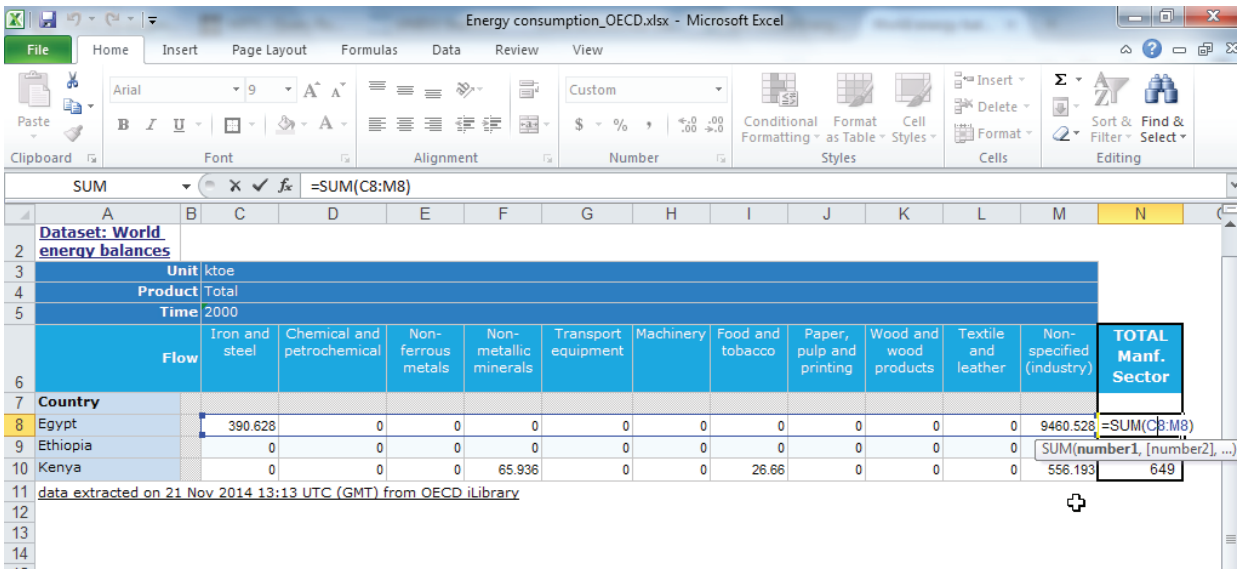


10) Click on the **Export to XLS file** and then **Open**



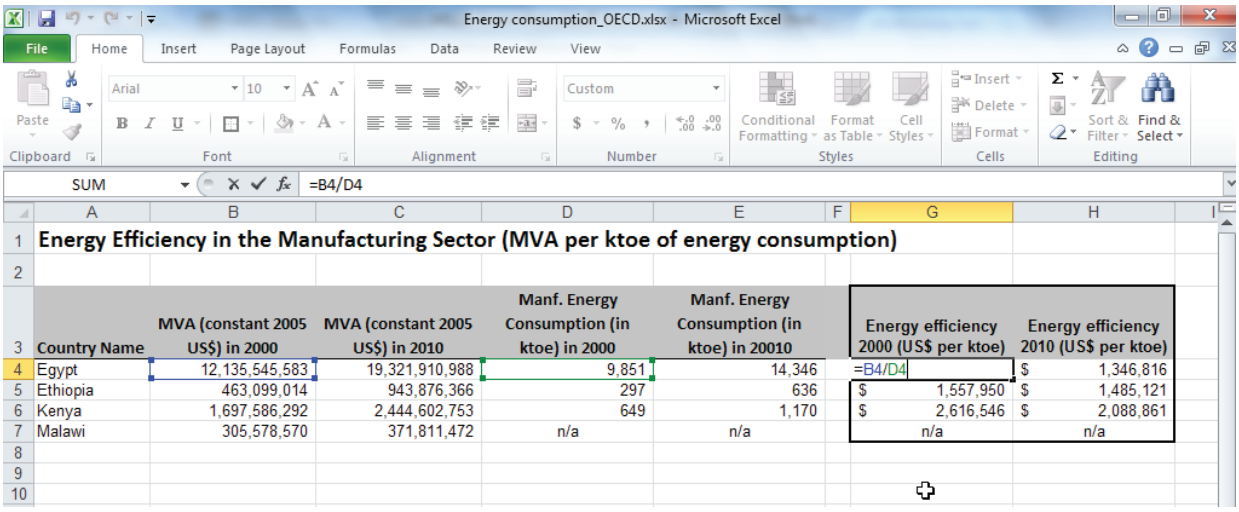
b. ***Data Analysis:***

1) Once we have our datasheet we will sum up the energy consumption of all sub-sectors to get the Manufacturing Energy Consumption for each country and year.



