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Assessing the Socio-Economic Impact of the Circular Economy through input-output modelling: Evidence from developing countries

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Assessing the Socio-Economic Impact of the Circular Economy through input-output modelling: Evidence from developing countries

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Abstract

The concept of circular economy is gaining growing importance in the policy debate as the need to focus the international effort to accomplish the Sustainable Development Goal (SDG) 12, "Responsible production and consumption", has become increasingly paramount. Many international organisations are now fully involved in implementing technical cooperation projects to reduce the use of materials for industrial output. However, while there is a wide consensus that the prevailing production paradigm cannot sustain the current industrial practices indefinitely, the policy space for the promotion of the Circular Economy is hampered by the lack of a complete understanding of winners and losers in international or domestic value chains and the overall net benefits of the undertaken measures. This paper develops the NICE (National Impacts of Circular Economy) tool, which is based on the Eora input-output data to analyse how technical cooperation projects, which are aimed at more sustainable use of materials, affect economic and social indicators. Whereas the long-term transition towards a circular economy and a more efficient economic system is less controversial, the results of this study help deepen the understanding of the possible short-term impacts, especially for countries struggling to climb the ladder of development. Strategic implications for a reconciliation of economic, social and environmental targets for inclusive and sustainable industrial development and a full accomplishment of the SDG 9 are presented.

Keywords: *circular economy; input-output analysis, developing*

1 Introduction

Input-output (IO), computable general equilibrium (CGE) models and material flow analysis (MFA) are widely used tools to quantitatively analyse the impacts of the Circular Economy (CE) on an industry or country level. However, particularly in the context of developing countries, the literature discussing the socio-economic effects of circular economy interventions on the overall economy remains scarce. This study fills the gap in the literature by evaluating the impact of circular economy measures on economic and social indicators such as value-added and employment focusing on four developing countries (Egypt, Georgia, Indonesia and Viet Nam). The study introduces a new simulation tool, the NICE (National Impacts of Circular Economy) framework, which is based on Eora global multi-region input-output (MRIO) tables. The aim of NICE is to offer a preliminary assessment of the net socio-economic impact of circular projects in terms of net result, main drivers, the relevance of direct vs indirect effect, etc., within a simple, tractable and transparent simulation framework.

To the best of our knowledge, the original contribution of the present study is twofold. First, it is the first contribution comparing the impact of CE on economic indicators for a group of developing countries. Secondly, this study is the first contribution feeding an input/output modelling exercise with actual data derived from observed CE impacts generated by four distinct technical cooperation projects implemented in a heterogeneous set of lower-income countries. To this end, the present study introduces the NICE (National Impact of Climate Economy) tool. It proposes a framework to connect a firm-level microdata layer by quantifying the specific CE projects on single firms across different manufacturing sectors, which manifest themselves along direct and indirect lines and include resource and materials savings of single firms, with the macro-layer to evaluate the aggregate economic (value-added) and social (employment) of the respective CE activities.

This paper is structured as follows: Section 2 reviews the relevant literature. Section 3 discusses the methodology behind the NICE design. Section 4 illustrates and interprets the main results. Section 5 concludes.

2 Literature

The high level of uncertainty related to climate change, resource scarcity and growing population has intensified the need for sustainable development. This mandate was formulated by the United Nations (1972) and aims to balance economic growth, environmental conservation, preservation, and social well-being. Over the years, this initiative has received strong resonance worldwide, particularly with the launch of the 2030 Agenda for Sustainable Development Goals (SDGs). The concepts underpinning the SDGs emphasise cooperation on multiple levels (local, national, regional and international) to promote a global partnership. In this context, the Circular Economy concept has gained increasing attention recently and is considered the best solution to pursue this growth path.

In December 2015, the European Commission launched its Action Plan for the Circular Economy, which was redefined with a new emphasis in 2020, at the onset of the global pandemic. It is aimed at unlocking the growth and job potential of CE, boosting EU competitiveness through new business opportunities and innovative means of production and consumption (EMF, 2015) and overcoming resource scarcity and the volatility in material prices (EC, 2015; 2011). The decoupling of the economy from the environment, i.e., an increase in economic value while decreasing resource use, depends on innovation and structural change factors (UNIDO, 2016). It follows that the transition to a CE is highly influenced by the composition and innovation intensity of the economy, the evolution of new green markets, and environmental and industrial policy-setting that characterise national and regional levels. The CE strategy is strictly connected with the previously launched Roadmap to a Resource-Efficient Europe, which outlines how we can transform Europe's economy into a sustainable one by 2050 (EEA, 2014; 2018; 2019).

The traditional linear economy, which follows the *take-make-dispose* principle, is not sustainable as limited resources cannot feed the increased demand of a growing population indefinitely. The way in which we produce and consume, applying the *take-make-dispose* principles, is responsible for 45% of total GHG, having enormous consequences on the level of climate change and social conditions. The 'Circular Economy' model has been proposed as a global strategy to achieve sustainable development. The basic idea considers the transition from a linear model to the circular one as the essential strategy, including economic, social and environmental aspects, achieving economic growth and ecological sustainability within planetary boundaries (Rizos et al., 2017). At its heart, CE proposes a model of production and consumption aimed at reshaping global value chains, involving sharing, leasing, reusing, repairing, refurbishing, and recycling existing materials and products as long as possible.

Several scholars have conducted studies comparing linear economy and circular economy frameworks. They found both the existing and potential benefits and proved the necessity of transition from a linear economy to a circular economy (Nasir et al., 2017; Marino and Pariso, 2020; Saidani et al., 2018; Valko, 2018).

The CE may be viewed as a business and policy strategy that targets the redesign of production and consumption through pervasive technological and behavioural changes that revolve around new (uses of) materials and products (EMF, 2015). Conceptually, the IPAT (Impact ≡ Population x Affluence x Technology) identity shows how sustainability-oriented technological development (resource/emission efficiency of production) can compensate for scale economy-driven effects (Marin and Mazzanti, 2013). Given the heterogeneity of technological and environmental performance across sectors, understanding the underlying forces requires in-depth meso- and micro-level analyses, which unveil the macroeconomic determinants (UNIDO, 2015).

It is worth noting that the transition to a CE is driven by the coevolution of different economic, technological, social and ecological changes, occurring at different geographical and sector dimensions. 'Sectoral Systems of Innovation' and 'National Systems of Innovation', as developed in innovation economics, are relevant concepts for understanding the CE at the global level, given the possible pervasiveness of CE changes across industrial and consumption systems (FEEM, 2020).

As in any techno-organisational 'revolution', there will be winners but also losers. Recognising this, policymaking aims to provide a clear direction to investors and citizens and puts in place mechanisms to ensure that the most vulnerable segments of society are supported and not left behind.

The framework mentioned above points to the necessity of integration of micro-, meso- and macro-economic layers of analyses for a complete understanding of the CE transition. In addition, circularity needs to extend its development and impact beyond high-income economies, through the analysis of international value chains and sector-based analysis, with consequential upscaling at macro levels and particularly in emerging economies. This is relevant to enrich the policy and business narrative of the CE and to make it more robust, inclusive, and relevant.

Against this backdrop, the present work aims to extend the analysis of eco-innovations in circularity by analysing how firm and sector strategies impact socio-economic indicators. It integrates micro-meso-macro layers of analyses by using input-output models (IO). The IO framework is a relevant tool in the macroeconomic modelling toolkit, complementing econometric forecasting, machine learning and other approaches. IO modelling for structural change and economic dynamics analysis can be fruitfully used for sustainability assessments and policy evaluation (Marin and Mazzanti, 2021). The present work aims to offer original methodological insights and empirical evidence around circularity assessments in emerging countries through the IO lenses, filling the main gaps in a rapidly evolving literature.

2.1 Modelling routes of CE transition pathways

With notable exceptions, resource-efficiency and circularity scenarios have been built using and adapting Integrated Assessment (IAM) and Macro-economic models (e.g. E3ME, GINFORS, ENV-linkages) with resource information. These models were mainly developed to inform energy and climate policies. Recent attempts use more bottom-up Life Cycle Inventory (LCI) information, or hybrid LCI/IO approaches informed by the Shared Socio-economic Pathways (SSPs) assessed with IAM.

For most economic enquiries, the unit of analysis in this field is often the micro "product level", with the possibility to widen the focus to the sector, i.e., meso-level. Nevertheless, there is another perspective to consider. Moving from the "micro" lens to the "macro" one implies the necessity to assess the potential impact of CE on the gross domestic product (GDP), employment and carbon emissions. McDowall et al. (2017) argue that the macro-level perspective is essential for identifying which policy measures can be implemented to promote a cost-effective circularity transition. In broad terms, a detailed macroeconomic analysis of all major economic aggregates is crucial to create the right policy mix to support the transition. As the extensive literature on the policy-environment nexus states (Stavins, 2003), the choice of policy instruments depends on the conditions of the economic framework. In the case of CE, this is well established, yet simultaneously also more difficult to achieve. Being still in its early developing stages, the lack of macro instruments represents an obstacle to introducing efficient policies capable of stimulating the "just transition" to ensure that no one is left behind in their pursuit of development. This insight is even more critical if we consider CE as a tool to improve the social conditions of developing countries. As Ferronato et al. (2019) stated, CE strategies should be considered as a tool to improve sustainability at the global level, including in developing countries. There, CE could help boost economic growth by overcoming many barriers concerning the introduction of environmental policies, effective investments, social inclusion, public awareness etc., all of which are consequential issues in developing countries.

Currently, governments and institutions are committed to finding indicators and methodologies that allow them to monitor the progress of the circular model and, at the same time, assess their effects on central economic aggregates. The motivations behind these interests are twofold: on the one hand, there is the need for an environmental, social and economic assessment of the progress in implementing the new paradigm. On the other hand, policy evaluation plays a vital role in mapping out future steps. For this purpose, the literature highlighted the necessity to draw different circular economy scenarios. Due to the lack of historical experience that can be drawn upon for empirical analysis, as McCarthy et al. (2018) argued, ex-ante economy-wide quantitative models, appear to be best suited for analysing this transition as they capture the major drivers of the economic consequences. The authors reviewed 24 modelling-based assessments of a circular economy transition underscoring the complexity of the macroeconomics evaluation of CE. Modelling the macroeconomic impacts of CE concerns different opportunities, targets and policy-based scenarios (Woltjer, 2018).

Up to now, most research on CE has focused on the following regions and countries: Europe, China, and other developed countries like the USA, Japan, and Australia. The studies typically evaluated the efficiencies and economic or environmental impacts of CE. Applying the ENGAGE-materials model to the case of steel for the period 2017-2030, Winning et al. (2017) found that doubling scrap availability in each region of interest would lead to an increase in secondary production of 7% globally and an overall increase in global steel output of around 2%. As the authors state, regional differences are observed depending on initial inputs and costs and technological production structure. Overall, GDP effects are relatively small, yet mostly positive. In a follow-up study, Mayer et al. (2018) tried extending the time horizon to 2050. Results obtained using a GINFORS model suggest that adopting certain climate policies may result in a relative decoupling of resource use and GDP growth (an increase of 4%) but combining this action with resource-efficiency targets could lead to absolute decoupling. What is not assessed in these studies is the role played by technology. In a circular context, technology induces an increasing efficiency in material extraction, use and re-use that could positively affect GDP. According to Tuladhar et al. (2016), this effect is around 1.1% (conservative scenario) or about 2% (ambitious scenario) above the baseline for the EU in 2030. Pagotto and Halog (2016) studied the agri-food industry in Australia, employing an IO–oriented data envelopment and material flow analysis approach. The results show inefficiencies during the life cycle of food production and hint at utilising sustainable processes to (i) diminish undesirable outputs; and (ii) decrease the use of non-renewable inputs within the production cycle.

Peng et al. (2019) investigated the positive effect of policy subsidies using a CGE model to assess remanufacturing in China. In this case, results showed that the subsidy policy and the energy efficiency improvement (of 15%) for the Engine Remanufacture sector could result in economic and environmental benefits. However, the increase in efficiency of circular practices in the Chinese industrial context also reflects geographical and spatial aggregation characteristics at the provincial level (Guo et al., 2017; Lu et al., 2020). In general, the transition to circularity requires some degree of policy intervention to generate incremental macroeconomic and social benefits and more considerable environmental benefits (Aguilar-Hernandez et al., 2021).

Recently, there have been two trends of CE-related research in the economic-development and ecological-economics macro-level context. Firstly, the focus has shifted from developed countries to developing countries with a more extensive focus on South Asian, African, and Latin American economies. Dunmade (2018) stated that there is much potential for circular economic development in Africa. Many African countries have large populations that can provide a full supply of necessary inputs and adequate market demand for outputs in a CE. For a selection of countries, the effects of CE have been quantified by the European Commission (EC, 2020). For example, analyses of Egypt and Nigeria have demonstrated positive economic effects of CE, especially looking at the employment side, for a period up to 2030. The reports showed a net increase in employment relative to the baseline scenario (around 0.3% and 4.9%, respectively). The model suggests that economic growth (caused in both cases by CE activities) would produce higher carbon emissions than in the baseline. Overall, the CE scenarios' impact on CO2 emissions is smaller than the impact on GDP, suggesting that the economic gains from CE activities would have a relatively low carbon intensity. The gains shown by the introduction of circular practices in the economic system make CE a good tool for developing countries to solve environmental problems and support an economic growth path that can improve social inclusion and living conditions. According to Ngan et al. (2019), local authorities can adopt the recommendations to design policies to encourage the adoption of CE in real industry operations to spur economic development without neglecting environmental well-being and social benefits.

Second, the evaluation of social impacts is growing in importance in scholarly work. Chateau and Mavroeidi (2020) used a CGE model to study the job potential of a transition toward a resource-efficient and circular economy. They found that the overall reallocation of jobs is limited to 18 million jobs in 2040, and net job creations are marginal, with 1.8 million jobs globally. Although the net impact on employment is small, some sectors are heavily affected, both in terms of job creation (e.g., secondary materials, recycling, services, utilities) and job destruction (e.g. primary materials, non-metallic materials, construction).

Using the example of the apparel value chains, Repp et al. (2021) found that employment could significantly decrease in low- to upper-middle-income countries outside the EU, particularly in labour-intense apparel production. In turn, employment could increase in less labour-intense downstream re-use and recycling activities in the EU and second-hand retail in and outside the EU. Beccarello and Di Foggia (2021) studied packaging waste management in Italy. By comparing the CE scenario with the baseline scenario, results suggest that higher recycling targets could positively affect job creation, production, and value-added by both direct and indirect effects. Chen et al. (2019) evaluate the Mediterranean circular rice production system's feasibility and potential benefits through a multi-regional input-output database. The results indicated that the circular system did not necessarily achieve more positive social-economic impacts than the conventional linear system.

As visible from the reviewed literature, CE affects economic and social systems. It is characterised by a human dimension that influences the growth path of countries, starting with the choices made by individuals. Its main objective is to increase the capacity of individuals/collectives to adapt to the shocks generated by the squandering of the linear model (climate change, scarcity of resources, etc.). Under this framework, the ecosystem is seen as an interwoven mesh of social, environmental and economic components with overlapping and inseparable boundaries. The symbiotic analysis of these three aspects would allow the creation of resilient systems to preserve existing species, ensure human well-being, and support the growth path in developed and developing countries.

Bosello et al. (2016) conducted a policy-based scenario analysis of the circular economy impacts. In the context of CGE models, they evaluated three different models with three different scenarios, considering the impacts of several policies developed to obtain resource-efficiency improvements. A consistent finding of their work hints at the importance of a well-designed revenue-recycling scheme as well as technological progress. The authors showed that introducing a tax on materials (or externalities) accompanied by revenue recycling and technological progress may result in decoupling economic growth and resource use. On the other hand, in the absence of revenue recycling and technological progress, the tax policy might be very costly for the economy and may even fail to reduce resource consumption. The positive role of policies related to increasing resource efficiency is also corroborated by Schandl et al. (2016). They stated that achieving a more resource-efficient and carbon-neutral world is possible at relatively low economic costs, with potentially significant environmental and social benefits.

This potential economic growth highlighted by computational models over a 10/40-year time frame reminds us of the capacity of CE to improve economic performance in developing countries. Most of the CE literature has focused on industrialised countries while neglecting issues and priorities of developing ones (Schröder et al., 2019). The analysis and the comparison between results achieved by CE could represent an opportunity to contribute to sustainable growth in developing countries. The industrial transition in these countries would not only imply a change in the already existing structure, but it would allow a creation process that already takes its steps from the principles of the CE.

In the context of the reviewed modelling literature and the best to our knowledge, the original contribution of the present study is twofold. First, it is the first contribution comparing the impact of CE on economic indicators for a group of developing countries. Secondly, this study is the first contribution feeding an input/output modelling exercise with actual data derived from observed CE impacts generated by four distinct technical cooperation projects implemented in a heterogeneous set of lower-income countries. To this end, the present study introduces the NICE (National Impact of Climate Economy) tool. It proposes a framework to connect a firm-level microdata layer by quantifying the specific CE projects on single firms across different manufacturing sectors, which manifest themselves along direct and indirect lines and include resource and materials savings of single firms, with the macro-layer to evaluate the aggregate economic (value-added) and social (employment) of the respective CE activities.

3 Modelling the Circular Economy through input-output tools: connecting micro and macroeconomic layers into NICE

The NICE framework has three key concepts: model development, sensitivity analysis and stakeholder involvement. The relevant economic agents we consider throughout the work are firms, sectors and countries. This complementarity is found across all layers of the analysis. The involvement of industries and other relevant stakeholders in the territory has multiple goals: (i)

Collect data and information in a bottom-up manner; (ii) provide relevant case studies (of winners and losers): (iii) validate the results ex-post. NICE differs from existing tools as follows:

1) It builds upon the Eora model, which guarantees an almost universal country data coverage, yet, to the best of our knowledge, it is the first attempt to use Eora for a modelling exercise with a circular economy focus;
2) It complements Eora by adding data on employment (ILO) to the modelling framework. For each country, plausibility checks are conducted to update unrealistic data;
3) Simulation exercises are not based on assumed or mathematically derived values. Rather they are surveyed directly, providing quantifiable impacts of circular economy technical cooperation projects in terms of energy and material savings, project expenditures and firms' investments in a bottom-up way. Observed impacts are collected through questionnaires conducted with project managers from UNIDO, who provide information based on final project outcomes and officially validated reports.

3.1 Micro-data collection

In the first step, the relevant impacts of CE are quantified. Circular economy impacts are accounted for using the information on four relevant projects implemented by UNIDO in Viet Nam, Egypt, Indonesia and Georgia. A summary of the four projects is reported in Table 1. The first impact of the project is derived from the expenditure of the project funds for local goods and services. Project accounting may not be aligned with the Eora modelling framework.

For this reason, the project monitoring information on expenditures needs to be adapted to ad hoc Eora modelling assumptions as summarised in Table 1. The information is adjusted so that the project expenditure is shared in Eora between goods, services and wages representing the hiring of local consultants and the purchase of goods and services. As the static nature of Eora, a further assumption is that all project funding and all socio-economic outcomes occur within a single period. The remuneration of local consultants is allocated entirely as wages, which are used up in the consumption of locally produced and imported products and services.

