Decent employment and income are key factors in pursuing sustainable development and facilitating quality jobs is a direct or indirect goal of many projects undertaken by the German Development Cooperation (DG). With a growing trend towards impact assessment, there is stronger focus on recording the effects that these projects have on employment.

The following shows a model used by KfW to assess the direct, indirect and induced employment effects of the German Financial Cooperation’s (FC) portfolio based on project types. An evaluation of the model for commitments from 2014 is presented alongside in the position paper "Employment effects of Financial Cooperation: Results of an Estimation Model".

There is a growing desire to measure employment effects – but the methods for doing so are very complex.

The 2013 World Development Report on Jobs was not the first clear indication that employment is key to development. Quality employment has a "transformative" effect in several ways: not only does it create income, but it also improves qualifications, produces valuable goods and services, strengthens social cohesion and thus political stability, and contributes to individual fulfilment. The term employment encompasses both dependent and independent work. It includes the full-time teacher as well as a tailor in the informal sector or even a small farmer. It’s easy to understand how the prominence of employment as an issue at the moment might also entail greater interest in a legitimate assessment of how the DC measures are impacting employment.

However, there are significant issues with the methods used in doing so. Employment effects include more than just jobs created directly as a result of a DC measure, for example during the construction phase of an infrastructure project. They go far beyond this (see Figure 1): a typical goal in building a power plant for example is to improve the general economic conditions by improving the electricity supply, which can stimulate the economy and thereby create jobs in the private sector. Recording the direct effects on employment in the construction phase and ongoing operation – things that are relatively easy to measure – would therefore come up short. Measuring the induced effects from improved site conditions and productivity or by increasing local demand (cycle effects) is equally as important. Indirect effects through the various upstream and downstream steps of the value chain also frequently play an important role. Identifying all of a measure’s indirect and induced effects on employment is
a very complex task and requires, for example, knowledge of the sectoral intermediate inputs of an economy. In order to also calculate net employment effects, any possible displacement effects must be pitted against the employment growth generated (in the case of a power plant being built, for example, the reduction of employment among suppliers of mobile electricity generators). Things get even more complicated if we want to consider the variations in quality of newly created jobs and displaced work, compare temporary work with permanent jobs, or include regional aspects (e.g. urban versus rural). Another challenge lies in differentiating newly created jobs from secured employment. Furthermore, in many developing countries a majority of people are employed in the informal sector, and there is little data available here.

Some DC institutions have tested different approaches for measuring employment. One obvious approach in institutions dealing with private sector development is to survey customers (=companies), for example when loans are being issued, on how many jobs they will create or secure through the project. This must be monitored accordingly later on. However, this method cannot be used to record the indirect and induced effects, and is just as insufficient for assessing displacement effects. Another approach uses input-output models, which can offer information on direct and indirect (value chain) effects as well as the impact on demand through an economy’s intermediate inputs. However, input-output tables are only available for a few partner countries. Moreover, these models do not incorporate productivity effects, for example productivity increases as a result of improvements in the electricity supply. Various individual case studies look into the effects that individual projects have on employment – some with experimental or quasi-experimental methods, while others use a pragmatic combination of different methodical approaches. The more detail these studies show in considering the various levels of effect, the more complex they become.

A case-by-case review of employment effects for all DC projects aimed at getting a general overview of the German DC portfolio would therefore incur costs too high to bear. An assessment based on typical project types seems to make more sense. One primary school programme for example essentially has comparable ways of affecting employment in different partner countries. If we apply legitimate analyses to some of the projects of a project type, we can extrapolate the effects that all projects of this type would have on employment. This must take into consideration local aspects such as the share of supplies produced locally versus those imported. This offers an affordable option for estimating employment effects for an entire portfolio without overburdening the partners and each individual project with the enormous costs involved in collecting data. A portfolio model can also include a great deal of data and information specific to a country and sector (e.g. national wage data or consumption rates). A legitimately researched portfolio model therefore offers an acceptable average ratio between the costs involved in collecting data and the added value from the information.

Figure 2: Calculated shares of the total costs of a project entailed in the various employment categories

Basic idea of the model

The aim of the model presented here is an aggregate recording of the employment effects of the Financial Cooperation portfolio for reporting purposes. This is based on the volume of commitments, broken down into 41 standardised project types, which feature varying effect profiles.