2) In a next step, copy the MVA data and the Manufacturing Energy Consumption into a single worksheet.

3) In order to calculate the energy efficiency of the manufacturing sector we will divide MVA by the manufacturing energy consumption.



Energy consumption_OECD.xlsx - Microsoft Excel

SUM =B4/D4

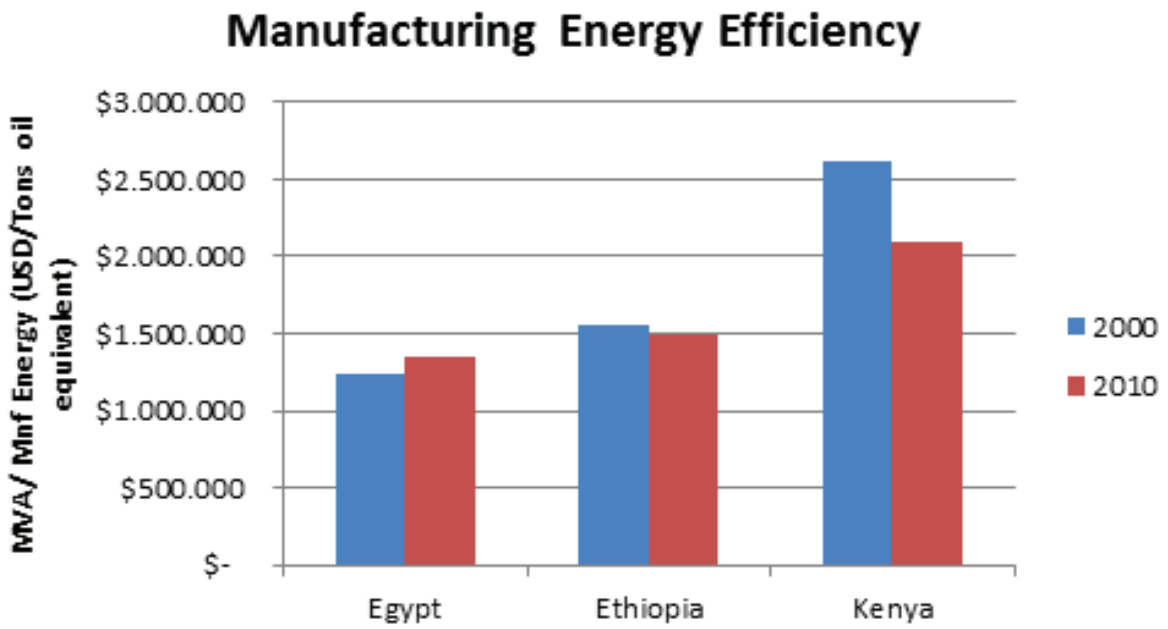
Energy Efficiency in the Manufacturing Sector (MVA per ktoe of energy consumption)

Country Name	MVA (constant 2005 US$) in 2000	MVA (constant 2005 US$) in 2010	Manf. Energy Consumption (in ktoe) in 2000	Manf. Energy Consumption (in ktoe) in 20010	Energy efficiency 2000 (US$ per ktoe)	Energy efficiency 2010 (US$ per ktoe)
Egypt	12,135,545,583	19,321,910,988	9,851	14,346	=B4/D4	$ 1,346,816
Ethiopia	463,099,014	943,876,366	297	636	$ 1,557,950	$ 1,485,121
Kenya	1,697,586,292	2,444,602,753	649	1,170	$ 2,616,546	$ 2,088,861
Malawi	305,578,570	371,811,472	n/a	n/a	n/a	n/a

c. ***Data Illustration/ Interpretation:***

Depending upon the number of countries and years of analysis, you can graph the manufacturing sector's energy efficiency in a line or bar graph such as Figure 6.

Figure 6: Energy efficiency of the manufacturing sector of selected countries, 2000-2010



What we can see from our analysis is that Kenya's manufacturing sector is generating the most value added from its energy consumption but that it has become less efficient over time. Meanwhile, as we can see in the Excel worksheet shown above, Egypt's manufacturing sector is using the most energy in absolute terms among the three countries in our sample. As can be seen in Figure 6, it is also relatively inefficient in terms of energy use in manufacturing production (although this has improved slightly over time).

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