Table 1. Summary of the projects

Country	Number of involved firms	Expenditures from donor funding	Annual savings	Investments
Egypt	29 firms in the chemical, food, and textile sector	The multi – annual and multi - country project was about 24 millions USD. On the basis of the available information it can be considered approximately 700k USD spent with a	**Food** 3.460.851 EUR (Electricity and thermal) 747.533 EUR	36.262.253 EUR

		direct imputation in Egypt. Funds have been used largely for purchasing consulting services.	(Materials) 281.560 EUR (Water) **Chemical** 3.464.793 EUR (Electricity and thermal) 2.047.442 EUR (Materials) 250.877 EUR (Water) **Textile** 4.062 EUR (Electricity and thermal) 76.340 EUR (Materials) **Total** 10.333.457 EUR*	
Georgia	50 firms in the food, materials and construction sector	Multi annual and multi country project. On the basis of the provided information the project funding amount was spent on international (EUR 73,843 EUR) and national (236,772 EUR) expertise including national events and measuring equipment purchased in the country, it is assumed 200.000 USD spent for local consultants and 57.000 USD spent to buy goods.	**Food** 108.711 EUR (Energy) 10.168 EUR (Materials) 62.362 EUR (Water) **Chemical** 202.640 EUR (Energy) 37.989 EUR (Materials) 22.660 EUR (Water) **Construction** 66.783 EUR (Energy) 14.741 EUR (Materials) 13.756 EUR (Water) **Total** 539.810 EUR**	338.244 EUR
Indonesia	55 firms (only textile)	Indonesia multi – annual project with about 4,000,000 USD funding. The assumption is that projects expenditures for local Indonesia consultants, goods and services represent 62% of total projects expenditures	**Textile and total** 5.329.472 USD (Electricity) 14.566.605 USD (Coal) 148.044 USD (Diesel) 438.499 USD (Water) **Total** 20.482.622 USD	10.076.197 USD
Viet Nam	53 firms in the food, textile, wood, metal, electrical machinery, and other manufacturing and services.	Viet – Nam multi – annual project. Projects expenditures is about 4,300,000 USD. According to info provided, 28% of the Viet Nam project funding was spent outside Viet Nam. On the basis of the projects information 71% of the	**Food** 859.365 EUR (Electricity) 13.493 EUR (LPG/fuel) 312.311 EUR (Water)	9.306.550 EUR

		project budget is spent for services, 29% for local consultants.	19.021 EUR (Wood) 2.840 EUR (Flake ice) **Textile** 62.445 EUR (Electricity) 13.516 EUR (Coal) 6.472 EUR (Water) 24.954 EUR (Wood) **Wood** 117.305 EUR (Electricity) 3.505 EUR (Water) 39.779 EUR (Wood) 74.129 EUR (Scrap paper) **Petrochemical** 21.507 EUR (Electricity) 1,520 EUR (LPG/fuel) 3.333 EUR (Water) **Metal products** 99.652 EUR (Electricity) 57.908 EUR (Coal) 57.909 EUR (LPG/fuel) 87.325 EUR (CNG) 13.055 EUR (Water) **Electrical and machinery** 14.015 EUR (Electricity) 806 EUR (Water) 2.075 EUR (Paint) 2,727 EUR (Steel scrap) 1,636 EUR (Sand) **Other manufacturing** 392.616 EUR (Electricity) 456.212 EUR (Coal) 3.270 EUR (Gas) 33.074 EUR (LPG/Fuel) 48.447 EUR (Water) 585 EUR (Wood) 9.282 EUR (Cement) 30.333 EUR (Steel) 3.100 EUR (Silica) 7.040 EUR (Soda)	

			Services 417 EUR (Electricity) **Total** 2.896.820 EUR	

* The final project document reports 10.336.162 EUR of annual savings. Rounding issues slightly change the value contained in the table. ** For Georgia savings and investments values are reported as aggregated for 2016 and 2017.

The project budget expenditure and its allocation represent drivers to feed the simulations. To identify further modelling options, we classify projects according to a taxonomy based on different aspects of the circular economy.

Project managers are requested to indicate if their projects belong to the following four CE activities and to specify the impacts of these projects on different variables, such as the generation of new investments, savings from material and energy consumption, savings in the use of other inputs etc. The four identified circular economy activities are:

Circular Economy Activity 1 - Firms save materials and consumption of energy in the production of final goods.

Circular Economy Activity 2 - Firms replace a kind of material with less toxic (hazardous) or obsolete material.

Circular Economy Activity 3 - Boosting the Recycling Activities of the Recycling Sector

Circular Economy Activity 4 - Boosting the business of the "Repair, Remanufacturing, Refurbish and Prepare-for-Reuse" Sector.

All the selected projects belong to Circular Economy Activity 1.[1] Information reported by project managers on the impacts is used as input to shape the IO simulations based on the Eora database. IO modelling is particularly suitable for investigating the socio-economic impact of projects as it allows us to differentiate between direct, indirect and induced effects. The direct impact of a project is the value of the initial change in expenditures. For example, building a bridge would require spending on cement, steel, construction equipment, labour, and other inputs. The indirect, or secondary, impact would be due to the suppliers of the inputs themselves acquiring inputs in the supply chain. The induced, or tertiary, impact would result from additional income created and used by capital holders and workers to purchase additional goods and services. A firm's purchase of new capital equipment to reduce the consumption of energy or materials can be a typical situation where a CE project generates a primary impact in the machinery manufacturing sector, secondary impacts in terms of the inputs needed to produce the equipment and tertiary

[1] Modelling options and assumptions for all Circular Economy Activities remain available upon request.

impacts from the additional disposable income generated by the process.

A questionnaire was sent to the project managers of the four UNIDO projects, who provided the information based on officially validated final data documents. Other information is not part of the monitoring but needs to be assumed. This is the case, for example, when modelling how firms re-spend savings from the consumption of materials and energy sources (see the next subsection). The previously collected information is then organised based on the structure of the Eora model. When data are available at the firm level, they are aggregated following the Eora sectorial taxonomy. When information about water, materials or energy savings is not detailed enough, we proceed as follows. Either the amount of savings is attributed to each material in proportion to the Eora country- and sector-specific bundle of materials consumption (Egypt case). Alternatively, savings are attributed to each source based on speculative assumptions (Georgia case), or the savings attribution by source is based on a restricted number of firms for which information is available (Indonesia).

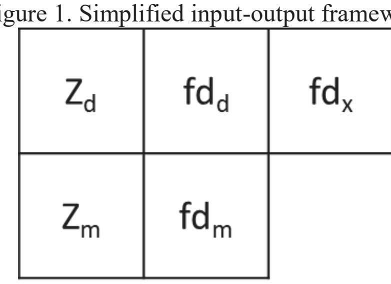
Except for budget expenditures for which the timing of the financial transactions is more uncertain, all monetary values are deflated to 2015 USD values in alignment with Eora. Financial impacts are evaluated at the annual level.

3.2 Input-output modelling of projects in a base scenario

The Eora global input-output database (Lenzen et al., 2012; 2013) consists of a multi-region input-output database for 190 countries. In this work, we consider the harmonised 26-industries version of the database, which covers the period 1990-2015. In addition to the global input-output table, Eora also provides information on as many as 2720 satellite accounts covering material and resource use, air emissions, value-added, etc.

In the companion Excel files, we report data from the Eora database (Eora26) for 2015. For each country, selected data are extracted from the full input-output table. More specifically, all inter-sectoral transactions involving other countries are aggregated by sector, simplifying the model into a two-country model for each reference country. Moreover, we will consider IO modelling within a single-country framework as a starting point to streamline the empirical modelling. This means that feedback loops occurring through imports are assumed to be small: this assumption is adequate for small countries (Serrano and Dietzenbacher, 2010). The simplified input-output framework is described in Figure 1:

Figure 1. Simplified input-output framework



where:

- $\mathbf{Z_d}$ is the matrix of inter-sectoral transactions for domestically-produced intermediate inputs. Each column describes the value of intermediate inputs purchased domestically by a sector to produce its total gross output;
- $\mathbf{Z_m}$ is the matrix of inter-sectoral transactions for imported intermediate inputs (with no country breakdown). Each column describes the value of intermediate inputs imported by a sector to produce its total gross output;
- $\mathbf{fd_d}$ is the vector of final demand by domestic consumers of domestically produced products and services;
- $\mathbf{fd_m}$ is the vector of final demand by domestic consumers of imported products and services (with no country breakdown);
- $\mathbf{fd_x}$ is the vector of export, both as final demand and intermediate inputs (with no country breakdown).

Total gross output by sector is defined as the vector $\mathbf{x} = \mathbf{Z_d}\ \mathbf{i} + \mathbf{fd_d} + \mathbf{fd_x}$, where $\mathbf{i}$ is the summation vector (i.e., a column vector only containing ones).

The matrix of domestic technical coefficients is defined as $\mathbf{A_d} = \mathbf{Z_d} <\mathbf{x}>^{-1}$, where $<\mathbf{x}>$ indicates a diagonal matrix with the values of vector $\mathbf{x}$ over the main diagonal. Each column of the matrix $\mathbf{A_d}$ indicates the monetary value of intermediate inputs (domestically produced) needed by the sector to produce one dollar's worth of gross output. Similarly, $\mathbf{A_m} = \mathbf{Z_m} <\mathbf{x}>^{-1}$ is the matrix of technical coefficients for imported intermediate inputs.

Finally, we compute the two Leontief matrices for both domestic and imported intermediate inputs, respectively, as:

$\mathbf{L_d} = (\mathbf{I} - \mathbf{A_d})^{-1}$

$\mathbf{L_m} = (\mathbf{I} - \mathbf{A_m})^{-1}$

where $\mathbf{I}$ is the identity matrix. The column of the Leontief matrix indicates how much gross output is generated in each sector to produce one dollar's worth of final demand of the sector.

To calculate the overall effects of gross value-added, we multiply changes in output with the vector of value-added coefficients of output. In addition to these monetary data, we also extract a selection of socio-economic and environmental accounts at the sector-by-country level from Eora. These are already expressed as quantities divided by gross output. To compute coefficients for imported inputs, we use the weighted average for all other countries, using gross output as weight. Finally, we collect information on employment headcounts by industry from the ILOSTAT database.

As reported by project managers in response to the questionnaire, material input savings (specific for each material) are considered a reduction in gross output for the upstream sector (either domestic or abroad) that directly extracts the resource, as reported in the Eora satellite accounts. On the other hand, savings in primary inputs (labour or capital) are modelled as a corresponding reduction in the level of final demand of domestic workers and capital holders. This, in turn, leads to a reduction in the final demand for both domestic and imported products and services.

For what concerns additional investments, we allocate spending related to equipment to tangible and intangible goods: 50% goes to 'Electrical and machinery', 40% to 'Construction' and 10% to 'Financial intermediation and business activities' (including R&D). Project expenditures for consultants are attributed to wages spent according to the country-specific average composition of final consumption of households by sector. Project expenditures for goods and services are allocated to the purchase of goods and services according to the project information.

As for the use of savings, we assume that, explicitly or implicitly, these are in the first stage employed to finance additional investments of companies. If some savings are left, these are redistributed as profits and then used for final consumption. For the re-use of savings to finance investments, we also adopt an arbitrary distribution of investments based on the same proportions used for additional investments.

The purchase of goods and services from projects expenditures, for additional investments and for the re–use of savings in the baseline is assumed to be subject to "leakage". It is reasonable to assume that not all purchased goods and services are acquired locally. Due to the lack of project-specific information, the assumption is that the percentage of foreign-purchased goods is proportional to the country´s purchase composition.

Table 2. Summary of baseline assumptions

Domain	Assumption
Use of savings	Savings are re–spent by manufacturing industries to fund the additional investments indicated by the project. The remaining savings are distributed to owners as profits and consequently spent by households.
Destination of additional investments	Additional investments are spent: 50% on machinery; 40% on construction; 10% on R&D.
Time horizon of savings and additional investments	Total investments and annual savings are assumed to be annual.
Use of project expenditures	Projects expenditures are addressed to the purchase of goods, services and local consultants and are assumed to be spent in one year.
Origin of the goods and services	Part of the household consumption, investments and re-spending of savings are "leaked" by importing goods and do not generate a multiplier effect on the local economy. Project expenditures are assumed to be spent entirely in the local economy in Viet Nam consistent with the project information. As the uncertainty of the origin of purchases of goods, for the other projects, we assume that expenditures can be leaked with imports.

3.3 Plausibility checks and hoc model extensions

Before running our simulations, we perform (data) plausibility checks to verify the validity of some key variables contained in Eora. These checks cover variables such as GDP and the share of manufacturing value-added for the four countries of enquiry, which we cross-validate using information from other internationally recognised databases, such as the World Bank Development Indicators and UNIDO statistics.

To this end, we do not find dramatic or consistent discrepancies. Whenever we run into data inconsistencies - such as for the emissions data for Egypt, which is only reported for two manufacturing sectors - we abstain from evaluating this component in our simulation framework. We also check for extreme values in the matrix of technical coefficients (i.e. >1). We set the VA/output ratio to one in the few cases where value-added figures were larger than gross output. Eora does not explicitly contain employment as a default variable. However, employment remains a key variable to explore. To fill this gap, we extend Eora by adding information on employees by industry as estimated by ILOSTAT. Also, in this case, we check for outliers in simple labour productivity measures (measured as gross output per employee). We trim the distribution of labour productivity by only considering values which do not exceed three times the interquartile range of the raw data distribution.

4 Results

4.1 Socio-economic impact

A summary of the results based on the baseline assumptions (Table 2) is reported in Table 3. All four projects (except Georgia concerning value-added) led to net gains in terms of value-added and employment. However, these results hide negative effects for some sectors, which are more than compensated by positive effects in other sectors. Results by sector are reported in section 4.2. To better understand what drives value-added and employment creation, we decompose the total net effect into different components that contribute to the overall net effect. A summary of the results is reported in Figure 2. As expected, the contribution of input (materials and other) saving is detrimental to employment and value-added. For Egypt, Viet Nam and Indonesia, a positive net effect would have emerged even in the absence of direct project funding and is due to additional investments (Egypt and Viet Nam) and the re-use of savings (Indonesia). In the baseline, Georgia shows a negative value-added impact but a positive impact on employment.

Additional investments (funded by savings) are the most important 'positive' contributor to the net effect, except for Indonesia, where the re-use of savings (beyond the funding of investments) contributes primarily to the positive impact. By definition, material and other input savings contribute negatively to value-added and jobs.

Despite this, we record an increase in value-added in Viet Nam and Indonesia and an increase (decrease) in CO_2 emissions for Viet Nam (Indonesia). Despite an aggregated increase of value-added, the final balance depends on the emissions intensity of the sectors' losers and winners, determining the overall result. CO_2 emissions in Georgia decreased following a negative value-added impact.

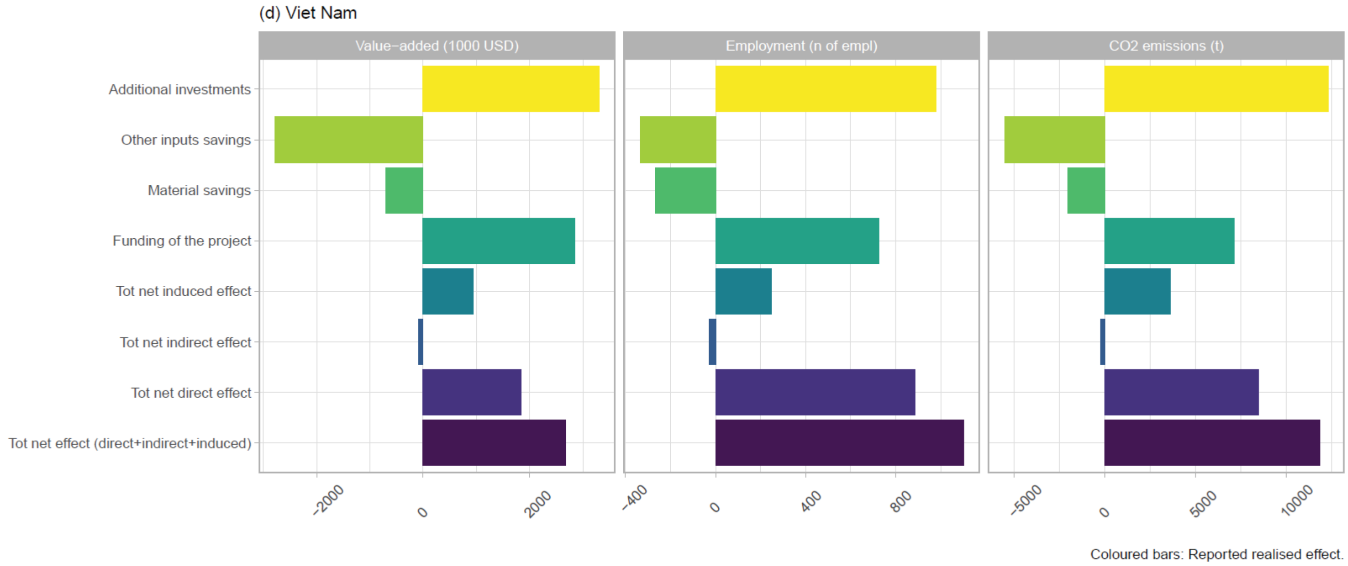
Table 3. Summary of the main results

	Egypt	**Georgia**	**Indonesia**	**Viet Nam**
Funding of the project (1000 US$)	700	257	2325	2980
Total value of savings (1000 US$)	10.930	322	19.458	3.133
Direct economic effect on VA (1000 US$)	12.694	12	2.574	5.178
Indirect economic effect on VA (1000 US$)	-1.087	-100	-4.577	207
Induced economic effect on VA (1000 US$)	16.293	83	5.348	1.603
Total (direct + indirect + induced) economic effect on VA (1000 US$)	27.901	-5	3.345	6.988
Direct economic effect on employment (n. of emp.)	1.590	8	543	1.910
Indirect economic effect on employment (n. of emp.)	-229	-17	-701	56
Induced economic effect on employment (n. of emp.)	2.056	12	830	607
Total (direct + indirect + induced) effect on employment (n. of emp.)	3.417	2	672	2.573
Import of intermediate inputs (direct effect) (1000 US$)	8.520	412	412	2.346
Import of intermediate inputs (indirect effect) (1000 US$)	- 734	-993	-993	- 55
Import of investment assets (1000 US$)	3.621	2.452	2.452	3.355
Import of final consumption of households (1000 US$)	-	913	913	235

Note: Emp.: Employment

Figure 2. Decomposition of net effects

(Figure continued)



Note: Coloured bars: Reported realised effect. CO2 estimates for Egypt were excluded because of data quality concerns.

4.2 Winners and losers

The NICE design also provides estimates on the cross-sectoral distribution of gains and losses in terms of value-added and employment which are reported in Table 4 and Table 5, respectively. As expected, for all four countries, the most important sector among the losers is 'electricity, gas and water'. Indeed, all savings in terms of electricity and water use are attributed to this sector which is the provider of these inputs. At the same time, it could seem surprising that the net impact on the 'mining and quarrying' sector is generally small and negative but only for Egypt and Georgia. Indeed, the projects analysed in this paper only feature relatively small savings of raw materials and minerals. Moreover, when it comes to raw materials, quite a large share of them is imported from abroad, which leads to small impacts on the national economy.

Table 4. Net effect (total) in terms of value-added (1000 US$, 2015 prices)

Sector	Egypt	Georgia	Indonesia	Vietnam
Agriculture	26	19	1035	850
Fishing	261	1	451	73
Mining and Quarrying	-131	-4	37	293
Food & Beverages	240	12	1486	372
Textiles and Wearing Apparel	358	4	71	100
Wood and Paper	400	1	-115	90
Petroleum, Chemical and Non-Metallic Mineral Products	395	3	-1165	31
Metal Products	583	-3	-209	56
Electrical and Machinery	7901	16	1062	220
Transport Equipment	1509	0	187	291
Other Manufacturing	788	-11	-219	-58
Recycling	40	-11	-56	53
Electricity, Gas and Water	-4141	-178	-4767	-2073
Construction	8477	47	1106	2815
Maintenance and Repair	747	2	46	240
Wholesale Trade	705	9	171	539
Retail Trade	880	9	338	21
Hotels and Restraurants	464	8	742	177
Transport	604	8	439	179
Post and Telecommunications	746	9	158	160
Finacial Intermediation and Business Activities	4534	25	2296	2246
Public Administration	1030	-2	-169	76
Education, Health and Other Services	623	25	280	100
Private Households	0	0	0	0
Others	776	8	135	38
Re-export & Re-import	86	0	4	0
Total	27901	-5	3345	6988

Table 5. Net effect (total) in terms of employment (number of employees)

Sector	Egypt	Georgia	Indonesia	Vietnam
Agriculture	24	6	350	747
Fishing	166	0	53	25
Mining and Quarrying	-3	0	0	5
Food & Beverages	22	1	73	45
Textiles and Wearing Apparel	122	0	12	69
Wood and Paper	26	0	-10	35
Petroleum, Chemical and Non-Metallic Mineral Products	21	0	-39	3
Metal Products	59	0	-10	32
Electrical and Machinery	105	0	20	56
Transport Equipment	16	0	3	24
Other Manufacturing	252	-4	-108	-66
Recycling	30	-4	-10	34
Electricity, Gas and Water	-232	-11	-223	-77
Construction	2121	4	141	945
Maintenance and Repair	38	0	4	94
Wholesale Trade	29	1	17	79
Retail Trade	130	1	89	17
Hotels and Restraurants	34	1	145	75
Transport	133	0	54	83
Post and Telecommunications	13	0	7	24
Finacial Intermediation and Business Activities	36	1	72	263
Public Administration	102	0	-87	23
Education, Health and Other Services	60	5	119	40
Private Households	0	0	0	0
Others	113	0	0	0
Re-export & Re-import	0	0	0	0
Total	3417	2	672	2573

On the side of the winners, the construction sector features large gains due to the assumption of reusing savings for gross fixed investments. Similarly, the two other sectors representing the destination of investments ('electrical and machinery' and 'financial intermediation and business activities') also exhibit significant gains.

To further investigate the role played by the three sectors identified as destinations of investments, Table 6 reports the national Leontief multipliers of these three sectors for the four countries considered. These sectors (with some country-specific exceptions) contribute both directly and indirectly (by demanding intermediate inputs) to upstream job and value-added creation, leading to a significant rebound effect in terms of value-added, jobs and also CO2 emissions.