Building on the evaluation of available studies on the effects of individual projects on employment, the model was established together with an expert in the main features. The assumptions and parameters were then supplemented by further studies committed by KfW, examined by in-house sectoral experts, and adjusted after considering the characteristics of the current FC portfolio. The model was developed incrementally, which should also continue in the future. Any time more precise figures were not available, rough estimates were initially used (sometimes across industries) for the calculations. These are to be gradually improved with the help of empirical reference studies and ex-post evaluations.

The basic idea of the model is as follows: First, for each project type an assessment is made to determine which share of a Euro invested goes into which employment category (see Figure 2). A distinction is made between employment in the project country, in other developing countries or in industrialised countries as well as between three qualification categories. The results for each category are multiplied by the commitment volume. Dividing the resulting amount by the wage level for the respective category (e.g. average wage for less-qualified employees in Ghana) gives us the number of years of employment that we can expect through direct effects as well as indirect (value chain) effects. The operational phase effects and induced effects must then be calculated as well. The demand effect can be assessed using national consumption rates and a consumption multiplier. Other induced effects (e.g. through increased productivity) have been assessed depending on the project type wherever possible. In cases where this was not possible, they were estimated using a Cobb-Douglas production function and national macrodata.

The model yields information on the number of secured and newly created jobs on both a local and an international level for three qualification types. Different types of analysis are possible, for example for individual industries or timeframes.
The unit of measurement used for the model is "employment years". One employment year translates as a person employed for one year. This means that 100 employment years can either be one year of employment for 100 people, or that 20 people can be employed throughout the entire duration of a five-year construction phase. Given that some of the employment effects of FC projects are only temporary (for example over the duration of a construction phase), this unit of measurement is used for a more precise calculation of employment effects. For reasons of comparability, however, it may be helpful to also convert this unit into jobs or 'permanent employment equivalents'. Factors used in the conversion can either be an assumed average working life or the average useful life of an investment. The average useful life in the current FC portfolio is 21 years averaged over all types of project. If we choose to express the results of the model in jobs, there is an option to divide the results in employment years by a factor of 21. However, because this is less precise, it is recommended to stick with employment years (at least in addition).

**Direct and indirect effects in the construction and operation phase**

In order to define project types, the model makes use of a classification system that is already in use in the FC for other reporting purposes. The system consists of 41 project types with different impact profiles, for example road transport, rail transport, micro-finance or grid-connected renewable energies. Some of the project types proved too heterogeneous for a standardised form of recording (e.g. grid-connected renewable energies). In these cases, a distinction was made within the project type (e.g. between wind energy, solar energy and hydropower). Some other project types entail very few commitments, meaning the effort for a separate recording would have been disproportionate. These project types were forecast using either the average values of each respective industry or of the entire FC portfolio.

The model is based on the assumption that the costs of a project will ultimately all go to wages – in the case of commissioned companies as well as through the value chain, since supplier products also require human work. Companies' profits are included as entrepreneurs' salary

1. In determining the proportions of the total costs entailed in each individual type of employment, the total costs of a project representative for a type of project have first been split up into construction costs, supplies in goods and consulting services. As Figure 2 shows in simplified form, the costs are then broken down into more specific terms, namely by country in which the costs have an impact on employment (project country / other developing/industrialised country) and qualification level. To this end, a data collection sheet has been used for each project type. This shows the respective parameter values for the project type. The values have been collected as an average across all regions, weighted with the share of each respective region in the FC portfolio. Using these values, commitments by project type and country can be assigned to the three qualification levels. If we then divide the resulting figures by the local average wage for each qualification level, the result is the number of employment years (temporary employment) coming about directly from the construction phase and indirectly through the value chain. However, this method is limited in its scope for differentiating between direct and indirect effects.

The lasting effects from the operation phase are added to the temporary employment effects from the construction phase. The operating costs are usually not financed through the FC, but rather by the partner or the customer by way of fees. However, because an operation phase is not possible if the construction phase is not financed, the resulting employment effects are attributed to the FC project. If this entails the new construction of infrastructure, these are assessed as new employment, whereas renovation is assessed as existing employment. The number of people employed directly for the property, the number employed through maintenance and the annual expenses for materials used for maintenance are used as the basis for calculating the operation phase effects. In line with the construction phase, differentiations are made between qualification levels of employment as well as the relevant regions.

