Do IFC Investments Reduce Poverty by Creating Jobs?  
A Case Study of a Manufacturing Investment in Indonesia

Gayatri Datar and Alexis Diamond  
International Finance Corporation  
September 5, 2012

ABSTRACT

This impact evaluation uses econometric techniques to assess the social and economic impact of an IFC investment in Ecogreen Oleochemicals in Indonesia. This investment doubled the capacity of an Ecogreen plant in the Kabil district on the island of Batam. We use the synthetic control methodology and household level survey data from 1994-2009 to assess whether measureable impacts are observed after the investment. We find that monthly expenditures per capita in the Kabil district grew by 165,000 more rupiah (~$210 per year) than in the control district, representing a 22% increase over the 2009 level of expenditures of 785,000 rupiah ($1,000 per year) in the control district. When this $210 is extrapolated to the 19,000 people that live in the treated district, the total annual impact in 2009 is ~$4 million. Aggregating each year since 2005, the impact over 4 years was $6.8 million. However, there has been no significant increase in Kabil in employment, and in fact a decrease in formality. Based on qualitative interviews in Batam, this expected. The investment resulted in the employment of many high-paid workers, as Ecogreen hired mostly skilled labor with college degrees in the natural sciences. These workers generally migrated from outside of Batam to join Ecogreen, thus boosting the local economy through additional demand for products and services from local enterprises. As expenditures per capita is a measure of the welfare of the local economy, this increase is expected. However, employment did not increase faster than the control group, possibly demonstrating that existing local businesses grew, and this growth was not spread to additional businesses and additional employment. Additionally, employment rates in Batam have historically been high (90-95%) given that it is a Special Economic Zone, so increases are not likely to be large and therefore difficult to observe in the data. Finally, formality actually decreased, likely because much of the job growth in the local economy was in the informal sector.

This evaluation demonstrates that investments in skilled labor can have positive spillover effects to the local economy. It also represents the first time the IFC has used econometric methods and survey data to understand induced impact. This evaluation therefore also provides a methodological example for how the IFC can evaluate its impact in the future.
INTRODUCTION

Motivation

The vision of the International Finance Corporation is “that people should have the opportunity to escape poverty and improve their lives”\(^1\). A major way the institution seeks to do this by promoting private sector development that will create jobs and thus enhance livelihood opportunities.

IFC currently utilizes a system to measure the development impact of its investments called the Development Outcomes Tracking System (DOTS). However, DOTS captures only one layer of the impact made through private investment – the direct jobs created or supported. Investments also create and impact indirect jobs, for example, along the supply chain. Furthermore, the local economy of an investment could be benefitted through additional demand for goods and services by the influx of workers. We call this positive spillover “induced impact”.

In order to better understand not only direct impact of IFC investments, but both indirect and induced impact, the Manufacturing, Agribusiness and Services (MAS) Department of IFC is undertaking two linked studies. The first study examines the effect of three IFC investments on indirect jobs. This paper constitutes the second study, which seeks to assess induced impact of one of these investments, in Ecogreen Oleochemicals.

Background of Ecogreen and IFC’s investment

Ecogreen is an oleochemicals manufacturing company that processes palm kernel oil and coconut oil to produce fatty acids, fatty alcohols, and glycerine. These products are used in detergents, soaps, and other personal care products. The company was established in 1988 with a plant in Medan, Indonesia.

and has since expanded to also have a manufacturing facility in Batam. Ecogreen has export markets across Asia Pacific, the US, Latin America, and Europe.

Ecogreen's workforce is made up of unskilled, semi-skilled, and mostly skilled labor. Given that chemicals manufacturing requires a base level of technical skill, most of their employees have Bachelor’s degrees in Chemistry or other natural sciences and are recruited from universities across Indonesia. In addition, they hire unskilled and semi-skilled labor as contractors for upkeep of their facilities.

In 2005, the IFC made an investment in Ecogreen for a large expansion of its manufacturing facility in Batam. This $84 million USD project nearly doubled Ecogreen’s capacity. The number of employees grew from 293 employees directly before the investment, to 470 employees after the investment. It is also worth noting that Ecogreen was unable to find financing to meet their growth plans in the local market, and IFC was able to fill this gap.