Table 6. Leontief multipliers for selected sectors

	Electrical and Machinery				**Construction**				**Financial services and business activities**			
	EGY	GEO	IDN	VNM	EGY	GEO	IDN	VNM	EGY	GEO	IDN	VNM
Agriculture	0.013	0.000	0.005	0.004	0.011	0.001	0.007	0.000	0.165	0.014	0.032	0.010
Fishing	0.022	0.000	0.002	0.006	0.005	0.001	0.003	0.000	0.064	0.018	0.042	0.034
Mining and Quarrying	0.030	0.000	0.009	0.012	0.034	0.041	0.005	0.000	0.158	0.032	0.009	0.026
Food & Beverages	0.020	0.000	0.004	0.009	0.012	0.002	0.004	0.000	0.168	0.034	0.038	0.040
Textiles and Wearing Apparel	0.037	0.004	0.004	0.006	0.018	0.011	0.003	0.000	0.209	0.132	0.039	0.023
Wood and Paper	0.023	0.000	0.011	0.008	0.014	0.001	0.004	0.000	0.145	0.014	0.055	0.018
Petroleum, Chemical and Non-Metallic Mineral Products	0.031	0.000	0.007	0.009	0.017	0.008	0.003	0.000	0.181	0.039	0.023	0.019
Metal Products	0.058	0.000	0.008	0.055	0.017	0.019	0.004	0.000	0.160	0.078	0.050	0.037
Electrical and Machinery	1.197	1.010	1.060	1.721	0.009	0.012	0.004	0.000	0.187	0.142	0.081	0.028
Transport Equipment	0.289	0.002	0.024	0.020	0.008	0.002	0.003	0.000	0.163	0.023	0.053	0.024
Other Manufacturing	0.085	0.024	0.006	0.022	0.011	0.028	0.003	0.000	0.159	0.344	0.053	0.039
Recycling	0.031	0.024	0.008	0.008	0.019	0.028	0.003	0.000	0.165	0.344	0.067	0.016
Electricity, Gas and Water	0.011	0.000	0.012	0.032	0.028	0.044	0.007	0.000	0.087	0.051	0.021	0.006
Construction	0.064	0.001	0.009	0.084	1.007	1.114	1.004	1.000	0.177	0.040	0.080	0.022
Maintenance and Repair	0.018	0.000	0.004	0.004	0.008	0.012	0.011	0.000	0.158	0.187	0.136	0.081
Wholesale Trade	0.014	0.000	0.004	0.004	0.007	0.002	0.011	0.000	0.155	0.096	0.136	0.086
Retail Trade	0.030	0.000	0.004	0.004	0.013	0.014	0.011	0.000	0.197	0.200	0.136	0.005
Hotels and Restraurants	0.015	0.002	0.003	0.008	0.015	0.002	0.005	0.000	0.177	0.037	0.046	0.050
Transport	0.016	0.000	0.007	0.015	0.013	0.002	0.016	0.000	0.181	0.054	0.081	0.073
Post and Telecommunications	0.015	0.000	0.007	0.013	0.009	0.004	0.017	0.000	0.149	0.112	0.065	0.078
Finacial Intermediation and Business Activities	0.007	0.000	0.016	0.008	0.010	0.006	0.012	0.000	1.010	1.121	1.097	1.078
Public Administration	0.039	0.000	0.003	0.008	0.029	0.002	0.003	0.000	0.157	0.024	0.031	0.042
Education, Health and Other Services	0.014	0.000	0.016	0.017	0.010	0.010	0.008	0.000	0.121	0.052	0.077	0.029

In Table 7 and Table 8, we report the correlation matrices of the projects' cross-sectoral net impacts in terms of value-added and employment. Interestingly, even though the four projects were inherently different in their structure and aims, the distribution of impacts across sectors is similar across countries, especially for value-added. This result could be due to either (i) input-saving actions generating a quite standard response in different contexts; or (ii) the modelling assumptions about the re-use of savings, which are common to the four countries, contribute to similar net impacts.

Table 7. Cross-country correlation between total effect for value-added

	Egypt	Georgia	Indonesia	Viet Nam
Egypt	1	0.61	0.62	0.76
Georgia		1	0.90	0.75
Indonesia			1	0.78
Viet Nam				1

Table 8. Cross-country correlation between total effect for employment

	Egypt	Georgia	Indonesia	Viet Nam
Egypt	1	0.31	0.27	0.73
Georgia		1	0.84	0.55
Indonesia			1	0.68
Viet Nam				1

4.3 Sensitivity analysis

The previously obtained results highlight the importance of assessing how savings from CE activities are then re-employed. For this purpose, we developed several sensitivity analyses to understand to what extent more conservative assumptions about the re-use of savings lead to lower positive (or even negative) net effects.

To further explore the variability in our results, we introduce uncertainty in the IO framework by quantifying to what extent the main results are driven by either firm selection or the imposed assumptions about investment (either by the project or the participating firms).

Three sensitivity typologies of analysis are implemented to explore three sources of uncertainty:

1) Uncertainty from the bias derived from the selection of firms (section 4.3.1).
2) Uncertainty from the bias derived from how firms' investments generated by the projects are allocated across different sectors (section 4.3.2).
3) Uncertainty from the bias derived from how project expenditures are allocated across different sectors (section 4.3.3).

The three typologies are analysed for the *baseline scenario* (Table 2)*,* which assumes a project horizon of one year, including project expenditure. We further relax these baseline scenario assumptions in section 4.3.5. In *Appendix B. Detailed simulation results,* we provide the complete results supporting the sensitivity analysis. The corresponding tables also offer estimates of quantified CO_2 emissions.

4.3.1 Random firm selection

*Simulation setup***.** Until now, we have used project surveys to construct sector-level aggregates of the project investment volume as well as initial consumption levels and savings in LCU and purchased quantities. While this allows us to quantify the project's overall effect, it says very little about the effectiveness of the project in terms of participation and generalisability. For example, if all realised savings are generated by one firm only, a simple aggregation of firm-level effects would not allow us to differentiate this from an alternative scenario where all n firms benefit equally from the project, as long as the aggregated effects amount to the same. We address this concern by conducting a Monte-Carlo simulation where we randomly draw a sub-set of firms (with replacement, i.e., the same firm can be drawn twice in one simulation) to build an artificial representation of the project. We do so by retaining the sectoral composition of the actual project. In other words, if the project consisted of firms belonging to either sector A or sector B, our simulations randomly draw n_A (n_B) firms from sector A (B), respectively. We then re-apply the IO model to the randomly drawn artificial data, record the results, and repeat these steps R = 500 times.[2]

Results. The results of the simulation exercise are summarised in Table 9. The results display a strong positive effect on value-added and employment generation. For Egypt, Indonesia and Viet Nam, all simulated scenarios show a positive total net effect of the projects, which is, in terms of magnitude, similar to the results obtained with the actual project data. Lastly, while Georgia's value-added generation is somewhat less pronounced than the other economies, the overall effect of the Georgian project (in terms of value-added and employment) is borderline positive.

[2] For the case of Indonesia, we randomly draw firm-level information and calculate respective saving shares in monetary values across all inputs where savings occurred. These shares are then scaled up to match the project's overall impact as indicated by the project managers. We follow this approach because of the limited firm-level information on input savings available to us.

Table 9. Summary Randomised firm selection including in the baseline including project expenditure

	Value-added (1000 USD)		Employment (headcount)	
	Average increase	(+) share	Average increase	(+) share
Egypt	27,950.2	100%	3401.7	100%
Georgia	1.6	27%	3.4	97%
Indonesia	3,462.0	100%	713.9	100%
Viet Nam	2,766.9	100%	1,149.7	100%

Note: See Appendix B for a complete set of results. Results are based on bootstrapping repetitions. (+)/(-) share: share of positive (negative) outcomes; average across all simulated with project expenditure only. Tot net effect: direct + indirect + induced effects. CO2 estimates for Egypt were excluded because of data quality concerns.

4.3.2 Randomised investment allocation

Simulation setup. We assume an ad-hoc distribution of project-induced investments across sectors for the baseline results. In this sensitivity test, we document how this ad-hoc selection determines the sign and magnitude of the quantified project effects. To illustrate that the identified effects are not the result of an assumed transmission channel which maximises the overall effects, we produce a Monte-Carlo simulation where we randomly generate hypothetically induced sector-level spending patterns. We randomly draw the sector-level contributions from a Pareto distribution. To this end, the only requirement we impose on the randomisation process is that the highest assumed share is attributed to the Electrical and Machinery sector.

Figure 3 illustrates the distribution of assumed investment shares in the case of Egypt. For the Monte-Carlo simulation, we again use the project information reported by the firms.

Results. The results of the simulation exercise are summarised in Table 10. The sensitivity analysis results again highlight that the ad-hoc assumption of the dispersion pattern of additional investment streams does not drive the positive total net impact of the respective projects. More precisely, Table 10 indicates that the net positive effect on value-added and employment generation can be confirmed under all evaluated scenarios. The only exception to this trend is the value-added generation for Georgia which shows a negative trend and a very low share of simulations showing a positive value.

Table 10. Summary Randomised additional investment (random sector allocation) in the baseline, including project expenditure

	Value-added (1000 USD)		Employment (headcount)	
	Average increase	(+) share	Average increase	(+) share
Egypt	16,854.3	100%	1,797.9	100%
Georgia	-48.5	3%	1.2	61%
Indonesia	2,688.4	100%	783.8	100%
Viet Nam	2,977.7	100%	1,237.1	100%

Note: See Appendix B for a complete set of results. Results are based on bootstrapping repetitions. (+)/(-) share: share of positive (negative) outcomes; average across all simulated with project expenditure only. Tot net effect: direct + indirect + induced effects. CO2 estimates for Egypt were excluded because of data quality concerns.

4.3.3 Randomised project investment

Simulation setup. Finally, we investigate to what extent the model results depend on the imposed distribution on the project investment structure. Similar to the previous investment simulation, we randomly draw numbers from a Pareto distribution from which we construct shares and project them onto the reported project expenditure data. In other words, we reweigh reported project expenditure with weights constructed from random draws of a skewed distribution. We only impose the condition that the sectors with the highest actual recorded spending get the highest sample weight in every single draw.[3]

Results. The results of the simulation exercise are summarised in Table 11. As with previous results, randomisation of the project investment structure does not change dramatically the sign or magnitude of the previously established total net effects for the projects evaluated in this study. Compared to the previous simulations, Georgia's value-added turns positive, whereas employment maintains a positive impact.

Table 11. Summary- Randomised project investment (random sector allocation) based on reported project volume in the baseline, including project expenditures

	Value-added (1000 USD)		Employment (headcount)	
	Average increase	(+) share	Average increase	(+) share
Egypt	27,052.1	100%	3,350.3	100%
Georgia	-25.4	54%	0.7	54%
Indonesia	2,910.1	100%	599.9	100%
Viet Nam	2,195.2	100%	1,125.8	100%

Note: See Appendix B for a complete set of results. Results are based on bootstrapping repetitions. (+)/(-) share: share of positive (negative) outcomes; average across all simulated with project expenditure only. Tot net effect: direct + indirect + induced effects. CO2 estimates for Egypt were excluded because of data quality concerns.

[3] Note that the sector with the highest recorded actual project spending varies by economy.

4.3.4 Synthesis of sensitivity analysis on emissions

In *Appendix B. Detailed simulation results,* we provide the complete set of results supporting the sensitivity analysis. The corresponding tables also give estimates on quantified CO2 emissions.[4] In most analysed cases (Viet Nam and Georgia), the results indicate a positive correlation between value-added and emissions induced by the same sign in the variation of value-added and emissions. This implies rebound effects on emissions from the positive effects of CE projects. Moreover, it calls for integrated policy and technical cooperation interventions in all sectors beyond those impacted by the project to avoid adverse environmental spillover effects. The only relevant exception is Indonesia, where an increase in value-added is accompanied by a decrease in emissions representing the ideal but not necessarily the most frequent case.

4.3.5 Sensitivity analysis relaxing the baseline scenario

Next, we extend the sensitivity analysis by relaxing the baseline scenario. We do so by evaluating variations in the modelling assumptions highlighted in Table 15. For a detailed list of the aggregated simulation results across all four scenarios, please see Appendix C. As our results suggest, Egypt, Indonesia, and Viet Nam retain their positive value-added and employment effect. In general, a high share of scenarios feature a positive value-added and employment effect. Georgia shows a more negative trend in the value-added decrease. Additional scenarios, including a higher amount of savings, generate a more considerable reduction of value-added induced by loss of revenues, especially from the energy sectors. However, the sensitivity analyses reveal a higher share of simulations with a positive value-added for Georgia. Results for all countries and scenarios are also quite similar concerning CO2 emissions except for Indonesia turning to an average positive increase of emissions associated with an average rise of value-added, similar to Viet Nam.

4.4 Beyond the base scenario assumptions[5]

The findings presented so far may suffer from biases that result from some of the underlying baseline assumptions (Table 2). The baseline scenario points to a positive impact of circular economy projects savings on value-added and employment in all analysed countries (except for value-added in the case of Georgia). In all three countries with a positive change of value-added,

[4] Estimates for Egypt were excluded because of data quality concerns.
[5] Extending the Monte Carlo simulations introduced in section 4.3 to a broader set of baseline scenario variations like those discussed in section 4.4 is left for further research.

the positive impact does not depend on the contribution of project expenditures. In this section, we analyse the impact of circular economy technical cooperation projects with different assumptions. Table 12 summarises the hypotheses which are introduced in the complementary analysis. With this modelling strategy, we build a set of 108 scenarios for each of the four analysed countries Egypt, Indonesia, Viet Nam and Georgia. The average is calculated as the simple mean across 108 scenarios.

Table 12. Beyond the baseline assumptions

Domain	Assumption in the baseline	Assumptions in alternative scenarios
1) Use of savings	Savings are re–spent by manufacturing industries to fund the additional investments indicated by the project. The remaining savings are distributed to owners as profits and consequently spent by households.	1a) savings are spent entirely as final expenditures of households 1b) savings are spent on purchasing intermediate inputs 1c) savings are spent to finance additional investments, but the distribution across sectors follows the national economy composition rather than the project information 1d) Total savings are spent for investments equally across sectors.
2) Destination of additional investments	Additional investments are spent: 50% on machinery; 40% on construction 10% on R&D.	2a) The assumption 50%/40%/10% is relaxed, and investments are spent according to the national composition of the economy 2b) Investments are spent equally across the economic sectors.
3) Time horizon of savings and additional investments	Total investments and annual savings are assumed to be annual.	For Egypt, Indonesia and Viet Nam, we assume double annual savings in 2015 to capture future savings impacts. For Georgia, we consolidate investments and savings for 2016 and 2017 as reported in the final project information, and we assume they were captured in 2015.
4) Use of project expenditures	Projects expenditures are addressed to the purchase of goods, services and local consultants and are assumed to be spent in one year.	Only portions or no project expenditures are spent in one year.
5) Origin of the goods and services	Part of the household consumption, investments and re-spending of savings are "leaked" by importing goods and do not generate a multiplier effect on the local economy. Project expenditures are assumed to be spent entirely in the local economy in Viet Nam, consistent with the project information. As the uncertainty of the origin of purchases of goods, for the other projects, we assume that expenditures can be leaked with imports.	Investments and project expenditures are totally spent in the local economy.

As our results in Table 13 show, most scenarios show a positive value-added and employment impact and a positive average value of value-added and employment change when deviating from the baseline assumptions. The share of scenarios with positive value-added or employment effects is calculated as the number of scenarios presenting a positive value-added or employment out of 108 scenarios.

Table 13. Average value-added and employment and share of scenarios with a positive value-added and employment across 108 scenarios.

Country	Value-added	Employment
Egypt	100% of scenarios with positive value-added Average value-added increase: 30.287 million USD 2015	100% of scenarios with positive employment Average employment increase: 4.190
Indonesia	93% of scenarios with positive value-added Average value-added increase: 6.613 million USD 2015	100% of scenarios with positive employment Average employment increase: 1.671
Georgia	60% of scenarios with positive value-added Average value-added increase: 0.061 million USD 2015	79% of scenarios with positive employment Average employment increase: 20
Viet Nam	95% of scenarios with positive value-added Average value-added increase: 4.785 million 2015 USD	100% of scenarios with positive employment. Average employment increase: 2.480

Emissions frequently follow the sign of the value-added impacts. As an illustrative example, we take five scenarios:

(1) the baseline;

(2) baseline assumptions, but assuming that all purchased goods were produced locally;

(3) a scenario in which projects expenditures are excluded;

(4) a scenario in which we also capture two years of savings captured in a 2015 model setting;

(5) additional investments are addressed to sectors according to the national composition rather than ad hoc assumptions.

As shown in Table 14, in twelve out of 15 cases, emissions follow the sign of value-added. This finding reveals that whereas projects, on average, show a positive impact on value-added and employment, this positive scale effect could also bring further pressure on emissions. In other words, a rebound effect on emissions could manifest as an effect of circular economy projects.

Table 14. Variation of value-added and emissions in selected scenarios

	(1) Baseline		(2) Baseline but domestic origin of purchased goods		(3) Baseline but no project expenditures		(4) Baseline but 2 years of savings in one year		(5) Additional investments according to national composition	
	VA	Em	VA	Em	VA	Em	VA	Em	VA	Em
Indonesia	3.354	-124	4.900	1.496	930	-2.157	8.486	882	3.361	504
Viet Nam	3.791	12.029	9.801	23.397	-175	377	4.893	15.392	5.611	15.429
Georgia	- 5	- 30	49	74	-180	-21	-118	-205	27	12

Note: Data on Egypt emissions are omitted as Eora data on emissions are incomplete. Value-added information is expressed in 1,000 2015 USD. Emissions are expressed in tons.
VA: Value-added; Em.: Emissions.

5 Conclusions and policy implications

This paper uses an innovative modelling tool to highlight the impact of the circular economy on firms' socio-economic performance. While most of the existing evidence comes from developed countries, the empirical evidence from this research confirms that the same benefits apply to economic systems in a developing country context. This finding reinforces the idea that CE is not just a phenomenon of the Global North but a worldwide paradigm shift.

The results confirm that circularity positively impacts aggregate value-added in three of the four countries analysed. The case of Georgia needs further research as other external factors might influence in-firm value addition that the model has not captured. More interestingly, the results suggest that the CE's supposed triple impact (on the economy, employment and environment) is not always straightforward. Indeed, the impact of technical cooperation projects on value-added and employment cannot always be simultaneously positive for value-added and employment depending on the sector-specific set of multipliers. This paper also shows that circularity's economic boost can have a rebound effect leading to increased emissions.

Policymakers should also understand that sectors are affected differently by circularity. This paper shows that some are more akin to circularity benefits while others face severe challenges. This calls for a thorough understanding of the country's productive sector to anticipate the potential impact that the circular economy could bring to an economy. The assessment of the country's opportunities and threats induced by the circular transition should consider both macro-economic dimensions and location- and skill-specific consequences. Regions relying on winner (resp. loser) sectors will experience benefits (losses) from the circular transition. The same applies to workers in different skill categories with sectoral and regional specificities.

Given that the circular economy constitutes a change in the ecosystem, the role of policy becomes crucial. This paper uses firm-level data to illustrate that circularity does not happen in a vacuum. The supposed triple impact of the circular economy does not seem to respond only to the adoption of new business practices in firms but rather to a combination of factors, many of which are external to the firms and part of the so-called conducive business environment for a circular economy. Policies should act as a lighthouse to guide firms towards their circularity path with incentives and disincentives and by compensating the risks, short-term losses and trade-offs derived from adopting a circular business model. Similarly, technical cooperation projects on CE will have to take into consideration the policy dimension as a critical cornerstone to guarantee a positive socio-economic impact.

Circular economy research in developing countries is still in its nascence. There is an urgent need to develop and implement circular economy-related indicators at the firm level and collect data to shed further light on this matter. Otherwise, policymakers in the developing world are at a loss in trying to learn and adapt experiences from the Global North. This paper has contributed to the literature on the socio-economic impact of the circular economy in a developing country and recognises the need to advance the research agenda.

Further research and extensions are possible along various lines. For one, sensitivity analyses are crucial. The present modelling strategy can incorporate different scenarios concerning savings and investment strategies hypotheses.

Among other issues, firms may spend only a fraction of the savings from CE actions on capital equipment. This applies to households as well when we take a full macroeconomic picture. Different coefficient values may represent the heterogeneity of savings-investment decisions, which are also influenced by structural conditions (marginal propensity to consume and invest), the specific market equilibrium (interest rates, GDP) and GDP expectations.

On the other hand, impacts may be underestimated as well. Investments may be scaled up by considering the evolving behavioural change of firms and, relatedly speaking, technological change improvements.

Project-related data (and representativeness of the selected firms) could also be improved in future works, and this is a weakness shared with all CE-oriented efforts. There, especially at micro- and meso-levels, the information sets available are far from those available in the energy and climate change research realm. Nevertheless, this is valuable for zooming into the CE foundations and better understanding its macroeconomic development.

As is always the case, modelling assumptions influence the result (e.g., returns to scale hypotheses). This points to model integration and complementarities between approaches.