Examples of highly qualified employment in the operation phase of FC projects are power plant technicians or doctors. Semi-qualified positions for example are office workers. Less-qualified employees are security guards and cleaning staff. The annual employment effects are multiplied by the average useful life of the infrastructure in each respective project type, thereby yielding the total number of employment years.

The financial sector is a special case in the FC portfolio, as the system of splitting costs as illustrated above into construction costs, supplies and services cannot be applied here. The model includes the effects for the ultimate borrower (generally small or micro-companies) as direct effects. These effects are assessed as a result of studies and empirical data. In the event of microloans, for example, usually it is only the employment of the micro-entrepreneurs themselves that is secured or improved through higher productivity (= income), whereas additional jobs are not created.

2. When small and medium-sized enterprises (SMEs) are promoted, conservative estimates show that 20 percent of the employment effects come in the form of newly created jobs (growth effect) and 80 percent in the form of secured or improved (more productive) employment. Using the average loan totals and terms, the second step is then to calculate how often the loans can be issued on a revolving basis by the institution offering the financing (thereby securing or creating additional jobs) before the FC financing has to be repaid. In the financial sector, indirect effects are calculated alongside other industries since the loans are used for purchases that also create employment along the value chain.

**Induced effects**

Induced effects comprise employment effects through the increase in local demand (consumption multiplier) on the one hand and through improved site conditions and productivity on the other hand. The consumption multiplier reflects the income generated from newly created employment (for example for construction workers in an infrastructure project), some of which goes to local markets and in turn generates employment and income there. The vendor in turn spends part of his or her additional income locally, etc. The "local" consumption multiplier can be calculated using the national consumption rate, the import share of consumption and the average wage.

While consumption multiplier effects are easy to survey on a national level, productivity effects depend heavily on the type of project and should ideally be collected by way of empirical studies. However, these kinds of studies are unfortunately rare. Plausibility assumptions and expert analyses have therefore been used for some project types. Yet the
former seem too vague for the majority of project types, meaning most have called on cross-sectoral evaluators with the aim of gradually replacing these with results from new empirical studies specific to the types of project. First, “growth accounting” is used to estimate the national income growth resulting from improved productivity.\(^4\) This income growth stimulates general economic demand, thus creating jobs. This is illustrated in additional employment years, in that the increase in income is multiplied by the consumption multiplier and divided by the net national income per employed person.

In some sectors, the project type-specific estimator is included in addition to the cross-sectoral estimator. This is due to the fact that the effects are additive, for example in occupational training: at project type-level, the number of graduates able to find a job as a result of the measure is recorded. In addition, the graduate can be expected to be more productive as a result of the measure and to thereby generate additional income in the economy, which in turn leads to employment. This is covered by the cross-sectoral estimator.

The model does not include any negative effects such as displacement effects. These can arise in the financial sector, for example, if the growth in jobs at companies receiving support comes at the expense of other companies. In the infrastructure sectors, a net analysis is intrinsic in the model’s system for the construction phase effects, since funds additionally invested are converted into additional (net) employment years (regardless of the company at which these emerge). However, the creation of infrastructure can result in displacement effects, for example if sales of bottled drinking water decline as a result of modern water lines.

**Data sources**

The model requires national data on wages by qualification level as well as on consumer behaviour and productivity data, which come from various sources.

**Wage data**

The model distinguishes three qualification levels which feature different wage levels. The sources of data for wages by qualification level are very patchy. For this reason, two different records of wage data have been used, the first being an ILO data set and the second a data set by the Wage Indicator Foundation. The latter collects wage data globally through its website, but also carried out extensive surveys in 28 developing countries between 2011 and 2013 before making the complete records of data available to KfW. The ILO’s wage data come from the LABORSTA database and were prepared and published in the form of the Occupational Wages around the World (OWN) data set. The record includes data on wage levels for 161 types of employment in 171 countries over a period from 1983 to 2008. However, because wage data are not regularly collected in a number of non-OECD countries, a large quantity of data in the ILO data set are either not up to date or are absent entirely.