**LITERATURE REVIEW**

Previous papers that empirically assess the induced impact of IFC investments on the local economy are limited. Much of the relevant literature is theoretical, analyzing the channels through which private investment may affect poverty alleviation. Many argue that this effect is largely positive through jobs (direct, indirect, and induced), higher wages, and economic growth (IFC, 2011; Graham, 2000; ODI, 2002). FDI also may have positive spillovers on other firms in the country, for example through technology transfer, but this reduces poverty largely through growth rather than directly. However, some point to the fact that inequality and thus poverty may be exacerbated for investments utilizing higher skilled labor and that the volatility of FDI has adverse effects (Nunnenkamp, 2004).
One evaluation by the World Bank’s Independent Evaluation group evaluates the impact of an IFC investment in Agrokasa, a Peruvian agribusiness, and finds high positive impacts on labor and economic outcomes (Datar and Del Carpio, 2009). A similar methodology to this paper is used: existing household survey data is analyzed to identify a comparable control group and assess whether the “treatment” group shows better outcomes after the investment takes place.

The Independent Evaluation Group has also assessed the impact of IFC investments on poverty by examining project objectives and qualitative results (IEG, 2011). The report finds that fewer than half of projects have poverty alleviation as an objective of the project, and most “do not provide evidence of identifiable opportunities for the poor to participate in, contribute to, or benefit from the economic activities that the project supports”. However, the report does state that most projects have contributed to growth, which has an effect on poverty. One recommendation is that IFC invest in understanding how their investments contribute to poverty and jobs through select in-depth evaluations. This paper is one such effort made towards this understanding.

Other relevant literature has been much broader, for example, focused on the impact of foreign direct investment on growth and poverty alleviation. Jenkins and Thomas (2002) find that access to formal-sector employment is an extremely important factor in shifting poor people out of poverty, substantiated by several studies that examine this relationship (Jenkins and Knight, 2002; Johnson and Sender, 1995; Knight and Kingdon, 2000; Leibbrandt et al, 1999; Seekings, 1999; Wilson and Ramphele, 1989). However, other studies show only modest contributions of FDI to employment generation (Nzomo, 1971).

Together, this literature gives us indication that IFC investments have strong potential to reduce poverty. However, there are few studies that directly assess this impact, especially induced impact on
the local economy. This paper and its accompanying case study on direct and indirect job creation help address this gap in the literature.

DATA

This evaluation uses the SUSENAS dataset collected by the Bureau of Statistics (Badan Pusat Statistik Republik) in Indonesia. It uses stratified multi-stage cluster sampling with two strata (urban and rural area) for each district/municipality. The SUSENAS survey is nationally representative and has been collected annually with a core module (on basic economic and social indicators) and a rotating module (on various topics of interest). Thus, this survey allows us to assess a range of economic outcomes, controlling for various demographic, economic, and social variables.

The island of Batam is a district (Kabupaten) of the Kepulauan Riau province, and there are several sub-districts (desa) within Batam. For political and social reasons, the sub-districts of Batam have evolved over time. While in 1993 there were only 19 sub-districts, in 2010 there were 64. In order to compare the same geographical location over time, we mapped these splits and defined all individuals by their 1993 sub-district (what the name of their district was in 1993). There are a few sub-districts of Batam that are themselves smaller islands close to Batam. These are excluded from the analysis, and we are left with 12 “1993 desa”.

EMPIRICAL STRATEGY

Motivation

Batam has been growing rapidly since the 1990’s when the government pronounced it a special economic zone. Given its strategic proximity to Singapore, the government aggressively invested in
infrastructure throughout the island in order to make it an attractive investment destination. Therefore, the whole islands has been on an upwards development trend. As seen from the map in Exhibit 1, the more populated areas are the commercial area on the north of the island, in Batam City (Kota Batam), and a largely residential area towards the southwest region of Batam.

**Exhibit 1: Map of Batam**

Ecogreen (shown with a red marker on the map) was among the first large manufacturing facilities to be built on the island. Construction began in 1992 and the plant began operations in 1994. Ecogreen is located on the south east coast of Batam, in the Kabil district. According to locals and Ecogreen management, Ecogreen constituted the only major industrial activity in Kabil until late 2008/early 2009. In 2005, the IFC investment almost doubled the size of the plant.

Given that the whole island has been on an upwards trajectory (see Exhibit 2), simply comparing outcomes of interest before and after the investment would almost certainly show a large increase. However, such an analysis would not allow us to understand the impact of the IFC investment *beyond*
the general growth of the island. Therefore, calculating the *post minus pre* difference in outcome metrics would overestimate the impact of IFC’s investment greatly. It is therefore necessary to identify a control district to compare Kabil to, or a *counterfactual* that provides an indication for what would have happened in Kabil in the absence of the IFC investment.