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Appendix A. Modelling material, energy and other inputs savings: the simulations design approach

1. Material and energy saving from production improvements generates a corresponding **direct decline in demand** and, consequently, gross production of the saved material and energy. This effect implies a decline in gross output and value-added of the supplier of the saved material and energy. The direct suppliers are identified by considering data on raw material inputs at the macro-level.
   - The effect of changes in gross output is computed as if it was a change in domestic ($\Delta \mathbf{fd}_d$) or imported ($\Delta \mathbf{fd}_m$) final demand. However, the change in the demand for imported products does not influence gross domestic output.
2. The direct decline in production due to material and energy saving also generates **indirect effects through input-output linkages**.
   - The indirect effects in terms of change of gross output are computed as the difference between total effects ($\mathbf{L}_d\ \Delta \mathbf{fd}_d$ for domestic output, $\mathbf{L}_m\ \Delta \mathbf{fd}_m$ for foreign output) and the direct effect ($\Delta \mathbf{fd}_d$ and $\Delta \mathbf{fd}_m$).
3. In addition to changes in intermediate inputs, material and energy saving could result in saving **other inputs** such as labour, capital, taxes, and electricity.
   - Savings in terms of labour result in lower wages paid and, consequently, lower aggregate consumptions. The total change in wages is thus weighted according to the observed composition of final demand and modelled as changes in total demand ($\Delta \mathbf{fd}_d$ and $\Delta \mathbf{fd}_m$). Direct and indirect effects of these changes are calculated as described in, respectively, 1 and 2.
   - Savings in terms of capital result in lower gross fixed capital formation. The total change in gross fixed capital formation is thus weighted according to the observed composition of gross fixed capital formation and modelled as changes in total demand ($\Delta \mathbf{fd}_d$ and $\Delta \mathbf{fd}_m$). Direct and indirect effects of these changes are calculated as described in, respectively, 1 and 2.
   - Savings in taxes result in lower revenues for the government and, assuming a stable government budget balance, into lower public expenditure. The total change in government final expenditure is thus weighted according to the observed composition of final government expenditure and modelled as changes in total demand ($\Delta \mathbf{fd}_d$ and $\Delta \mathbf{fd}_m$). Direct and indirect effects of these changes are calculated as described in, respectively, 1 and 2.
   - Savings in terms of electricity are modelled as in points 1 and 2.

4. Adopting **waste-to-energy practices or renewable energy production** generates economic value.
    - As the marginal cost of energy inputs for waste-to-energy and renewable energy production is basically zero, all the additional gross output corresponds to greater value-added.
5. **Economic resources saved thanks to material and energy savings** can be **re-employed** in various ways by companies.
    - The different options of re-spending are modelled as additional gross production of the sectors where they occur and, consequently, as $\Delta \mathbf{fd_d}$ and $\Delta \mathbf{fd_m}$. Whenever information about the sector where re-spending is done is missing, macro-level shares are used. Direct and indirect effects of these changes are calculated as described in, respectively, 1 and 2.
6. The project could have **generated additional investments** beyond the project's funding.
    - Additional investments are modelled as additional gross production of the sectors where they occur and, consequently, as $\Delta \mathbf{fd_d}$ and $\Delta \mathbf{fd_m}$. Whenever information about the sector where re-spending is done is missing, macro-level shares are used. Direct and indirect effects of these changes are calculated as described in, respectively, 1 and 2.
7. Material and energy saving could result in lower production costs and, consequently, increases in competitiveness and **total sales**.
    - Increases in sales are modelled as a corresponding increase in gross output, which requires additional direct and indirect inputs. This is assumed to be captured into $\Delta \mathbf{fd_d}$.
8. Improved productivity (**lower production costs and/or higher labour productivity**) reduces the input needs per output unit.
    - Increases in labour productivity or decrease in production costs are modelled as a proportionate decrease in input use. This is done by modelling a corresponding decrease in production inputs (keeping input coefficients constant) with no change in value-added ($\Delta \mathbf{fd_d}$).

Appendix B. Detailed simulation results

The different simulated scenarios correspond to the baseline model's adjustments, as described in Table 15.

Table B1 – Randomised firm selection including project expenditure, considering imports

	Value-added (1000 USD)				Employment (headcount)				CO2 emissions (tonnes)			
		Simulations				Simulations				Simulations		
	Reference	Mean	SD	(+) share	Reference	Mean	SD	(+) share	Reference	Mean	SD	(-) share
Egypt												
Additional investments	33867.2	33867.2	.	100.0	4072.3	4072.3	.	100.0	.	.	.	.
Direct effect	12693.9	12734.0	1723.0	100.0	1590.4	1578.9	120.5	100.0	.	.	.	.
Funding of the project	1807.4	1807.4	.	100.0	171.6	171.6	.	100.0	.	.	.	.
Indirect effect	-1086.5	-1077.0	692.5	6.0	-228.7	-233.0	112.4	1.4	.	.	.	.
Total effects												
Induced effect	16293.3	16293.3	.	100.0	2055.8	2055.8	.	100.0	.	.	.	.
Material savings	-1282.7	-1426.7	651.8	.	-284.3	-316.2	144.5	.	.	.	.	.
Other inputs savings	-6491.3	-6297.7	2422.5	.	-542.2	-526.0	202.3	.	.	.	.	.
Total	27900.6	27950.2	2415.0	100.0	3417.4	3401.7	230.8	100.0	.	.	.	.
Georgia												
Additional investments	116.4	116.4	.	100.0	11.0	11.0	.	100.0	170.0	170.0	.	.
Direct effect	11.8	15.0	16.4	88.8	7.9	8.4	1.4	100.0	21.2	24.8	22.3	10.0
Funding of the project	175.1	175.1	.	100.0	23.5	23.5	.	100.0	223.7	223.7	.	.
Indirect effect	-99.8	-97.6	43.8	.	-17.0	-16.6	6.9	.	-172.7	-168.8	69.7	100.0
Total effects												
Induced effect	83.3	84.2	28.1	100.0	11.5	11.7	4.0	100.0	121.4	122.7	40.1	.
Material savings	-21.8	-17.8	8.9	.	-3.9	-3.1	1.6	.	-32.1	-26.2	13.1	100.0
Other inputs savings	-339.9	-339.5	85.0	.	-37.2	-37.2	9.3	.	-473.2	-472.7	118.4	100.0
Total	-4.7	1.6	34.7	26.6	2.4	3.4	2.8	96.8	-30.0	-21.3	55.0	80.8
Indonesia												
Additional investments	3467.5	4255.2	.	100.0	350.6	363.5	.	100.0	3603.2	4693.8	.	.
Direct effect	2250.9	2553.2	87.5	100.0	574.8	545.0	19.7	100.0	-1179.5	-395.8	14.8	100.0
Funding of the project	2415.1	2415.1	.	100.0	279.9	279.9	.	100.0	2033.5	2033.5	.	.
Indirect effect	-4576.9	-4438.8	168.6	.	-701.0	-661.4	47.3	.	-4760.5	-4605.1	188.2	100.0
Total effects												
Induced effect	4883.3	5347.6	0.0	100.0	785.1	830.3	0.0	100.0	4725.5	5020.2	0.0	.
Material savings	-9098.9	-7811.7	1538.6	.	-1043.0	-906.0	163.9	.	-11098.5	-9431.5	2000.7	100.0
Other inputs savings	-2969.9	-4140.2	1408.8	.	-241.1	-336.1	114.4	.	-3867.2	-5391.1	1834.5	100.0
Total	2557.3	3462.0	183.3	100.0	659.0	713.9	54.6	100.0	-1214.5	19.3	174.1	55.4
Vietnam												
Additional investments	3296.0	3296.0	.	100.0	978.4	978.4	.	100.0	12327.4	12327.4	.	.
Direct effect	1829.6	1896.6	466.7	100.0	884.9	921.5	51.3	100.0	8501.0	8641.3	907.9	.
Funding of the project	2852.5	2852.5	.	100.0	724.3	724.3	.	100.0	7153.2	7153.2	.	.
Indirect effect	-86.2	-114.4	378.3	41.0	-29.8	-39.8	126.5	40.2	-238.4	-319.2	1070.7	59.0
Total effects												
Induced effect	934.0	984.7	94.5	100.0	245.9	268.0	41.2	100.0	3620.1	3757.4	256.3	.
Material savings	-697.3	-759.8	480.9	.	-265.7	-279.3	148.2	.	-2060.8	-2224.2	1338.4	100.0
Other inputs savings	-2774.1	-2775.2	609.5	.	-336.2	-336.3	73.9	.	-5538.0	-5540.3	1216.7	100.0
Total	2677.5	2766.9	774.8	100.0	1101.0	1149.7	128.6	100.0	11882.7	12079.5	1789.5	.

Note: Results based on 500 bootstrapping repetitions. (+)/(-) share: share of positive (negative) outcomes; . = zeros effects/not applicable; Reference: project data; Total effect: direct+indirect+induced effect. CO2 estimates for Egypt excluded because of data quality concerns.

Table B2 – Randomised firm selection including project expenditure, domestic only

	Value-added (1000 USD)				Employment (headcount)				CO2 emissions (tonnes)			
		Simulations				Simulations				Simulations		
	Reference	Mean	SD	(+) share	Reference	Mean	SD	(+) share	Reference	Mean	SD	(-) share
Egypt												
Additional investments	36857.5	36857.5	.	100.0	4274.2	4274.2	.	100.0	.	.	.	.
Direct effect	14104.7	14287.5	1740.6	100.0	1610.3	1604.7	120.9	100.0	.	.	.	.
Funding of the project	1824.7	1824.7	.	100.0	173.3	173.3	.	100.0	.	.	.	.
Indirect effect	-1075.3	-1009.7	698.9	7.0	-227.2	-223.7	113.0	1.6	.	.	.	.
Total effects												
Induced effect	17878.8	17878.8	.	100.0	2237.7	2237.7	.	100.0	.	.	.	.
Material savings	-1282.7	-1448.6	662.7	.	-284.3	-321.1	146.9	.	.	.	.	.
Other inputs savings	-6491.3	-6077.1	2461.3	.	-542.2	-507.6	205.6	.	.	.	.	.
Total	30908.2	31156.6	2439.1	100.0	3620.9	3618.7	231.7	100.0	.	.	.	.
Georgia												
Additional investments	157.0	157.0	.	100.0	13.5	13.5	.	100.0	246.3	246.3	.	.
Direct effect	50.3	53.8	16.3	99.8	8.3	8.7	1.4	100.0	100.5	104.7	22.2	.
Funding of the project	187.9	187.9	.	100.0	24.0	24.0	.	100.0	251.3	251.3	.	.
Indirect effect	-98.0	-94.7	43.1	.	-16.5	-16.0	6.8	.	-169.2	-163.5	68.5	100.0
Total effects												
Induced effect	96.4	96.6	27.5	100.0	13.8	13.8	3.9	100.0	142.6	142.8	39.3	.
Material savings	-21.8	-17.8	8.8	.	-3.9	-3.1	1.6	.	-32.1	-26.2	13.0	100.0
Other inputs savings	-339.9	-337.2	83.5	.	-37.2	-37.0	9.2	.	-473.2	-469.5	116.3	100.0
Total	48.7	55.7	34.6	95.4	5.5	6.6	2.8	100.0	73.9	84.0	54.7	6.8
Indonesia												
Additional investments	5503.7	5503.7	.	100.0	421.6	421.6	.	100.0	6059.2	6059.2	.	.
Direct effect	3624.3	3605.5	86.8	100.0	570.7	573.3	19.9	100.0	773.2	761.8	14.3	.
Funding of the project	2721.9	2721.9	.	100.0	311.7	311.7	.	100.0	2288.3	2288.3	.	.
Indirect effect	-4425.2	-4296.6	165.0	.	-679.5	-642.8	45.9	.	-4626.2	-4481.6	183.8	100.0
Total effects												
Induced effect	5701.3	5701.3	0.0	100.0	870.5	870.5	0.0	100.0	5349.4	5349.4	0.0	.
Material savings	-9098.9	-7904.1	1490.9	.	-1043.0	-915.7	159.3	.	-11098.5	-9552.5	1935.1	100.0
Other inputs savings	-2969.9	-4054.9	1361.7	.	-241.1	-329.2	110.5	.	-3867.2	-5280.0	1773.1	100.0
Total	4900.4	5010.2	183.5	100.0	761.7	801.0	53.9	100.0	1496.4	1629.6	170.2	.
Vietnam												
Additional investments	6389.0	6389.0	.	100.0	1664.5	1664.5	.	100.0	22475.4	22475.4	.	.
Direct effect	3343.5	3624.9	393.0	100.0	1145.5	1268.1	42.9	100.0	13459.7	14078.1	722.7	.
Funding of the project	2852.5	2852.5	.	100.0	724.3	724.3	.	100.0	7153.2	7153.2	.	.
Indirect effect	-86.2	-112.3	374.5	41.0	-29.8	-38.6	124.9	40.8	-238.4	-311.9	1059.6	59.0
Total effects												
Induced effect	2513.2	2669.7	124.1	100.0	671.3	739.5	54.1	100.0	8809.4	9234.0	336.7	.
Material savings	-697.3	-743.2	470.1	.	-265.7	-275.0	145.0	.	-2060.8	-2180.8	1310.1	100.0
Other inputs savings	-2774.1	-2789.7	610.5	.	-336.2	-338.1	74.0	.	-5538.0	-5569.2	1218.8	100.0
Total	5770.5	6182.3	657.0	100.0	1787.1	1969.1	76.2	100.0	22030.7	23000.3	1484.1	.

Note: Results based on 500 bootstrapping repetitions. (+)/(-) share: share of positive (negative) outcomes; . = zeros effects/not applicable; Reference: project data; Total effect: direct+indirect+induced effect. CO2 estimates for Egypt excluded because of data quality concerns.

Table B3 – Randomised firm selection excluding project expenditure, domestic only

	Value-added (1000 USD)				Employment (headcount)				CO2 emissions (tonnes)			
		Simulations				Simulations				Simulations		
	Reference	Mean	SD	(+) share	Reference	Mean	SD	(+) share	Reference	Mean	SD	(-) share
Egypt												
Additional investments	36857.5	36857.5	.	100.0	4274.2	4274.2	.	100	.	.	.	.
Direct effect	13465.6	13605.6	1736.1	100.0	1605.2	1598.2	122.3	100	.	.	.	.
Funding of the project	.	.	.	.	.	.	.	.	.	.	.	.
Indirect effect	-2260.9	-2212.0	698.5	.	-395.3	-394.0	113.9	.	.	.	.	.
Total effects												
Induced effect	17878.8	17878.8	.	100.0	2237.7	2237.7	.	100	.	.	.	.
Material savings	-1282.7	-1437.7	645.1	.	-284.3	-318.7	143.0	.	.	.	.	.
Other inputs savings	-6491.3	-6147.4	2420.5	.	-542.2	-513.5	202.2	.	.	.	.	.
Total	29083.5	29272.4	2434.2	100.0	3447.6	3442.0	234.2	100	.	.	.	.
Georgia												
Additional investments	157.0	157.0	.	100.0	13.5	13.5	.	100	246.3	246.3	.	.
Direct effect	-53.7	-50.4	16.6	0.4	-3.5	-3.0	1.4	5	-29.7	-25.8	22.5	86.8
Funding of the project	.	.	.	.	.	.	.	.	.	.	.	100.0
Indirect effect	-181.9	-179.2	44.0	.	-28.8	-28.3	6.9	.	-290.3	-285.7	69.9	100.0
Total effects												
Induced effect	96.4	97.1	28.1	100.0	13.8	13.9	4.0	100	142.6	143.5	40.1	.
Material savings	-21.8	-17.7	8.7	.	-3.9	-3.1	1.5	.	-32.1	-26.0	12.9	100.0
Other inputs savings	-339.9	-338.7	85.3	.	-37.2	-37.1	9.3	.	-473.2	-471.6	118.7	100.0
Total	-139.2	-132.5	35.1	.	-18.5	-17.5	2.8	.	-177.4	-168.0	55.5	100.0
Indonesia												
Additional investments	5503.7	5503.7	.	100.0	421.6	421.6	.	100	6059.2	6059.2	.	.
Direct effect	2238.7	2217.8	83.6	100.0	455.7	457.8	18.9	100	-314.0	-325.6	14.6	100.0
Funding of the project	.	.	.	.	.	.	.	.	.	.	.	100.0
Indirect effect	-5761.4	-5632.2	166.7	.	-876.2	-839.1	46.7	.	-5827.3	-5681.8	186.1	100.0
Total effects												
Induced effect	5701.3	5701.3	0.0	100.0	870.5	870.5	0.0	100	5349.4	5349.4	0.0	.
Material savings	-9098.9	-7889.6	1519.1	.	-1043.0	-914.4	162.0	.	-11098.5	-9531.0	1973.4	100.0
Other inputs savings	-2969.9	-4070.8	1388.9	.	-241.1	-330.5	112.8	.	-3867.2	-5300.7	1808.5	100.0
Total	2178.5	2286.9	179.7	100.0	450.0	489.2	53.9	100	-791.9	-658.0	172.2	100.0
Vietnam												
Additional investments	6389.0	6389.0	.	100.0	1664.5	1664.5	.	100	22475.4	22475.4	.	.
Direct effect	1692.9	1974.3	393.0	100.0	789.3	911.9	42.9	100	9644.0	10262.4	722.7	.
Funding of the project	.	.	.	.	.	.	.	.	.	.	.	100.0
Indirect effect	-1288.2	-1314.3	374.5	.	-397.8	-406.6	124.9	.	-3575.9	-3649.4	1059.6	100.0
Total effects												
Induced effect	2513.2	2669.7	124.1	100.0	671.3	739.5	54.1	100	8809.4	9234.0	336.7	.
Material savings	-697.3	-743.2	470.1	.	-265.7	-275.0	145.0	.	-2060.8	-2180.8	1310.1	100.0
Other inputs savings	-2774.1	-2789.7	610.5	.	-336.2	-338.1	74.0	.	-5538.0	-5569.2	1218.8	100.0
Total	2917.9	3329.8	657.0	100.0	1062.8	1244.8	76.2	100	14877.5	15847.1	1484.1	.

Note: Results based on 500 bootstrapping repetitions. (+)/(-) share: share of positive (negative) outcomes; . = zeros effects/not applicable; Reference: project data; Total effect: direct+indirect+induced effect. CO2 estimates for Egypt excluded because of data quality concerns.

Table B4 – Randomised firm selection including project expenditure, domestic only, two years

	Value-added (1000 USD)				Employment (headcount)				CO2 emissions (tonnes)			
		Simulations				Simulations				Simulations		
	Reference	Mean	SD	(+) share	Reference	Mean	SD	(+) share	Reference	Mean	SD	(-) share
Egypt												
Additional investments	36857.5	36857.5	.	100.0	4274.2	4274.2	.	100.0	.	.	.	.
Direct effect	8619.6	9125.6	3295.5	99.6	1180.9	1179.3	233.9	100.0	.	.	.	.
Funding of the project	1824.7	1824.7	.	100.0	173.3	173.3	.	100.0	.	.	.	.
Indirect effect	-3336.2	-3219.6	1374.9	.	-622.5	-617.5	223.0	.	.	.	.	.
Total effects												
Induced effect	17904.8	18069.7	520.7	100.0	2241.6	2265.9	76.8	100.0	.	.	.	.
Material savings	-2565.4	-2891.1	1339.6	.	-568.6	-640.8	296.9	.	.	.	.	.
Other inputs savings	-12982.7	-12212.0	4843.3	.	-1084.4	-1020.0	404.5	.	.	.	.	.
Total	23188.2	23975.6	4584.6	100.0	2800.0	2827.7	442.0	100.0	.	.	.	.
Georgia												
Additional investments	232.7	232.7	.	100.0	20.1	20.1	.	100.0	365.3	365.3	.	.
Direct effect	13.0	5.3	22.0	79.2	8.6	10.2	3.2	100.0	66.8	55.1	33.5	7
Funding of the project	187.9	187.9	.	100.0	24.0	24.0	.	100.0	251.3	251.3	.	.
Indirect effect	-245.8	-274.5	86.3	.	-39.9	-44.4	13.6	.	-405.3	-450.2	137.3	100
Total effects												
Induced effect	187.4	206.8	60.5	100.0	26.8	29.5	8.6	100.0	274.8	302.4	86.2	.
Material savings	-44.0	-35.7	17.8	.	-7.8	-6.3	3.2	.	-64.9	-52.6	26.3	100
Other inputs savings	-611.3	-676.8	167.1	.	-67.0	-74.2	18.3	.	-851.1	-942.3	232.7	100
Total	-45.3	-62.4	49.0	8.4	-4.5	-4.7	2.2	3.4	-63.7	-92.7	85.8	89
Indonesia												
Additional investments	5503.7	5503.7	.	100.0	421.6	421.6	.	100.0	6059.2	6059.2	.	.
Direct effect	6815.3	6778.3	169.5	100.0	1458.0	1463.1	38.5	100.0	172.3	149.6	29.0	.
Funding of the project	2721.9	2721.9	.	100.0	311.7	311.7	.	100.0	2288.3	2288.3	.	.
Indirect effect	-10186.6	-9931.0	331.0	.	-1555.7	-1482.7	92.6	.	-10453.4	-10166.0	369.2	100
Total effects												
Induced effect	13412.6	13412.6	0.0	100.0	2158.8	2158.8	0.0	100.0	12783.5	12783.5	0.0	.
Material savings	-18197.9	-15824.2	3008.6	.	-2086.1	-1833.0	320.9	.	-22197.0	-19126.0	3907.9	100
Other inputs savings	-5939.8	-8094.9	2750.5	.	-482.2	-657.2	223.3	.	-7734.4	-10540.6	3581.5	100
Total	10041.3	10259.8	360.9	100.0	2061.0	2139.2	107.4	100.0	2502.3	2767.1	341.7	.
Vietnam												
Additional investments	6389.0	6389.0	.	100.0	1664.5	1664.5	.	100.0	22475.4	22475.4	.	.
Direct effect	1837.9	2175.1	542.6	100.0	1209.0	1365.1	154.9	100.0	10925.9	11667.1	974.7	.
Funding of the project	2852.5	2852.5	.	100.0	724.3	724.3	.	100.0	7153.2	7153.2	.	.
Indirect effect	-1374.4	-1426.6	749.0	0.8	-427.6	-445.2	249.8	1.0	-3814.3	-3961.3	2119.1	99
Total effects												
Induced effect	2848.1	3049.7	336.5	100.0	817.2	905.1	146.6	100.0	9717.8	10264.7	912.9	.
Material savings	-1394.7	-1486.4	940.3	.	-531.3	-550.0	290.0	.	-4121.5	-4361.5	2620.2	100
Other inputs savings	-5548.2	-5579.4	1221.0	.	-672.3	-676.1	148.0	.	-11076.0	-11138.3	2437.5	100
Total	3311.6	3798.2	963.3	100.0	1598.6	1825.0	133.1	100.0	16829.4	17970.5	2221.0	.