Using the latest available data in each case, averages were calculated for a period of five years for three qualification levels per country. These wage levels are a result of the employment types being categorised by education levels, for which the classification system ISCO88 applied by the UN is used. In the case of countries for which no data from the last ten years were available, the average of each group of countries was used, whereby the groups of countries were broken down according to the World Bank’s income classification. If countries were represented in both data records, the Wage Indicator data were given preference, since these came from the more up-to-date surveys. Given that wage data are often subject to considerable errors, all wage data (by both the ILO and the Wage Indicator Foundation) underwent a plausibility check. Unrealistic indications (e.g. the same value for all qualification levels) were removed from the data record and replaced by averages for the groups of countries. Data lacking a sufficient sample size (in the case of the Wage Indicator data) were not used.

In order to take into account inflation-based wage increases, the wage levels calculated were adjusted with a GDP deflator taken from the World Development Indicators and then converted into euros. Calculating the consumption multiplier effect also requires national average incomes. These were calculated on the basis of the net national income per employed person. The data sources are the World Development Indicators (2013).

**Productivity data**

The macrodata for the cross-sectoral estimator come from the World Development Indicators (2013), while data on general economic productivity increases are taken from the Total Economy Database published by the Conference Board.

**Consumption rates**

The data on country-specific consumption rates are also taken from the World Development Indicators (2013). Given that part of the local demand is met through imports, the share of imports is factored out of the consumption rate.

**Potential and limits of the method**

Given the methodology and empirical data available, this model assesses direct and indirect (construction and operation phase) effects more precisely than induced effects. Productivity effects at the moment are assessed largely cross-sectorally, and differences between the sectors at times thus level out. This is expected to be gradually improved for individual project types through reference studies. The model also only includes gross effects and does not deduct displacement effects. This implies a slight over-assessment of the employment effects on the one hand, although on the other hand this is believed to be offset by the very conservative assumptions for the productivity effects.

Country data such as average wages cannot be updated annually given the expense this entails and the availability of data; the recommendation is an update every five years or so. This may reveal a few “kinks” in a time comparison.

The goal of the model is to get a rough estimate of employment effects from the FC portfolio at a reasonable expense for reporting purposes. The model can be made even more precise through the use of other reference

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3 The conventional formula for the consumption multiplier is \( \Delta Y = I + c*\Delta Y \), whereby \( \Delta Y \) = change in income; \( I \) = initial investment (=total costs of the FC project); \( c \) = local consumption rate (excluding imports). Broken down by \( \Delta Y \) and less the first-round effect, which was already recorded in the construction phase, the result is \( \Delta Y = c/(1 - c) * I \). This can be divided by the net national income per employed person in order to estimate the employment years additionally generated via the consumption multiplier.

4 This estimation uses a model by W. Löwenthein (2013) as a basis. The starting point is a Cobb-Douglas production function \( Y = A*K^{\alpha}L^{1-\alpha} \). On a national level, the share of income growth \( \Delta Y \) attributable to capital \( K \) and labour \( L \) can be calculated (“Growth Accounting”). The share of income growth, which cannot be explained in this way \( \Delta Y_{\text{c}} \), can be attributed to higher productivity. As a result, the income increase from higher productivity can be calculated as follows: \( \Delta Y_{\text{c}} = (\%A / 100) / (1 - A/A_0 / 100) * \Delta Y_{\text{c}} \).
studies, especially on the induced effects. However, the model is not suitable for statements on individual projects, since effects can vary significantly in different countries and project contexts (e.g. depending on the qualification level of local construction companies and employees, the availability of local suppliers, or work intensity of individual projects that is higher or lower than average). At the same time, the results should not be misinterpreted as an exact "measurement" of employment effects, which from today's knowledge is utterly impossible due to limitations with the methodology.

The result is that the model is not suitable for guiding development policy. The projects should be controlled using systems tailored to individual cases as needed. A system suitable for cross-sectoral and cross-regional aggregation, by contrast, must undergo standardisation measures that can usually only be applied to the individual case and the data and reporting systems available there to a very limited degree.

**Literature**


RWI (2013), "Nachweis der Beschäftigungswirkungen von Maßnahmen der deutschen EZ – Pilotstudie Marokko" (Evidence of employment effects from measures by the German DC – pilot study Morocco (in German), Rheinisch-Westfälisches Institut für Wirtschaftsforschung (RWI Essen).