Note: Results based on 500 bootstrapping repetitions. (+)/(-) share: share of positive (negative) outcomes; . = zeros effects/not applicable; Reference: project data; Total effect: direct+indirect+induced effect. CO2 estimates for Egypt excluded because of data quality concerns.

Table B5 – Randomised firm selection excluding project expenditure, domestic only, two years

	Value-added (1000 USD)				Employment (headcount)				CO2 emissions (tonnes)			
		Simulations				Simulations				Simulations		
	Reference	Mean	SD	(+) share	Reference	Mean	SD	(+) share	Reference	Mean	SD	(-) share
Egypt												
Additional investments	36857.5	36857.5	.	100.0	4274.2	4274.2	.	100.0	.	.	.	.
Direct effect	7980.6	8450.0	3306.5	99.4	1175.8	1171.6	236.3	100.0	.	.	.	.
Funding of the project	.	.	.	.	.	.	.	.	.	.	.	.
Indirect effect	-4521.9	-4415.9	1373.0	.	-790.6	-787.5	223.8	.	.	.	.	.
Total effects												
Induced effect	17904.8	18059.9	497.1	100.0	2241.6	2264.4	73.3	100.0	.	.	.	.
Material savings	-2565.4	-2896.3	1317.0	.	-568.6	-641.9	291.9	.	.	.	.	.
Other inputs savings	-12982.7	-12243.3	4792.1	.	-1084.4	-1022.6	400.3	.	.	.	.	.
Total	21363.5	22094.0	4609.4	100.0	2626.8	2648.6	447.8	100.0	.	.	.	.
Georgia												
Additional investments	232.7	232.7	.	100.0	20.1	20.1	.	100.0	365.3	365.3	.	.
Direct effect	-91.0	-98.7	22.7	.	-3.2	-1.6	3.2	21.8	-63.4	-75.2	34.5	99.6
Funding of the project	.	.	.	.	.	.	.	.	.	.	.	100.0
Indirect effect	-329.6	-359.0	87.8	.	-52.1	-56.7	13.8	.	-526.4	-572.3	139.6	100.0
Total effects												
Induced effect	187.4	207.4	61.2	100.0	26.8	29.6	8.7	100.0	274.8	303.2	87.3	.
Material savings	-44.0	-35.6	17.7	.	-7.8	-6.3	3.1	.	-64.9	-52.4	26.1	100.0
Other inputs savings	-611.3	-678.2	170.4	.	-67.0	-74.3	18.7	.	-851.1	-944.3	237.3	100.0
Total	-233.2	-250.4	50.5	.	-28.5	-28.7	2.3	.	-315.1	-344.4	88.0	100.0
Indonesia												
Additional investments	5503.7	5503.7	.	100.0	421.6	421.6	.	100.0	6059.2	6059.2	.	.
Direct effect	5429.7	5433.7	168.1	100.0	1342.9	1369.2	37.9	100.0	-915.0	-879.8	29.5	100.0
Funding of the project	.	45.6	.	100.0	.	22.4	.	100.0	.	59.3	.	.
Indirect effect	-11522.9	-11266.3	335.1	.	-1752.4	-1678.7	94.0	.	-11654.6	-11365.7	374.1	100.0
Total effects												
Induced effect	13412.6	13412.6	0.0	100.0	2158.8	2158.8	0.0	100.0	12783.5	12783.5	0.0	.
Material savings	-18197.9	-15810.8	3058.8	.	-2086.1	-1832.1	325.9	.	-22197.0	-19103.9	3975.1	100.0
Other inputs savings	-5939.8	-8112.0	2798.3	.	-482.2	-658.5	227.2	.	-7734.4	-10562.8	3643.7	100.0
Total	7319.4	7579.9	360.1	100.0	1749.3	1849.3	108.2	100.0	214.0	538.0	346.1	.
Vietnam												
Additional investments	6389.0	6389.0	.	100.0	1664.5	1664.5	.	100.0	22475.4	22475.4	.	.
Direct effect	187.3	524.6	542.6	85.8	852.7	1008.8	154.9	100.0	7110.2	7851.3	974.7	.
Funding of the project	.	.	.	.	.	.	.	.	.	.	.	100.0
Indirect effect	-2576.4	-2628.6	749.0	.	-795.7	-813.2	249.8	.	-7151.8	-7298.8	2119.1	100.0
Total effects												
Induced effect	2848.1	3049.7	336.5	100.0	817.2	905.1	146.6	100.0	9717.8	10264.7	912.9	.
Material savings	-1394.7	-1486.4	940.3	.	-531.3	-550.0	290.0	.	-4121.5	-4361.5	2620.2	100.0
Other inputs savings	-5548.2	-5579.4	1221.0	.	-672.3	-676.1	148.0	.	-11076.0	-11138.3	2437.5	100.0
Total	459.0	945.6	963.3	85.0	874.3	1100.7	133.1	100.0	9676.2	10817.2	2221.0	.

Note: Results based on 500 bootstrapping repetitions. (+)/(-) share: share of positive (negative) outcomes; . = zeros effects/not applicable; Reference: project data; Total effect: direct+indirect+induced effect. CO2 estimates for Egypt excluded because of data quality concerns.

Table B6 – Randomised firm selection excluding project expenditure, considering imports

	Value-added (1000 USD)				Employment (headcount)				CO2 emissions (tonnes)			
		Simulations				Simulations				Simulations		
	Reference	Mean	SD	(+) share	Reference	Mean	SD	(+) share	Reference	Mean	SD	(-) share
Egypt												
Additional investments	33867.2	33867.2	.	100.0	4072.3	4072.3	.	100.0	.	.	.	.
Direct effect	12060.9	12223.3	1696.3	100.0	1585.3	1579.9	118.0	100.0	.	.	.	.
Funding of the project	.	.	.	.	.	.	.	.	.	.	.	.
Indirect effect	-2260.9	-2202.8	680.8	.	-395.3	-392.4	110.0	.	.	.	.	.
Total effects												
Induced effect	16293.3	16293.3	.	100.0	2055.8	2055.8	.	100.0	.	.	.	.
Material savings	-1282.7	-1434.4	663.5	.	-284.3	-317.9	147.1	.	.	.	.	.
Other inputs savings	-6491.3	-6119.0	2411.4	.	-542.2	-511.1	201.4	.	.	.	.	.
Total	26093.2	26313.8	2376.6	100.0	3245.8	3243.3	225.8	100.0	.	.	.	.
Georgia												
Additional investments	116.4	116.4	.	100.0	11.0	11.0	.	100.0	170.0	170.0	.	.
Direct effect	-81.1	-77.7	16.2	.	-3.9	-3.4	1.4	3.4	-84.9	-80.8	22.1	100.0
Funding of the project	.	.	.	.	.	.	.	.	.	.	.	100.0
Indirect effect	-181.9	-178.7	43.0	.	-28.8	-28.2	6.8	.	-290.3	-284.8	68.3	100.0
Total effects												
Induced effect	83.3	83.5	27.5	100.0	11.5	11.6	3.9	100.0	121.4	121.7	39.2	.
Material savings	-21.8	-17.8	8.8	.	-3.9	-3.1	1.6	.	-32.1	-26.2	13.0	100.0
Other inputs savings	-339.9	-337.4	83.4	.	-37.2	-37.0	9.1	.	-473.2	-469.8	116.2	100.0
Total	-179.7	-172.8	34.4	.	-21.1	-20.1	2.7	.	-253.8	-243.9	54.4	100.0
Indonesia												
Additional investments	4255.2	4255.2	.	100.0	363.5	363.5	.	100.0	4693.8	4693.8	.	.
Direct effect	1343.8	1361.0	88.4	100.0	437.8	458.8	20.0	100.0	-1350.3	-1312.8	14.8	100.0
Funding of the project	.	38.7	.	100.0	.	19.0	.	100.0	.	50.4	.	.
Indirect effect	-5761.4	-5628.6	168.3	.	-876.2	-838.0	47.1	.	-5827.3	-5677.7	187.7	100.0
Total effects												
Induced effect	5347.6	5347.6	0.0	100.0	830.3	830.3	0.0	100.0	5020.2	5020.2	0.0	.
Material savings	-9098.9	-7867.5	1533.7	.	-1043.0	-912.0	163.4	.	-11098.5	-9503.3	1994.2	100.0
Other inputs savings	-2969.9	-4090.0	1404.3	.	-241.1	-332.0	114.0	.	-3867.2	-5325.7	1828.6	100.0
Total	930.0	1080.1	184.2	100.0	391.9	451.1	54.6	100.0	-2157.4	-1970.3	173.7	100.0
Vietnam												
Additional investments	3296.0	3296.0	.	100.0	978.4	978.4	.	100.0	12327.4	12327.4	.	.
Direct effect	179.1	245.3	455.0	70.8	528.6	564.9	50.2	100.0	4685.3	4821.8	885.7	.
Funding of the project	.	.	.	.	.	.	.	.	.	.	.	100.0
Indirect effect	-1288.2	-1318.5	375.0	.	-397.8	-408.7	125.6	.	-3575.9	-3664.0	1061.6	100.0
Total effects												
Induced effect	934.0	985.4	96.3	100.0	245.9	268.3	42.0	100.0	3620.1	3759.4	261.3	.
Material savings	-697.3	-765.4	483.1	.	-265.7	-281.3	148.5	.	-2060.8	-2240.6	1343.6	100.0
Other inputs savings	-2774.1	-2774.1	600.1	.	-336.2	-336.2	72.7	.	-5538.0	-5538.1	1197.9	100.0
Total	-175.1	-87.9	756.7	44.6	376.7	424.4	124.3	100.0	4729.5	4917.2	1750.1	0.2

Note: Results based on 500 bootstrapping repetitions. (+)/(-) share: share of positive (negative) outcomes; . = zeros effects/not applicable; Reference: project data; Total effect: direct+indirect+induced effect. CO2 estimates for Egypt excluded because of data quality concerns.

Table B7 – Randomised firm selection including project expenditure, considering imports, two years

	Value-added (1000 USD)				Employment (headcount)				CO2 emissions (tonnes)			
		Simulations				Simulations				Simulations		
	Reference	Mean	SD	(+) share	Reference	Mean	SD	(+) share	Reference	Mean	SD	(-) share
Egypt												
Additional investments	33867.2	33867.2	.	100.0	4072.3	4072.3	.	100.0	.	.	.	.
Direct effect	7208.8	7456.8	3286.7	97.6	1161.0	1146.8	235.0	100.0	.	.	.	.
Funding of the project	1807.4	1807.4	.	100.0	171.6	171.6	.	100.0	.	.	.	.
Indirect effect	-3347.5	-3341.8	1381.7	.	-624.1	-635.4	224.4	.	.	.	.	.
Total effects												
Induced effect	16319.3	16504.2	552.6	100.0	2059.6	2086.9	81.5	100.0	.	.	.	.
Material savings	-2565.4	-2874.1	1335.7	.	-568.6	-637.0	296.0	.	.	.	.	.
Other inputs savings	-12982.7	-12619.4	4852.7	.	-1084.4	-1054.1	405.3	.	.	.	.	.
Total	20180.6	20619.1	4564.2	100.0	2596.5	2598.3	443.3	100.0	.	.	.	.
Georgia												
Additional investments	172.7	172.7	.	100.0	16.2	16.2	.	100.0	252.1	252.1	.	.
Direct effect	-38.7	-46.8	22.4	1.8	8.1	9.7	3.2	100.0	-39.1	-51.5	34.2	95.4
Funding of the project	175.1	175.1	.	100.0	23.5	23.5	.	100.0	223.7	223.7	.	.
Indirect effect	-247.5	-278.0	87.7	.	-40.4	-45.1	13.8	.	-408.8	-456.4	139.4	100.0
Total effects												
Induced effect	167.9	188.4	61.3	100.0	23.4	26.3	8.7	100.0	243.4	272.6	87.4	.
Material savings	-44.0	-35.6	17.7	.	-7.8	-6.3	3.1	.	-64.9	-52.4	26.1	100.0
Other inputs savings	-611.3	-680.4	170.3	.	-67.0	-74.6	18.7	.	-851.1	-947.3	237.0	100.0
Total	-118.3	-136.3	49.9	.	-8.8	-9.0	2.3	.	-204.5	-235.3	87.3	100.0
Indonesia												
Additional investments	4255.2	4255.2	.	100.0	363.5	363.5	.	100.0	4693.8	4693.8	.	.
Direct effect	5765.3	5725.3	170.4	100.0	1429.8	1435.1	38.2	100.0	-984.4	-1008.6	29.4	100.0
Funding of the project	2415.1	2415.1	.	100.0	279.9	279.9	.	100.0	2033.5	2033.5	.	.
Indirect effect	-10338.3	-10065.0	332.3	.	-1577.2	-1499.0	93.4	.	-10587.8	-10280.5	371.1	100.0
Total effects												
Induced effect	13059.0	13059.0	0.0	100.0	2118.6	2118.6	0.0	100.0	12454.3	12454.3	0.0	.
Material savings	-18197.9	-15658.1	3043.2	.	-2086.1	-1815.4	323.8	.	-22197.0	-18910.5	3959.3	100.0
Other inputs savings	-5939.8	-8246.3	2788.6	.	-482.2	-669.4	226.4	.	-7734.4	-10737.8	3631.1	100.0
Total	8486.0	8719.2	357.3	100.0	1971.2	2054.6	107.2	100.0	882.1	1165.2	343.2	.
Vietnam												
Additional investments	3296.0	3296.0	.	100.0	978.4	978.4	.	100.0	12327.4	12327.4	.	.
Direct effect	324.0	537.8	544.8	85.4	948.3	1053.6	160.8	100.0	5967.2	6422.8	997.3	.
Funding of the project	2852.5	2852.5	.	100.0	724.3	724.3	.	100.0	7153.2	7153.2	.	.
Indirect effect	-1374.4	-1433.0	758.9	0.8	-427.6	-448.6	254.1	1.2	-3814.3	-3981.5	2148.0	99.0
Total effects												
Induced effect	1268.9	1411.4	346.4	100.0	391.8	453.9	150.9	100.0	4528.5	4915.1	939.7	.
Material savings	-1394.7	-1525.6	973.9	.	-531.3	-560.5	298.8	.	-4121.5	-4462.1	2709.1	100.0
Other inputs savings	-5548.2	-5550.6	1212.1	.	-672.3	-672.6	146.9	.	-11076.0	-11080.8	2419.7	100.0
Total	218.5	516.2	970.5	70.2	912.5	1059.0	145.9	100.0	6681.4	7356.4	2258.9	.

Note: Results based on 500 bootstrapping repetitions. (+)/(-) share: share of positive (negative) outcomes; . = zeros effects/not applicable; Reference: project data; Total effect: direct+indirect+induced effect. CO2 estimates for Egypt excluded because of data quality concerns.

Table B8 – Randomised firm selection excluding project expenditure, considering imports, two years

	Value-added (1000 USD)				Employment (headcount)				CO2 emissions (tonnes)			
		Simulations				Simulations				Simulations		
	Reference	Mean	SD	(+) share	Reference	Mean	SD	(+) share	Reference	Mean	SD	(-) share
Egypt												
Additional investments	33867.2	33867.2	.	100.0	4072.3	4072.3	.	100.0	.	.	.	.
Direct effect	6575.8	6999.7	3258.4	98.0	1155.9	1152.9	231.0	100.0	.	.	.	.
Funding of the project	.	.	.	.	.	.	.	.	.	.	.	.
Indirect effect	-4521.9	-4445.0	1367.1	.	-790.6	-790.5	221.3	.	.	.	.	.
Total effects												
Induced effect	16319.3	16503.5	567.5	100.0	2059.6	2086.8	83.7	100.0	.	.	.	.
Material savings	-2565.4	-2859.7	1318.5	.	-568.6	-633.8	292.2	.	.	.	.	.
Other inputs savings	-12982.7	-12386.0	4822.2	.	-1084.4	-1034.6	402.8	.	.	.	.	.
Total	18373.2	19058.2	4529.3	100.0	2424.9	2449.2	437.1	100.0	.	.	.	.
Georgia												
Additional investments	172.7	172.7	.	100.0	16.2	16.2	.	100.0	252.1	252.1	.	.
Direct effect	-131.6	-138.9	22.1	.	-3.7	-2.2	3.1	17.8	-145.2	-156.3	33.5	100.0
Funding of the project	.	.	.	.	.	.	.	.	.	.	.	100.0
Indirect effect	-329.6	-357.1	85.3	.	-52.1	-56.4	13.4	.	-526.4	-569.3	135.7	100.0
Total effects												
Induced effect	167.9	186.5	59.6	100.0	23.4	26.0	8.5	100.0	243.4	269.8	85.0	.
Material savings	-44.0	-35.7	17.9	.	-7.8	-6.3	3.2	.	-64.9	-52.5	26.3	100.0
Other inputs savings	-611.3	-674.4	165.7	.	-67.0	-73.9	18.2	.	-851.1	-938.9	230.7	100.0
Total	-293.3	-309.5	49.1	.	-32.4	-32.5	2.3	.	-428.2	-455.8	85.5	100.0
Indonesia												
Additional investments	4255.2	4255.2	.	100.0	363.5	363.5	.	100.0	4693.8	4693.8	.	.
Direct effect	4534.8	4496.7	172.6	100.0	1325.1	1330.7	39.6	100.0	-1951.2	-1975.1	29.5	100.0
Funding of the project	.	.	.	.	.	.	.	.	.	.	.	100.0
Indirect effect	-11522.9	-11251.6	339.8	.	-1752.4	-1675.0	94.7	.	-11654.6	-11349.6	378.6	100.0
Total effects												
Induced effect	13059.0	13059.0	0.0	100.0	2118.6	2118.6	0.0	100.0	12454.3	12454.3	0.0	.
Material savings	-18197.9	-15683.6	3072.3	.	-2086.1	-1817.8	328.3	.	-22197.0	-18945.7	3985.4	100.0
Other inputs savings	-5939.8	-8220.9	2803.5	.	-482.2	-667.4	227.6	.	-7734.4	-10704.7	3650.5	100.0
Total	6070.9	6304.1	373.1	100.0	1691.3	1774.3	110.7	100.0	-1151.5	-870.5	350.6	98.4
Vietnam												
Additional investments	3296.0	3296.0	.	100.0	978.4	978.4	.	100.0	12327.4	12327.4	.	.
Direct effect	-1326.5	-1116.2	535.3	1.8	592.0	691.9	159.0	100.0	2151.5	2599.6	985.0	0.2
Funding of the project	.	.	.	.	.	.	.	.	.	.	.	100.0
Indirect effect	-2576.4	-2625.0	741.5	.	-795.7	-813.0	248.4	.	-7151.8	-7292.1	2098.6	100.0
Total effects												
Induced effect	1268.9	1402.4	338.3	100.0	391.8	450.0	147.4	100.0	4528.5	4890.6	917.9	.
Material savings	-1394.7	-1508.9	958.5	.	-531.3	-556.1	295.0	.	-4121.5	-4418.9	2665.2	100.0
Other inputs savings	-5548.2	-5542.3	1196.9	.	-672.3	-671.6	145.0	.	-11076.0	-11064.3	2389.3	100.0
Total	-2634.0	-2338.8	952.8	0.8	188.2	328.9	149.3	98.8	-471.8	198.1	2222.9	48.0

Note: Results based on 500 bootstrapping repetitions. (+)/(-) share: share of positive (negative) outcomes; . = zeros effects/not applicable; Reference: project data; Total effect: direct+indirect+induced effect. CO2 estimates for Egypt excluded because of data quality concerns.

Table B9 – Randomised additional investment (random sector allocation) including project expenditure, considering imports

	Value-added (1000 USD)				Employment (headcount)				CO2 emissions (tonnes)			
		Simulations				Simulations				Simulations		
	Reference	Mean	SD	(+) share	Reference	Mean	SD	(+) share	Reference	Mean	SD	(-) share
Egypt												
Additional investments	33867.2	22821.0	3261.8	100.0	4072.3	2452.8	601.0	100.0	.	.	.	.
Direct effect	12693.9	8031.9	1781.8	100.0	1590.4	641.6	507.5	84.4	.	.	.	.
Funding of the project	1807.4	1807.4	.	100.0	171.6	171.6	.	100.0	.	.	.	.
Indirect effect	-1086.5	-1086.5	.	.	-228.7	-228.7	.	.	.	.	.	.
Total effects												
Induced effect	16293.3	9909.0	2304.3	100.0	2055.8	1385.0	296.1	100.0	.	.	.	.
Material savings	-1282.7	-1282.7	.	.	-284.3	-284.3	.	.	.	.	.	.
Other inputs savings	-6491.3	-6491.3	.	.	-542.2	-542.2	.	.	.	.	.	.
Total	27900.6	16854.3	3261.8	100.0	3417.4	1797.9	601.0	100.0	.	.	.	.
Georgia												
Additional investments	116.4	72.6	24.3	100.0	11.0	9.7	4.2	100.0	170.0	110.2	31.4	.
Direct effect	11.8	-11.1	12.5	16.8	7.9	8.4	2.5	100.0	21.2	-12.3	12.5	85.6
Funding of the project	175.1	175.1	.	100.0	23.5	23.5	.	100.0	223.7	223.7	.	.
Indirect effect	-99.8	-99.8	.	.	-17.0	-17.0	.	.	-172.7	-172.7	.	100.0
Total effects												
Induced effect	83.3	62.3	14.6	100.0	11.5	9.7	2.4	100.0	121.4	95.1	23.5	.
Material savings	-21.8	-21.8	.	.	-3.9	-3.9	.	.	-32.1	-32.1	.	100.0
Other inputs savings	-339.9	-339.9	.	.	-37.2	-37.2	.	.	-473.2	-473.2	.	100.0
Total	-4.7	-48.5	24.3	3.2	2.4	1.2	4.2	61.4	-30.0	-89.9	31.4	99.2
Indonesia												
Additional investments	3467.5	3598.5	687.5	100.0	350.6	475.4	187.2	100.0	3603.2	3569.6	553.9	.
Direct effect	2250.9	2148.5	388.0	100.0	574.8	648.9	133.1	100.0	-1179.5	-1452.3	294.2	100.0
Funding of the project	2415.1	2415.1	.	100.0	279.9	279.9	.	100.0	2033.5	2033.5	.	.
Indirect effect	-4576.9	-4576.9	.	.	-701.0	-701.0	.	.	-4760.5	-4760.5	.	100.0
Total effects												
Induced effect	4883.3	5116.8	351.8	100.0	785.1	835.8	66.0	100.0	4725.5	4964.8	354.5	.
Material savings	-9098.9	-9098.9	.	.	-1043.0	-1043.0	.	.	-11098.5	-11098.5	.	100.0
Other inputs savings	-2969.9	-2969.9	.	.	-241.1	-241.1	.	.	-3867.2	-3867.2	.	100.0
Total	2557.3	2688.4	687.5	100.0	659.0	783.8	187.2	100.0	-1214.5	-1248.0	553.9	97.4
Vietnam												
Additional investments	3296.0	3596.3	774.0	100.0	978.4	1114.4	353.6	100.0	12327.4	11569.2	1889.0	.
Direct effect	1829.6	1516.6	622.0	99.8	884.9	742.9	280.0	100.0	8501.0	5997.3	1014.5	.
Funding of the project	2852.5	2852.5	.	100.0	724.3	724.3	.	100.0	7153.2	7153.2	.	.
Indirect effect	-86.2	-86.2	.	.	-29.8	-29.8	.	.	-238.4	-238.4	.	100.0
Total effects												
Induced effect	934.0	1547.3	288.2	100.0	245.9	524.0	111.6	100.0	3620.1	5365.5	1069.8	.
Material savings	-697.3	-697.3	.	.	-265.7	-265.7	.	.	-2060.8	-2060.8	.	100.0
Other inputs savings	-2774.1	-2774.1	.	.	-336.2	-336.2	.	.	-5538.0	-5538.0	.	100.0
Total	2677.5	2977.7	774.0	100.0	1101.0	1237.1	353.6	100.0	11882.7	11124.4	1889.0	.

Note: Results based on 500 bootstrapping repetitions. (+)/(-) share: share of positive (negative) outcomes; . = zeros effects/not applicable; Reference: project data; Total effect: direct+indirect+induced effect. CO2 estimates for Egypt excluded because of data quality concerns.

Table B10 – Randomised additional investment (random sector allocation) including project expenditure, domestic only

	Value-added (1000 USD)				Employment (headcount)				CO2 emissions (tonnes)			
		Simulations				Simulations				Simulations		
	Reference	Mean	SD	(+) share	Reference	Mean	SD	(+) share	Reference	Mean	SD	(-) share
Egypt												
Additional investments	36857.5	29624.1	2664.1	100.0	4274.2	3471.0	840.0	100.0	.	.	.	.
Direct effect	14104.7	12854.3	1937.1	100.0	1610.3	1378.8	835.2	96.6	.	.	.	.
Funding of the project	1824.7	1824.7	.	100.0	173.3	173.3	.	100.0	.	.	.	.
Indirect effect	-1075.3	-1075.3	.	.	-227.2	-227.2	.	.	.	.	.	.
Total effects												
Induced effect	17878.8	11895.8	2536.7	100.0	2237.7	1666.1	299.7	100.0	.	.	.	.
Material savings	-1282.7	-1282.7	.	.	-284.3	-284.3	.	.	.	.	.	.
Other inputs savings	-6491.3	-6491.3	.	.	-542.2	-542.2	.	.	.	.	.	.
Total	30908.2	23674.8	2664.1	100.0	3620.9	2817.8	840.0	100.0	.	.	.	.
Georgia												
Additional investments	157.0	187.0	39.7	100.0	13.5	21.9	7.1	100.0	246.3	266.8	42.6	.
Direct effect	50.3	79.4	20.9	100.0	8.3	15.2	4.7	100.0	100.5	113.6	16.4	.
Funding of the project	187.9	187.9	.	100.0	24.0	24.0	.	100.0	251.3	251.3	.	.
Indirect effect	-98.0	-98.0	.	.	-16.5	-16.5	.	.	-169.2	-169.2	.	100.0
Total effects												
Induced effect	96.4	97.4	25.5	100.0	13.8	15.2	3.9	100.0	142.6	150.0	39.0	.
Material savings	-21.8	-21.8	.	.	-3.9	-3.9	.	.	-32.1	-32.1	.	100.0
Other inputs savings	-339.9	-339.9	.	.	-37.2	-37.2	.	.	-473.2	-473.2	.	100.0
Total	48.7	78.8	39.7	93.2	5.5	13.9	7.1	93.6	73.9	94.4	42.6	0.4
Indonesia												
Additional investments	5503.7	6796.3	854.6	100.0	421.6	841.8	253.6	100.0	6059.2	6389.1	608.2	.
Direct effect	3624.3	4593.2	468.2	100.0	570.7	904.5	198.7	100.0	773.2	567.4	238.2	3.8
Funding of the project	2721.9	2721.9	.	100.0	311.7	311.7	.	100.0	2288.3	2288.3	.	.
Indirect effect	-4425.2	-4425.2	.	.	-679.5	-679.5	.	.	-4626.2	-4626.2	.	100.0
Total effects												
Induced effect	5701.3	6025.0	507.9	100.0	870.5	957.0	87.4	100.0	5349.4	5885.1	528.5	.
Material savings	-9098.9	-9098.9	.	.	-1043.0	-1043.0	.	.	-11098.5	-11098.5	.	100.0
Other inputs savings	-2969.9	-2969.9	.	.	-241.1	-241.1	.	.	-3867.2	-3867.2	.	100.0
Total	4900.4	6193.0	854.6	100.0	761.7	1181.9	253.6	100.0	1496.4	1826.3	608.2	0.6
Vietnam												
Additional investments	6389.0	8073.1	865.0	100.0	1664.5	2793.1	579.2	100.0	22475.4	23344.8	2168.1	.
Direct effect	3343.5	4659.2	1092.9	100.0	1145.5	1994.9	595.1	100.0	13459.7	13164.0	720.1	.
Funding of the project	2852.5	2852.5	.	100.0	724.3	724.3	.	100.0	7153.2	7153.2	.	.
Indirect effect	-86.2	-86.2	.	.	-29.8	-29.8	.	.	-238.4	-238.4	.	100.0
Total effects												
Induced effect	2513.2	2881.6	444.2	100.0	671.3	950.6	133.6	100.0	8809.4	9974.4	1991.9	.
Material savings	-697.3	-697.3	.	.	-265.7	-265.7	.	.	-2060.8	-2060.8	.	100.0
Other inputs savings	-2774.1	-2774.1	.	.	-336.2	-336.2	.	.	-5538.0	-5538.0	.	100.0
Total	5770.5	7454.6	865.0	100.0	1787.1	2915.7	579.2	100.0	22030.7	22900.1	2168.1	.

Note: Results based on 500 bootstrapping repetitions. (+)/(-) share: share of positive (negative) outcomes; . = zeros effects/not applicable; Reference: project data; Total effect: direct+indirect+induced effect. CO2 estimates for Egypt excluded because of data quality concerns.

Table B11 – Randomised additional investment (random sector allocation) excluding project expenditure, domestic only

	Value-added (1000 USD)				Employment (headcount)				CO2 emissions (tonnes)			
		Simulations				Simulations				Simulations		
	Reference	Mean	SD	(+) share	Reference	Mean	SD	(+) share	Reference	Mean	SD	(-) share
Egypt												
Additional investments	36857.5	29583.0	2808.1	100.0	4274.2	3495.4	835.2	100.0	.	.	.	.
Direct effect	13465.6	12206.2	1961.2	100.0	1605.2	1399.9	835.0	97.4	.	.	.	.
Funding of the project	.	.	.	.	.	.	.	.	.	.	.	.
Indirect effect	-2260.9	-2260.9	.	.	-395.3	-395.3	.	.	.	.	.	.
Total effects												
Induced effect	17878.8	11863.8	2573.7	100.0	2237.7	1664.3	316.4	100.0	.	.	.	.
Material savings	-1282.7	-1282.7	.	.	-284.3	-284.3	.	.	.	.	.	.
Other inputs savings	-6491.3	-6491.3	.	.	-542.2	-542.2	.	.	.	.	.	.
Total	29083.5	21809.0	2808.1	100.0	3447.6	2668.9	835.2	100.0	.	.	.	.
Georgia												
Additional investments	157.0	188.1	39.1	100.0	13.5	22.0	6.9	100.0	246.3	268.5	42.5	.
Direct effect	-53.7	-24.3	20.7	8.8	-3.5	3.4	4.6	78.2	-29.7	-16.1	16.4	86.2
Funding of the project	.	.	.	.	.	.	.	.	.	.	.	100.0
Indirect effect	-181.9	-181.9	.	.	-28.8	-28.8	.	.	-290.3	-290.3	.	100.0
Total effects												
Induced effect	96.4	98.2	25.4	100.0	13.8	15.3	3.9	100.0	142.6	151.1	38.8	.
Material savings	-21.8	-21.8	.	.	-3.9	-3.9	.	.	-32.1	-32.1	.	100.0
Other inputs savings	-339.9	-339.9	.	.	-37.2	-37.2	.	.	-473.2	-473.2	.	100.0
Total	-139.2	-108.1	39.1	0.2	-18.5	-10.0	6.9	3.2	-177.4	-155.3	42.5	99.8
Indonesia												
Additional investments	5503.7	6790.3	849.6	100.0	421.6	840.2	249.8	100.0	6059.2	6400.1	597.2	.
Direct effect	2238.7	3201.8	456.8	100.0	455.7	788.3	195.2	100.0	-314.0	-509.7	223.1	100.0
Funding of the project	.	.	.	.	.	.	.	.	.	.	.	100.0
Indirect effect	-5761.4	-5761.4	.	.	-876.2	-876.2	.	.	-5827.3	-5827.3	.	100.0
Total effects												
Induced effect	5701.3	6024.7	505.7	100.0	870.5	956.5	86.5	100.0	5349.4	5885.9	527.5	.
Material savings	-9098.9	-9098.9	.	.	-1043.0	-1043.0	.	.	-11098.5	-11098.5	.	100.0
Other inputs savings	-2969.9	-2969.9	.	.	-241.1	-241.1	.	.	-3867.2	-3867.2	.	100.0
Total	2178.5	3465.1	849.6	100.0	450.0	868.6	249.8	100.0	-791.9	-451.0	597.2	79.4
Vietnam												
Additional investments	6389.0	8070.1	849.7	100.0	1664.5	2798.6	582.4	100.0	22475.4	23310.4	2152.0	.
Direct effect	1692.9	3014.2	1078.9	100.0	789.3	1646.8	600.3	100.0	9644.0	9343.1	730.6	.
Funding of the project	.	.	.	.	.	.	.	.	.	.	.	100.0
Indirect effect	-1288.2	-1288.2	.	.	-397.8	-397.8	.	.	-3575.9	-3575.9	.	100.0
Total effects												
Induced effect	2513.2	2873.0	443.8	100.0	671.3	947.9	136.3	100.0	8809.4	9945.3	1970.4	.
Material savings	-697.3	-697.3	.	.	-265.7	-265.7	.	.	-2060.8	-2060.8	.	100.0
Other inputs savings	-2774.1	-2774.1	.	.	-336.2	-336.2	.	.	-5538.0	-5538.0	.	100.0
Total	2917.9	4599.0	849.7	100.0	1062.8	2196.9	582.4	100.0	14877.5	15712.5	2152.0	.

Note: Results based on 500 bootstrapping repetitions. (+)/(-) share: share of positive (negative) outcomes; . = zeros effects/not applicable; Reference: project data; Total effect: direct+indirect+induced effect. CO2 estimates for Egypt excluded because of data quality concerns.

Table B12 – Randomised additional investment (random sector allocation) including project expenditure, domestic only, two years

	Value-added (1000 USD)				Employment (headcount)				CO2 emissions (tonnes)			
		Simulations				Simulations				Simulations		
	Reference	Mean	SD	(+) share	Reference	Mean	SD	(+) share	Reference	Mean	SD	(-) share
Egypt												
Additional investments	36857.5	29647.4	2734.1	100.0	4274.2	3486.0	845.8	100.0	.	.	.	.
Direct effect	8619.6	7399.7	1981.6	100.0	1180.9	963.7	841.0	82.0	.	.	.	.
Funding of the project	1824.7	1824.7	.	100.0	173.3	173.3	.	100.0	.	.	.	.
Indirect effect	-3336.2	-3336.2	.	.	-622.5	-622.5	.	.	.	.	.	.
Total effects												
Induced effect	17904.8	11914.7	2560.1	100.0	2241.6	1670.7	310.2	100.0	.	.	.	.
Material savings	-2565.4	-2565.4	.	.	-568.6	-568.6	.	.	.	.	.	.
Other inputs savings	-12982.7	-12982.7	.	.	-1084.4	-1084.4	.	.	.	.	.	.
Total	23188.2	15978.1	2734.1	100.0	2800.0	2011.9	845.8	100.0	.	.	.	.
Georgia												
Additional investments	232.7	277.7	58.5	100.0	20.1	32.5	10.4	100.0	365.3	396.8	63.2	.
Direct effect	13.0	56.1	31.0	92.8	8.6	18.9	6.9	100.0	66.8	86.7	24.7	.
Funding of the project	187.9	187.9	.	100.0	24.0	24.0	.	100.0	251.3	251.3	.	.
Indirect effect	-245.8	-245.8	.	.	-39.9	-39.9	.	.	-405.3	-405.3	.	100.0
Total effects												
Induced effect	187.4	189.3	37.6	100.0	26.8	29.0	5.8	100.0	274.8	286.4	57.6	.
Material savings	-44.0	-44.0	.	.	-7.8	-7.8	.	.	-64.9	-64.9	.	100.0
Other inputs savings	-611.3	-611.3	.	.	-67.0	-67.0	.	.	-851.1	-851.1	.	100.0
Total	-45.3	-0.4	58.5	54.8	-4.5	7.9	10.4	79.6	-63.7	-32.3	63.2	68.6
Indonesia												
Additional investments	5503.7	6799.6	858.3	100.0	421.6	843.3	252.0	100.0	6059.2	6401.3	599.4	.
Direct effect	6815.3	7782.5	462.1	100.0	1458.0	1792.4	196.6	100.0	172.3	-27.3	226.6	43.8
Funding of the project	2721.9	2721.9	.	100.0	311.7	311.7	.	100.0	2288.3	2288.3	.	.
Indirect effect	-10186.6	-10186.6	.	.	-1555.7	-1555.7	.	.	-10453.4	-10453.4	.	100.0
Total effects												
Induced effect	13412.6	13741.3	510.7	100.0	2158.8	2246.0	87.4	100.0	12783.5	13325.1	530.8	.
Material savings	-18197.9	-18197.9	.	.	-2086.1	-2086.1	.	.	-22197.0	-22197.0	.	100.0
Other inputs savings	-5939.8	-5939.8	.	.	-482.2	-482.2	.	.	-7734.4	-7734.4	.	100.0
Total	10041.3	11337.1	858.3	100.0	2061.0	2482.7	252.0	100.0	2502.3	2844.4	599.4	.
Vietnam												
Additional investments	6389.0	8079.4	854.4	100.0	1664.5	2803.0	584.8	100.0	22475.4	23304.1	2171.4	.
Direct effect	1837.9	3168.4	1084.9	100.0	1209.0	2071.5	604.2	100.0	10925.9	10626.5	736.4	.
Funding of the project	2852.5	2852.5	.	100.0	724.3	724.3	.	100.0	7153.2	7153.2	.	.
Indirect effect	-1374.4	-1374.4	.	.	-427.6	-427.6	.	.	-3814.3	-3814.3	.	100.0
Total effects												
Induced effect	2848.1	3207.9	445.2	100.0	817.2	1093.3	135.6	100.0	9717.8	10845.9	1981.9	.
Material savings	-1394.7	-1394.7	.	.	-531.3	-531.3	.	.	-4121.5	-4121.5	.	100.0
Other inputs savings	-5548.2	-5548.2	.	.	-672.3	-672.3	.	.	-11076.0	-11076.0	.	100.0
Total	3311.6	5001.9	854.4	100.0	1598.6	2737.2	584.8	100.0	16829.4	17658.1	2171.4	.

Note: Results based on 500 bootstrapping repetitions. (+)/(-) share: share of positive (negative) outcomes; . = zeros effects/not applicable; Reference: project data; Total effect: direct+indirect+induced effect. CO2 estimates for Egypt excluded because of data quality concerns.

Table B13 – Randomised additional investment (random sector allocation) excluding project expenditure, domestic only, two years

	Value-added (1000 USD)				Employment (headcount)				CO2 emissions (tonnes)			
		Simulations				Simulations				Simulations		
	Reference	Mean	SD	(+) share	Reference	Mean	SD	(+) share	Reference	Mean	SD	(-) share
Egypt												
Additional investments	36857.5	29628.6	2817.1	100.0	4274.2	3494.9	845.2	100.0	.	.	.	.
Direct effect	7980.6	6757.7	1989.2	100.0	1175.8	970.1	844.8	81.4	.	.	.	.
Funding of the project	.	.	.	.	.	.	.	.	.	.	.	.
Indirect effect	-4521.9	-4521.9	.	.	-790.6	-790.6	.	.	.	.	.	.
Total effects												
Induced effect	17904.8	11898.8	2585.6	100.0	2241.6	1668.0	317.5	100.0	.	.	.	.
Material savings	-2565.4	-2565.4	.	.	-568.6	-568.6	.	.	.	.	.	.
Other inputs savings	-12982.7	-12982.7	.	.	-1084.4	-1084.4	.	.	.	.	.	.
Total	21363.5	14134.6	2817.1	100.0	2626.8	1847.5	845.2	100.0	.	.	.	.
Georgia												
Additional investments	232.7	277.7	58.3	100.0	20.1	32.5	10.4	100.0	365.3	397.2	62.8	.
Direct effect	-91.0	-48.2	30.8	2.0	-3.2	7.0	6.8	84.2	-63.4	-43.5	24.1	95.8
Funding of the project	.	.	.	.	.	.	.	.	.	.	.	100.0
Indirect effect	-329.6	-329.6	.	.	-52.1	-52.1	.	.	-526.4	-526.4	.	100.0
Total effects												
Induced effect	187.4	189.5	37.5	100.0	26.8	29.0	5.8	100.0	274.8	286.8	57.5	.
Material savings	-44.0	-44.0	.	.	-7.8	-7.8	.	.	-64.9	-64.9	.	100.0
Other inputs savings	-611.3	-611.3	.	.	-67.0	-67.0	.	.	-851.1	-851.1	.	100.0
Total	-233.2	-188.3	58.3	.	-28.5	-16.1	10.4	1.6	-315.1	-283.1	62.8	100.0
Indonesia												
Additional investments	5503.7	6802.7	848.5	100.0	421.6	845.3	251.6	100.0	6059.2	6401.2	600.0	.
Direct effect	5429.7	6398.9	458.3	100.0	1342.9	1679.0	196.4	100.0	-915.0	-1116.4	231.2	100.0
Funding of the project	.	.	.	.	.	.	.	.	.	.	.	100.0
Indirect effect	-11522.9	-11522.9	.	.	-1752.4	-1752.4	.	.	-11654.6	-11654.6	.	100.0
Total effects												
Induced effect	13412.6	13742.4	505.4	100.0	2158.8	2246.4	86.8	100.0	12783.5	13326.9	526.9	.
Material savings	-18197.9	-18197.9	.	.	-2086.1	-2086.1	.	.	-22197.0	-22197.0	.	100.0
Other inputs savings	-5939.8	-5939.8	.	.	-482.2	-482.2	.	.	-7734.4	-7734.4	.	100.0
Total	7319.4	8618.4	848.5	100.0	1749.3	2173.0	251.6	100.0	214.0	555.9	600.0	18.4
Vietnam												
Additional investments	6389.0	8083.0	845.5	100.0	1664.5	2801.5	583.0	100.0	22475.4	23313.9	2155.3	.
Direct effect	187.3	1520.1	1079.8	90.8	852.7	1713.2	603.3	100.0	7110.2	6816.6	731.7	.
Funding of the project	.	.	.	.	.	.	.	.	.	.	.	100.0
Indirect effect	-2576.4	-2576.4	.	.	-795.7	-795.7	.	.	-7151.8	-7151.8	.	100.0
Total effects												
Induced effect	2848.1	3209.2	443.3	100.0	817.2	1093.7	135.6	100.0	9717.8	10849.9	1974.1	.
Material savings	-1394.7	-1394.7	.	.	-531.3	-531.3	.	.	-4121.5	-4121.5	.	100.0
Other inputs savings	-5548.2	-5548.2	.	.	-672.3	-672.3	.	.	-11076.0	-11076.0	.	100.0
Total	459.0	2153.0	845.5	99.4	874.3	2011.3	583.0	100.0	9676.2	10514.7	2155.3	.

Note: Results based on 500 bootstrapping repetitions. (+)/(-) share: share of positive (negative) outcomes; . = zeros effects/not applicable; Reference: project data; Total effect: direct+indirect+induced effect. CO2 estimates for Egypt excluded because of data quality concerns.

Table B14 – Randomised additional investment (random sector allocation) excluding project expenditure, considering imports

	Value-added (1000 USD)				Employment (headcount)				CO2 emissions (tonnes)			
		Simulations				Simulations				Simulations		
	Reference	Mean	SD	(+) share	Reference	Mean	SD	(+) share	Reference	Mean	SD	(-) share
Egypt												
Additional investments	33867.2	22816.4	3208.8	100.0	4072.3	2432.6	580.0	100.0	.	.	.	.
Direct effect	12060.9	7342.4	1695.0	100.0	1585.3	616.3	499.2	83.2	.	.	.	.
Funding of the project	.	.	.	.	.	.	.	.	.	.	.	.
Indirect effect	-2260.9	-2260.9	.	.	-395.3	-395.3	.	.	.	.	.	.
Total effects												
Induced effect	16293.3	9960.9	2330.4	100.0	2055.8	1385.1	294.5	100.0	.	.	.	.
Material savings	-1282.7	-1282.7	.	.	-284.3	-284.3	.	.	.	.	.	.
Other inputs savings	-6491.3	-6491.3	.	.	-542.2	-542.2	.	.	.	.	.	.
Total	26093.2	15042.3	3208.8	100.0	3245.8	1606.1	580.0	100.0	.	.	.	.
Georgia												
Additional investments	116.4	72.1	23.9	100.0	11.0	9.6	4.2	100.0	170.0	109.7	30.9	.
Direct effect	-81.1	-104.1	12.4	.	-3.9	-3.4	2.5	8.2	-84.9	-118.3	12.4	100.0
Funding of the project	.	.	.	.	.	.	.	.	.	.	.	100.0
Indirect effect	-181.9	-181.9	.	.	-28.8	-28.8	.	.	-290.3	-290.3	.	100.0
Total effects												
Induced effect	83.3	62.0	14.3	100.0	11.5	9.7	2.4	100.0	121.4	94.6	23.0	.
Material savings	-21.8	-21.8	.	.	-3.9	-3.9	.	.	-32.1	-32.1	.	100.0
Other inputs savings	-339.9	-339.9	.	.	-37.2	-37.2	.	.	-473.2	-473.2	.	100.0
Total	-179.7	-224.1	23.9	.	-21.1	-22.5	4.2	.	-253.8	-314.1	30.9	100.0
Indonesia												
Additional investments	4255.2	3600.5	698.4	100.0	363.5	477.0	191.7	100.0	4693.8	3575.9	563.4	.
Direct effect	1343.8	916.1	393.2	99.4	437.8	544.9	136.7	100.0	-1350.3	-2417.1	299.4	100.0
Funding of the project	.	.	.	.	.	.	.	.	.	.	.	100.0
Indirect effect	-5761.4	-5761.4	.	.	-876.2	-876.2	.	.	-5827.3	-5827.3	.	100.0
Total effects												
Induced effect	5347.6	5120.7	355.7	100.0	830.3	836.7	67.0	100.0	5020.2	4969.1	358.8	.
Material savings	-9098.9	-9098.9	.	.	-1043.0	-1043.0	.	.	-11098.5	-11098.5	.	100.0
Other inputs savings	-2969.9	-2969.9	.	.	-241.1	-241.1	.	.	-3867.2	-3867.2	.	100.0
Total	930.0	275.3	698.4	65.4	391.9	505.4	191.7	100.0	-2157.4	-3275.2	563.4	100.0
Vietnam												
Additional investments	3296.0	3591.8	766.5	100.0	978.4	1107.7	349.1	100.0	12327.4	11549.0	1879.3	.
Direct effect	179.1	-135.1	619.1	35.8	528.6	381.1	275.7	99.4	4685.3	2173.7	1008.4	1.8
Funding of the project	.	.	.	.	.	.	.	.	.	.	.	100.0
Indirect effect	-1288.2	-1288.2	.	.	-397.8	-397.8	.	.	-3575.9	-3575.9	.	100.0
Total effects												
Induced effect	934.0	1544.1	287.2	100.0	245.9	522.7	111.7	100.0	3620.1	5353.3	1067.9	.
Material savings	-697.3	-697.3	.	.	-265.7	-265.7	.	.	-2060.8	-2060.8	.	100.0
Other inputs savings	-2774.1	-2774.1	.	.	-336.2	-336.2	.	.	-5538.0	-5538.0	.	100.0
Total	-175.1	120.7	766.5	50.2	376.7	506.0	349.1	99.0	4729.5	3951.1	1879.3	1.8

Note: Results based on 500 bootstrapping repetitions. (+)/(-) share: share of positive (negative) outcomes; . = zeros effects/not applicable; Reference: project data; Total effect: direct+indirect+induced effect. CO2 estimates for Egypt excluded because of data quality concerns.

Table B15 – Randomised additional investment (random sector allocation) including project expenditure, considering imports, two years

	Value-added (1000 USD)				Employment (headcount)				CO2 emissions (tonnes)			
		Simulations				Simulations				Simulations		
	Reference	Mean	SD	(+) share	Reference	Mean	SD	(+) share	Reference	Mean	SD	(-) share
Egypt												
Additional investments	33867.2	22807.8	3353.3	100.0	4072.3	2465.0	611.1	100.0	.	.	.	.
Direct effect	7208.8	2539.9	1810.6	95.6	1161.0	221.5	510.4	68.4	.	.	.	.
Funding of the project	1807.4	1807.4	.	100.0	171.6	171.6	.	100.0	.	.	.	.
Indirect effect	-3347.5	-3347.5	.	.	-624.1	-624.1	.	.	.	.	.	.
Total effects												
Induced effect	16319.3	9928.8	2353.7	100.0	2059.6	1391.8	308.4	100.0	.	.	.	.
Material savings	-2565.4	-2565.4	.	.	-568.6	-568.6	.	.	.	.	.	.
Other inputs savings	-12982.7	-12982.7	.	.	-1084.4	-1084.4	.	.	.	.	.	.
Total	20180.6	9121.1	3353.3	99.8	2596.5	989.2	611.1	99.2	.	.	.	.
Georgia												
Additional investments	172.7	108.0	35.8	100.0	16.2	14.4	6.2	100.0	252.1	163.9	46.3	.
Direct effect	-38.7	-72.5	18.5	0.2	8.1	8.9	3.7	100.0	-39.1	-88.5	18.4	99.8
Funding of the project	175.1	175.1	.	100.0	23.5	23.5	.	100.0	223.7	223.7	.	.
Indirect effect	-247.5	-247.5	.	.	-40.4	-40.4	.	.	-408.8	-408.8	.	100.0
Total effects												
Induced effect	167.9	137.0	21.5	100.0	23.4	20.8	3.6	100.0	243.4	204.6	34.5	.
Material savings	-44.0	-44.0	.	.	-7.8	-7.8	.	.	-64.9	-64.9	.	100.0
Other inputs savings	-611.3	-611.3	.	.	-67.0	-67.0	.	.	-851.1	-851.1	.	100.0
Total	-118.3	-182.9	35.8	.	-8.8	-10.7	6.2	5.0	-204.5	-292.7	46.3	100.0
Indonesia												
Additional investments	4255.2	3598.2	686.2	100.0	363.5	475.4	186.7	100.0	4693.8	3570.6	554.4	.
Direct effect	5765.3	5338.7	387.2	100.0	1429.8	1536.0	132.8	100.0	-984.4	-2052.8	294.8	100.0
Funding of the project	2415.1	2415.1	.	100.0	279.9	279.9	.	100.0	2033.5	2033.5	.	.
Indirect effect	-10338.3	-10338.3	.	.	-1577.2	-1577.2	.	.	-10587.8	-10587.8	.	100.0
Total effects												
Induced effect	13059.0	12828.5	351.7	100.0	2118.6	2124.2	65.9	100.0	12454.3	12399.6	354.2	.
Material savings	-18197.9	-18197.9	.	.	-2086.1	-2086.1	.	.	-22197.0	-22197.0	.	100.0
Other inputs savings	-5939.8	-5939.8	.	.	-482.2	-482.2	.	.	-7734.4	-7734.4	.	100.0
Total	8486.0	7829.0	686.2	100.0	1971.2	2083.0	186.7	100.0	882.1	-241.1	554.4	70.8
Vietnam												
Additional investments	3296.0	3602.4	779.6	100.0	978.4	1112.0	351.3	100.0	12327.4	11581.2	1889.9	.
Direct effect	324.0	16.7	629.4	45.2	948.3	804.1	278.3	100.0	5967.2	3474.0	1019.6	0.2
Funding of the project	2852.5	2852.5	.	100.0	724.3	724.3	.	100.0	7153.2	7153.2	.	.
Indirect effect	-1374.4	-1374.4	.	.	-427.6	-427.6	.	.	-3814.3	-3814.3	.	100.0
Total effects												
Induced effect	1268.9	1882.6	288.1	100.0	391.8	669.7	111.3	100.0	4528.5	6275.5	1070.3	.
Material savings	-1394.7	-1394.7	.	.	-531.3	-531.3	.	.	-4121.5	-4121.5	.	100.0
Other inputs savings	-5548.2	-5548.2	.	.	-672.3	-672.3	.	.	-11076.0	-11076.0	.	100.0
Total	218.5	524.9	779.6	74.0	912.5	1046.2	351.3	100.0	6681.4	5935.1	1889.9	0.2

Note: Results based on 500 bootstrapping repetitions. (+)/(-) share: share of positive (negative) outcomes; . = zeros effects/not applicable; Reference: project data; Total effect: direct+indirect+induced effect. CO2 estimates for Egypt excluded because of data quality concerns.

Table B16 – Randomised additional investment (random sector allocation) excluding project expenditure, considering imports, two years

	Value-added (1000 USD)				Employment (headcount)				CO2 emissions (tonnes)			
		Simulations				Simulations				Simulations		
	Reference	Mean	SD	(+) share	Reference	Mean	SD	(+) share	Reference	Mean	SD	(-) share
Egypt												
Additional investments	33867.2	22849.5	3290.6	100.0	4072.3	2446.2	591.2	100.0	.	.	.	.
Direct effect	6575.8	1876.5	1749.9	89.8	1155.9	195.2	501.2	65.6	.	.	.	.
Funding of the project	.	.	.	.	.	.	.	.	.	.	.	.
Indirect effect	-4521.9	-4521.9	.	.	-790.6	-790.6	.	.	.	.	.	.
Total effects												
Induced effect	16319.3	10000.8	2347.6	100.0	2059.6	1394.2	302.2	100.0	.	.	.	.
Material savings	-2565.4	-2565.4	.	.	-568.6	-568.6	.	.	.	.	.	.
Other inputs savings	-12982.7	-12982.7	.	.	-1084.4	-1084.4	.	.	.	.	.	.
Total	18373.2	7355.4	3290.6	99.2	2424.9	798.8	591.2	99.2	.	.	.	.
Georgia												
Additional investments	172.7	107.6	35.0	100.0	16.2	14.4	6.1	100.0	252.1	163.4	45.4	.
Direct effect	-131.6	-165.5	18.2	.	-3.7	-2.8	3.6	18.4	-145.2	-194.6	18.2	100.0
Funding of the project	.	.	.	.	.	.	.	.	.	.	.	100.0
Indirect effect	-329.6	-329.6	.	.	-52.1	-52.1	.	.	-526.4	-526.4	.	100.0
Total effects												
Induced effect	167.9	136.7	21.0	100.0	23.4	20.7	3.5	100.0	243.4	204.2	33.9	.
Material savings	-44.0	-44.0	.	.	-7.8	-7.8	.	.	-64.9	-64.9	.	100.0
Other inputs savings	-611.3	-611.3	.	.	-67.0	-67.0	.	.	-851.1	-851.1	.	100.0
Total	-293.3	-358.4	35.0	.	-32.4	-34.3	6.1	.	-428.2	-516.9	45.4	100.0
Indonesia												
Additional investments	4255.2	3598.6	682.5	100.0	363.5	476.0	186.0	100.0	4693.8	3569.7	550.3	.
Direct effect	4534.8	4106.5	382.9	100.0	1325.1	1431.5	132.1	100.0	-1951.2	-3022.6	292.2	100.0
Funding of the project	.	.	.	.	.	.	.	.	.	.	.	100.0
Indirect effect	-11522.9	-11522.9	.	.	-1752.4	-1752.4	.	.	-11654.6	-11654.6	.	100.0
Total effects												
Induced effect	13059.0	12830.7	351.9	100.0	2118.6	2124.6	65.9	100.0	12454.3	12401.6	354.4	.
Material savings	-18197.9	-18197.9	.	.	-2086.1	-2086.1	.	.	-22197.0	-22197.0	.	100.0
Other inputs savings	-5939.8	-5939.8	.	.	-482.2	-482.2	.	.	-7734.4	-7734.4	.	100.0
Total	6070.9	5414.3	682.5	100.0	1691.3	1803.7	186.0	100.0	-1151.5	-2275.6	550.3	100.0
Vietnam												
Additional investments	3296.0	3590.6	768.1	100.0	978.4	1103.1	341.5	100.0	12327.4	11571.4	1874.0	.
Direct effect	-1326.5	-1645.9	623.3	1.4	592.0	440.3	268.4	99.8	2151.5	-357.4	1000.6	66.2
Funding of the project	.	.	.	.	.	.	.	.	.	.	.	100.0
Indirect effect	-2576.4	-2576.4	.	.	-795.7	-795.7	.	.	-7151.8	-7151.8	.	100.0
Total effects												
Induced effect	1268.9	1882.9	288.6	100.0	391.8	668.3	111.3	100.0	4528.5	6281.4	1074.5	.
Material savings	-1394.7	-1394.7	.	.	-531.3	-531.3	.	.	-4121.5	-4121.5	.	100.0
Other inputs savings	-5548.2	-5548.2	.	.	-672.3	-672.3	.	.	-11076.0	-11076.0	.	100.0
Total	-2634.0	-2339.4	768.1	0.6	188.2	313.0	341.5	87.4	-471.8	-1227.9	1874.0	72.4

Note: Results based on 500 bootstrapping repetitions. (+)/(-) share: share of positive (negative) outcomes; . = zeros effects/not applicable; Reference: project data; Total effect: direct+indirect+induced effect. CO2 estimates for Egypt excluded because of data quality concerns.

Table B17 – Randomised project investment (random sector allocation) based on reported project volume, considering imports

	Value-added (1000 USD)				Employment (headcount)				CO2 emissions (tonnes)			
		Simulations				Simulations				Simulations		
	Reference	Mean	SD	(+) share	Reference	Mean	SD	(+) share	Reference	Mean	SD	(-) share
Egypt												
Additional investments	33867.2	33867.2	.	100.0	4072.3	4072.3	.	100.0	.	.	.	.
Direct effect	12693.9	12452.4	84.3	100.0	1590.4	1607.6	7.3	100.0	.	.	.	.
Funding of the project	1807.4	958.9	290.5	100.0	171.6	104.5	23.5	100.0	.	.	.	.
Indirect effect	-1086.5	-1693.5	207.0	.	-228.7	-313.1	28.8	.	.	.	.	.
Total effects												
Induced effect	16293.3	16293.3	.	100.0	2055.8	2055.8	.	100.0	.	.	.	.
Material savings	-1282.7	-1282.7	.	.	-284.3	-284.3	.	.	.	.	.	.
Other inputs savings	-6491.3	-6491.3	.	.	-542.2	-542.2	.	.	.	.	.	.
Total	27900.6	27052.1	290.5	100.0	3417.4	3350.3	23.5	100.0	.	.	.	.
Georgia												
Additional investments	116.4	116.4	.	100.0	11.0	11.0	.	100.0	170.0	170.0	.	.
Direct effect	11.8	-14.1	16.1	18.8	7.9	4.2	2.5	100.0	21.2	0.0	14.2	54.4
Funding of the project	175.1	154.3	28.4	100.0	23.5	21.8	3.9	100.0	223.7	220.2	34.1	.
Indirect effect	-99.8	-94.5	16.7	.	-17.0	-15.0	2.8	.	-172.7	-154.9	25.9	100.0
Total effects												
Induced effect	83.3	83.3	.	100.0	11.5	11.5	.	100.0	121.4	121.4	.	.
Material savings	-21.8	-21.8	.	.	-3.9	-3.9	.	.	-32.1	-32.1	.	100.0
Other inputs savings	-339.9	-339.9	.	.	-37.2	-37.2	.	.	-473.2	-473.2	.	100.0
Total	-4.7	-25.4	28.4	19.0	2.4	0.7	3.9	54.0	-30.0	-33.5	34.1	81.6
Indonesia												
Additional investments	3467.5	4255.2	.	100.0	350.6	363.5	.	100.0	3603.2	4693.8	.	.
Direct effect	2250.9	2344.2	209.4	100.0	574.8	504.7	16.6	100.0	-1179.5	-514.7	77.7	100.0
Funding of the project	2415.1	1980.1	505.7	100.0	279.9	208.0	34.8	100.0	2033.5	1722.9	308.4	.
Indirect effect	-4576.9	-4781.8	298.0	.	-701.0	-735.1	41.1	.	-4760.5	-4940.0	243.0	100.0
Total effects												
Induced effect	4883.3	5347.6	.	100.0	785.1	830.3	.	100.0	4725.5	5020.2	.	.
Material savings	-9098.9	-9098.9	.	.	-1043.0	-1043.0	.	.	-11098.5	-11098.5	.	100.0
Other inputs savings	-2969.9	-2969.9	.	.	-241.1	-241.1	.	.	-3867.2	-3867.2	.	100.0
Total	2557.3	2910.1	505.7	100.0	659.0	599.9	34.8	100.0	-1214.5	-434.5	308.4	86.0
Vietnam												
Additional investments	3296.0	3296.0	.	100.0	978.4	978.4	.	100.0	12327.4	12327.4	.	.
Direct effect	1829.6	1449.1	392.2	100.0	884.9	890.8	80.1	100.0	8501.0	8617.8	191.2	.
Funding of the project	2852.5	2370.2	528.4	100.0	724.3	749.1	99.9	100.0	7153.2	7428.9	657.2	.
Indirect effect	-86.2	-188.0	184.3	13.6	-29.8	-10.9	50.1	40.6	-238.4	-79.5	538.9	53.2
Total effects												
Induced effect	934.0	934.0	.	100.0	245.9	245.9	.	100.0	3620.1	3620.1	.	.
Material savings	-697.3	-697.3	.	.	-265.7	-265.7	.	.	-2060.8	-2060.8	.	100.0
Other inputs savings	-2774.1	-2774.1	.	.	-336.2	-336.2	.	.	-5538.0	-5538.0	.	100.0
Total	2677.5	2195.2	528.4	100.0	1101.0	1125.8	99.9	100.0	11882.7	12158.4	657.2	.

Note: Results based on 500 bootstrapping repetitions. (+)/(-) share: share of positive (negative) outcomes; . = zeros effects/not applicable; Reference: project data; Total effect: direct+indirect+induced effect. CO2 estimates for Egypt excluded because of data quality concerns.

Table B18 – Randomised project investment (random sector allocation) based on reported project volume, domestic only

	Value-added (1000 USD)				Employment (headcount)				CO2 emissions (tonnes)			
		Simulations				Simulations				Simulations		
	Reference	Mean	SD	(+) share	Reference	Mean	SD	(+) share	Reference	Mean	SD	(-) share
Egypt												
Additional investments	36857.5	36857.5	.	100.0	4274.2	4274.2	.	100.0	.	.	.	.
Direct effect	14104.7	13888.0	74.6	100.0	1610.3	1630.2	8.1	100.0	.	.	.	.
Funding of the project	1824.7	1012.7	277.2	100.0	173.3	111.4	21.6	100.0	.	.	.	.
Indirect effect	-1075.3	-1670.6	203.0	.	-227.2	-308.9	28.0	.	.	.	.	.
Total effects												
Induced effect	17878.8	17878.8	.	100.0	2237.7	2237.7	.	100.0	.	.	.	.
Material savings	-1282.7	-1282.7	.	.	-284.3	-284.3	.	.	.	.	.	.
Other inputs savings	-6491.3	-6491.3	.	.	-542.2	-542.2	.	.	.	.	.	.
Total	30908.2	30096.2	277.2	100.0	3620.9	3559.1	21.6	100.0	.	.	.	.
Georgia												
Additional investments	157.0	157.0	.	100.0	13.5	13.5	.	100.0	246.3	246.3	.	.
Direct effect	50.3	56.1	12.8	100.0	8.3	8.4	2.4	100.0	100.5	121.2	20.9	.
Funding of the project	187.9	244.8	31.7	100.0	24.0	32.7	4.4	100.0	251.3	356.8	50.4	.
Indirect effect	-98.0	-46.9	29.2	6.4	-16.5	-7.9	4.8	7.2	-169.2	-84.4	45.4	95.6
Total effects												
Induced effect	96.4	96.4	.	100.0	13.8	13.8	.	100.0	142.6	142.6	.	.
Material savings	-21.8	-21.8	.	.	-3.9	-3.9	.	.	-32.1	-32.1	.	100.0
Other inputs savings	-339.9	-339.9	.	.	-37.2	-37.2	.	.	-473.2	-473.2	.	100.0
Total	48.7	105.6	31.7	100.0	5.5	14.2	4.4	100.0	73.9	179.4	50.4	.
Indonesia												
Additional investments	5503.7	5503.7	.	100.0	421.6	421.6	.	100.0	6059.2	6059.2	.	.
Direct effect	3624.3	3516.0	189.0	100.0	570.7	539.1	20.0	100.0	773.2	791.2	9.5	.
Funding of the project	2721.9	2526.4	486.6	100.0	311.7	268.2	29.3	100.0	2288.3	2247.0	244.0	.
Indirect effect	-4425.2	-4512.4	299.5	.	-679.5	-691.5	39.5	.	-4626.2	-4685.5	235.7	100.0
Total effects												
Induced effect	5701.3	5701.3	.	100.0	870.5	870.5	.	100.0	5349.4	5349.4	.	.
Material savings	-9098.9	-9098.9	.	.	-1043.0	-1043.0	.	.	-11098.5	-11098.5	.	100.0
Other inputs savings	-2969.9	-2969.9	.	.	-241.1	-241.1	.	.	-3867.2	-3867.2	.	100.0
Total	4900.4	4704.9	486.6	100.0	761.7	718.1	29.3	100.0	1496.4	1455.1	244.0	.
Vietnam												
Additional investments	6389.0	6389.0	.	100.0	1664.5	1664.5	.	100.0	22475.4	22475.4	.	.
Direct effect	3343.5	2962.9	392.2	100.0	1145.5	1151.5	80.1	100.0	13459.7	13576.5	191.2	.
Funding of the project	2852.5	2370.2	528.4	100.0	724.3	749.1	99.9	100.0	7153.2	7428.9	657.2	.
Indirect effect	-86.2	-188.0	184.3	13.6	-29.8	-10.9	50.1	40.6	-238.4	-79.5	538.9	53.2
Total effects												
Induced effect	2513.2	2513.2	.	100.0	671.3	671.3	.	100.0	8809.4	8809.4	.	.
Material savings	-697.3	-697.3	.	.	-265.7	-265.7	.	.	-2060.8	-2060.8	.	100.0
Other inputs savings	-2774.1	-2774.1	.	.	-336.2	-336.2	.	.	-5538.0	-5538.0	.	100.0
Total	5770.5	5288.2	528.4	100.0	1787.1	1811.9	99.9	100.0	22030.7	22306.4	657.2	.

Note: Results based on 500 bootstrapping repetitions. (+)/(-) share: share of positive (negative) outcomes; . = zeros effects/not applicable; Reference: project data; Total effect: direct+indirect+induced effect. CO2 estimates for Egypt excluded because of data quality concerns.

Table B19 – Randomised project investment (random sector allocation) based on reported project volume, domestic only, two years

	Value-added (1000 USD)				Employment (headcount)				CO2 emissions (tonnes)			
		Simulations				Simulations				Simulations		
	Reference	Mean	SD	(+) share	Reference	Mean	SD	(+) share	Reference	Mean	SD	(-) share
Egypt												
Additional investments	36857.5	36857.5	.	100.0	4274.2	4274.2	.	100.0	.	.	.	.
Direct effect	8619.6	8402.9	74.6	100.0	1180.9	1200.8	8.1	100.0	.	.	.	.
Funding of the project	1824.7	1012.7	277.2	100.0	173.3	111.4	21.6	100.0	.	.	.	.
Indirect effect	-3336.2	-3931.5	203.0	.	-622.5	-704.2	28.0	.	.	.	.	.
Total effects												
Induced effect	17904.8	17904.8	.	100.0	2241.6	2241.6	.	100.0	.	.	.	.
Material savings	-2565.4	-2565.4	.	.	-568.6	-568.6	.	.	.	.	.	.
Other inputs savings	-12982.7	-12982.7	.	.	-1084.4	-1084.4	.	.	.	.	.	.
Total	23188.2	22376.2	277.2	100.0	2800.0	2738.2	21.6	100.0	.	.	.	.
Georgia												
Additional investments	232.7	232.7	.	100.0	20.1	20.1	.	100.0	365.3	365.3	.	.
Direct effect	13.0	18.7	12.8	95.0	8.6	8.7	2.4	100.0	66.8	87.5	20.9	.
Funding of the project	187.9	244.8	31.7	100.0	24.0	32.7	4.4	100.0	251.3	356.8	50.4	.
Indirect effect	-245.8	-194.6	29.2	.	-39.9	-31.3	4.8	.	-405.3	-320.5	45.4	100.0
Total effects												
Induced effect	187.4	187.4	.	100.0	26.8	26.8	.	100.0	274.8	274.8	.	.
Material savings	-44.0	-44.0	.	.	-7.8	-7.8	.	.	-64.9	-64.9	.	100.0
Other inputs savings	-611.3	-611.3	.	.	-67.0	-67.0	.	.	-851.1	-851.1	.	100.0
Total	-45.3	11.5	31.7	59.2	-4.5	4.2	4.4	85.2	-63.7	41.8	50.4	23.8
Indonesia												
Additional investments	5503.7	5503.7	.	100.0	421.6	421.6	.	100.0	6059.2	6059.2	.	.
Direct effect	6815.3	6708.6	189.1	100.0	1458.0	1426.4	20.2	100.0	172.3	190.5	9.4	.
Funding of the project	2721.9	2530.5	487.3	100.0	311.7	268.6	29.3	100.0	2288.3	2249.1	244.6	.
Indirect effect	-10186.6	-10271.3	300.0	.	-1555.7	-1567.3	39.6	.	-10453.4	-10510.8	236.4	100.0
Total effects												
Induced effect	13412.6	13412.6	.	100.0	2158.8	2158.8	.	100.0	12783.5	12783.5	.	.
Material savings	-18197.9	-18197.9	.	.	-2086.1	-2086.1	.	.	-22197.0	-22197.0	.	100.0
Other inputs savings	-5939.8	-5939.8	.	.	-482.2	-482.2	.	.	-7734.4	-7734.4	.	100.0
Total	10041.3	9849.9	487.3	100.0	2061.0	2017.9	29.3	100.0	2502.3	2463.1	244.6	.
Vietnam												
Additional investments	6389.0	6389.0	.	100.0	1664.5	1664.5	.	100.0	22475.4	22475.4	.	.
Direct effect	1837.9	1457.3	392.2	100.0	1209.0	1214.9	80.1	100.0	10925.9	11042.7	191.2	.
Funding of the project	2852.5	2370.2	528.4	100.0	724.3	749.1	99.9	100.0	7153.2	7428.9	657.2	.
Indirect effect	-1374.4	-1476.1	184.3	.	-427.6	-408.7	50.1	.	-3814.3	-3655.4	538.9	100.0
Total effects												
Induced effect	2848.1	2848.1	.	100.0	817.2	817.2	.	100.0	9717.8	9717.8	.	.
Material savings	-1394.7	-1394.7	.	.	-531.3	-531.3	.	.	-4121.5	-4121.5	.	100.0
Other inputs savings	-5548.2	-5548.2	.	.	-672.3	-672.3	.	.	-11076.0	-11076.0	.	100.0
Total	3311.6	2829.2	528.4	100.0	1598.6	1623.5	99.9	100.0	16829.4	17105.1	657.2	.

Note: Results based on 500 bootstrapping repetitions. (+)/(-) share: share of positive (negative) outcomes; . = zeros effects/not applicable; Reference: project data; Total effect: direct+indirect+induced effect. CO2 estimates for Egypt excluded because of data quality concerns.

Table B20 – Randomised project investment (random sector allocation) based on reported project volume, considering imports, two years

	Value-added (1000 USD)				Employment (headcount)				CO2 emissions (tonnes)			
		Simulations				Simulations				Simulations		
	Reference	Mean	SD	(+) share	Reference	Mean	SD	(+) share	Reference	Mean	SD	(-) share
Egypt												
Additional investments	33867.2	33867.2	.	100.0	4072.3	4072.3	.	100.0	.	.	.	.
Direct effect	7208.8	6967.2	84.4	100.0	1161.0	1178.2	7.4	100.0	.	.	.	.
Funding of the project	1807.4	958.6	290.8	100.0	171.6	104.5	23.5	100.0	.	.	.	.
Indirect effect	-3347.5	-3954.7	207.1	.	-624.1	-708.4	28.8	.	.	.	.	.
Total effects												
Induced effect	16319.3	16319.3	.	100.0	2059.6	2059.6	.	100.0	.	.	.	.
Material savings	-2565.4	-2565.4	.	.	-568.6	-568.6	.	.	.	.	.	.
Other inputs savings	-12982.7	-12982.7	.	.	-1084.4	-1084.4	.	.	.	.	.	.
Total	20180.6	19331.8	290.8	100.0	2596.5	2529.4	23.5	100.0	.	.	.	.
Georgia												
Additional investments	172.7	172.7	.	100.0	16.2	16.2	.	100.0	252.1	252.1	.	.
Direct effect	-38.7	-64.7	16.1	.	8.1	4.4	2.5	100.0	-39.1	-60.3	14.2	100.0
Funding of the project	175.1	154.3	28.4	100.0	23.5	21.8	3.9	100.0	223.7	220.2	34.1	.
Indirect effect	-247.5	-242.3	16.7	.	-40.4	-38.4	2.8	.	-408.8	-391.0	25.9	100.0
Total effects												
Induced effect	167.9	167.9	.	100.0	23.4	23.4	.	100.0	243.4	243.4	.	.
Material savings	-44.0	-44.0	.	.	-7.8	-7.8	.	.	-64.9	-64.9	.	100.0
Other inputs savings	-611.3	-611.3	.	.	-67.0	-67.0	.	.	-851.1	-851.1	.	100.0
Total	-118.3	-139.0	28.4	.	-8.8	-10.6	3.9	0.2	-204.5	-208.0	34.1	100.0
Indonesia												
Additional investments	4255.2	4255.2	.	100.0	363.5	363.5	.	100.0	4693.8	4693.8	.	.
Direct effect	5765.3	5535.2	209.5	100.0	1429.8	1391.9	16.6	100.0	-984.4	-1115.8	77.8	100.0
Funding of the project	2415.1	1979.9	505.9	100.0	279.9	207.9	34.8	100.0	2033.5	1722.6	308.6	.
Indirect effect	-10338.3	-10543.3	298.1	.	-1577.2	-1611.3	41.1	.	-10587.8	-10767.4	243.1	100.0
Total effects												
Induced effect	13059.0	13059.0	.	100.0	2118.6	2118.6	.	100.0	12454.3	12454.3	.	.
Material savings	-18197.9	-18197.9	.	.	-2086.1	-2086.1	.	.	-22197.0	-22197.0	.	100.0
Other inputs savings	-5939.8	-5939.8	.	.	-482.2	-482.2	.	.	-7734.4	-7734.4	.	100.0
Total	8486.0	8050.8	505.9	100.0	1971.2	1899.2	34.8	100.0	882.1	571.2	308.6	1.2
Vietnam												
Additional investments	3296.0	3296.0	.	100.0	978.4	978.4	.	100.0	12327.4	12327.4	.	.
Direct effect	324.0	-56.5	392.2	34.4	948.3	954.2	80.1	100.0	5967.2	6084.0	191.2	.
Funding of the project	2852.5	2370.2	528.4	100.0	724.3	749.1	99.9	100.0	7153.2	7428.9	657.2	.
Indirect effect	-1374.4	-1476.1	184.3	.	-427.6	-408.7	50.1	.	-3814.3	-3655.4	538.9	100.0
Total effects												
Induced effect	1268.9	1268.9	.	100.0	391.8	391.8	.	100.0	4528.5	4528.5	.	.
Material savings	-1394.7	-1394.7	.	.	-531.3	-531.3	.	.	-4121.5	-4121.5	.	100.0
Other inputs savings	-5548.2	-5548.2	.	.	-672.3	-672.3	.	.	-11076.0	-11076.0	.	100.0
Total	218.5	-263.8	528.4	22.4	912.5	937.4	99.9	100.0	6681.4	6957.1	657.2	.

Note: Results based on 500 bootstrapping repetitions. (+)/(-) share: share of positive (negative) outcomes; . = zeros effects/not applicable; Reference: project data; Total effect: direct+indirect+induced effect. CO2 estimates for Egypt excluded because of data quality concerns.

Appendix C. Summary tables of the sensitivity analysis for four variants of the baseline

The aggregation of the sensitivity analysis results of four variants of the baseline scenario generates the following synthesis tables.

Table C1: Summary - Randomised firm selection, including project expenditure, considering four versions of the baseline as described in Table 15

	Value-added (1000 USD)		**Employment (headcount)**	
	Average increase	(+) share	Average increase	(+) share
Egypt	25925	100	3112	100
Georgia	-35	33	-1	50
Indonesia	6863	100	1427	100
Viet Nam	3316	93	1501	100

Table C2: Summary - Randomised additional investment (random sector allocation), including project expenditure, considering four versions of the baseline as in described in Table 15

	Value-added (1000 USD)		**Employment (headcount)**	
	Average increase	(+) share	Average increase	(+) share
Egypt	16407.	100	1904	100
Georgia	-38	38	3	60
Indonesia	7012	100	1632	100
Viet Nam	3990	94	1984	100

Table C3: Summary - Randomised project investment (random sector allocation) based on reported project volume, considering four versions of the baseline as described in Table 15

	Value-added (1000 USD)		**Employment (headcount)**	
	Average increase	(+) share	Average increase	(+) share
Egypt	24714	100	3044	100
Georgia	-12	45	2	60
Indonesia	6379	100	1309	100
Viet Nam	2512	81	1375	100

Note: See Appendix B for a complete set of results. Results are based on bootstrapping repetitions. (+)/(-) share: share of positive (negative) outcomes; average across all simulated with project expenditure only. Tot net effect: direct + indirect + induced effects. CO_2 estimates for Egypt were excluded because of data quality concerns.

Appendix D. Supplementary figures and tables

Figure 3. Randomised project investment shares by sector, Egypt

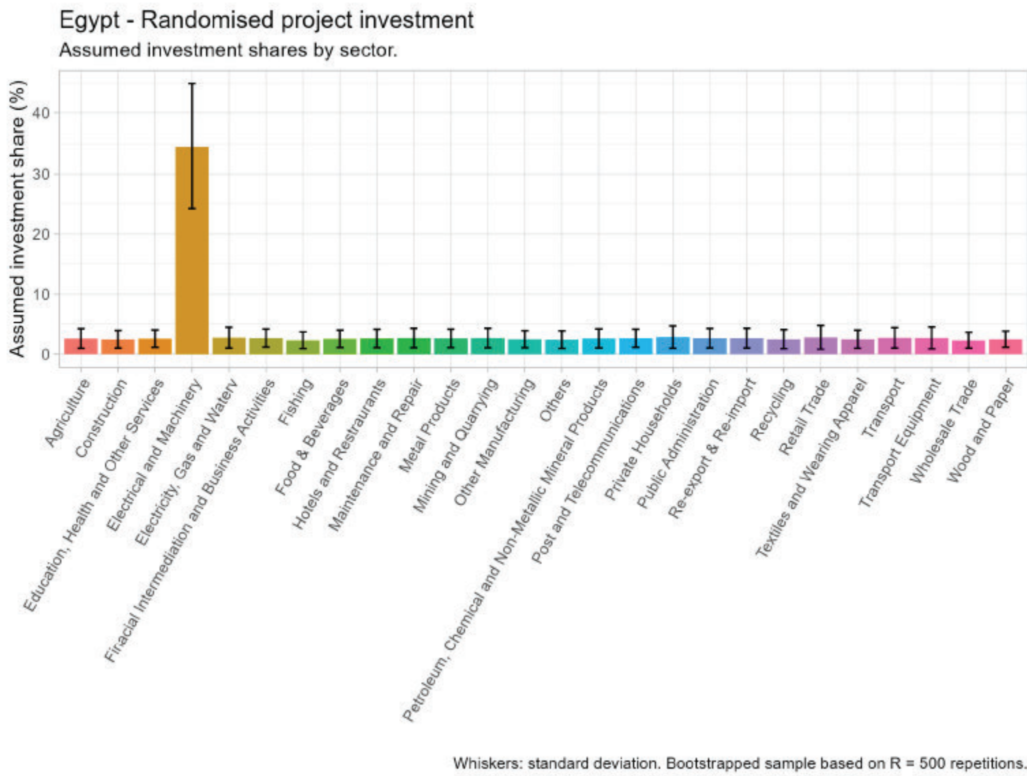

Table 15. Scenario description baseline simulation analysis

Scenario	Description
Baseline scenario	1) Savings are re–spent by manufacturing industries to fund the additional investments indicated by the project. The remaining savings are distributed to owners as profits and consequently spent by households. 2) Additional investments are spent: 50% on machinery; 40% on construction 10% on R&D. 3) Total investments and annual savings are assumed to be annual. 4) Projects expenditures are addressed to the purchase of goods, services and local consultants and are assumed to be spent in one year. 5) Part of the household consumption, investments and re-spending of savings are "leaked" by importing goods and do not generate a multiplier effect on the local economy. Project expenditures are assumed to be spent entirely in the local economy in Viet Nam, consistent with the project information. As the uncertainty of the origin of purchases of goods, for the other projects, we assume that expenditures can be leaked with imports.
Baseline (mostly domestic)	As in the baseline but except 5), the assumption in this scenario is that firms and project Investments are assumed to be entirely spent locally with no possibility of "leakage".
Baseline (including two years of savings)	As in the baseline except 3) as the assumption in this scenario is that financial gains from resources and energy savings are twice the savings in the baseline because they represent two years' savings. Savings are assumed to be entirely spent in 2015.
Baseline (mostly domestic and including two years of savings)	As in the baseline except point 5) as the assumption in this scenario is that firms and project Investments are assumed to be entirely spent locally with no possibility of "leakage" except 3) as the assumption in this scenario is that financial gains from resources and energy savings are twice the savings in the baseline because they represent two years savings. Savings are assumed to be entirely spent in 2015.

Note: Each baseline version included in the table is treated by including project expenditures. Other versions can be created by excluding project expenditures; results can be consulted in Appendix B. Baseline scenario, as described in the main text, refers to the first row, "baseline scenario", highlighted in grey.

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