**Exhibit 2: Growth trajectory of expenditures, formality, and employment in all of Batam**

![Graph showing growth trajectory of expenditures, formality, and employment in all of Batam]

**Dependent Variables**

We conduct the synthetic control analysis on three dependent variables: per capita expenditures, employment, and formality. Together, these variables provide a quite comprehensive story on how the local economy is trending. Expenditures is a typical measure of household welfare (because it is less volatile than income, as households tend to smooth consumption), employment will look at all jobs (direct, indirect, and induced) in the local economy, and any relative increases in formal job rates may be a good measure of the “direct” impact of Ecogreen.
The Synthetic Control Methodology

Several econometric methods of identifying a strong and plausible counterfactual have been developed over the past few decades including propensity score matching and regression discontinuity. The synthetic control methodology is a more recent development (Abadie and Gardeazabal, 2003; Abadie, Diamond, Hainmueller, 2010). The basic idea is to generate a “synthetic” district, developed by aggregating various possible districts with different weights. An optimization will find the districts that together most closely match the treatment district’s trend before the treatment. As seen in Annex 1, the rest of the districts on average do not match the treated districts’ trends.

This investment in Ecogreen only affected one subdistrict in Batam. Therefore, we cannot use propensity score matching to match the treated subdistrict to other subdistricts in Batam. Additionally, because treatment occurs on the sub-district level, and not the individual level, using the individual level data would require clustering on the sub-district level. Because there are only 12 sub-districts in our sample, by the central limit theorem, our estimates would not converge to the mean. Thus, we use the synthetic control method, which requires aggregate data on the level of geographic units (e.g. districts) and also requires only one of these geographic units to be affected by the treatment.

Given that the SUSENAS data is on the household level, we first aggregate the individual household level data on the district level. We then use a nonparametric LOWESS smoother to remove sampling variation, and obtain a measure of the general trend. After removing the districts that are clearly different from Kabil in their nature (districts that are not on the mainland island of Batam, which are unpopulated agricultural districts), we run the synthetic control optimization.
Identifying Synthetic Control Districts

Per capita Expenditures

The model we use includes several years of lagged per capita expenditures, the average percent of employment in manufacturing over the pre-treatment period, and the average level of formality over the pre-treatment period. The synthetic control district we obtain from this model looks very similar to the treatment district in the pre-treatment period (see Table 1 and Exhibit 3).

Table 1: Treated District and Synthetic District Predictor Means

<table>
<thead>
<tr>
<th></th>
<th>Treated</th>
<th>Synthetic</th>
<th>All Control Districts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expenditures (1994)</td>
<td>129643</td>
<td>129716</td>
<td>120814</td>
</tr>
<tr>
<td>Expenditures (1998)</td>
<td>249735</td>
<td>249722</td>
<td>280333</td>
</tr>
<tr>
<td>Expenditures (1999)</td>
<td>278580</td>
<td>272038</td>
<td>324787</td>
</tr>
<tr>
<td>Expenditures (2001)</td>
<td>344068</td>
<td>350550</td>
<td>433535</td>
</tr>
<tr>
<td>Expenditures (2004)</td>
<td>490461</td>
<td>489074</td>
<td>617662</td>
</tr>
<tr>
<td>% Jobs in Manufacturing</td>
<td>0.34</td>
<td>0.38</td>
<td>0.28</td>
</tr>
</tbody>
</table>

Exhibit 3: Treated District and Synthetic District Expenditures over Time
The districts that make up the synthetic control are in Sei Beduk and Sekupang, which are areas similar to Kabil in its level of industrialization and commercial activity. Kampung Pelita is the other sub-district included, in the Lubuk Baja district, which is slightly more populated but not the main city.

**Employment**

The model we use includes several years of lagged employment and the average percent of employment in manufacturing over the pre-treatment period. The synthetic control district we obtain from this model roughly follows the treatment district in the pre-treatment period (see Table 2 and Exhibit 4).

**Table 2: Treated District and Synthetic District Predictor Means**

<table>
<thead>
<tr>
<th></th>
<th>Treated</th>
<th>Synthetic</th>
<th>All Control Districts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment in 1994</td>
<td>.91</td>
<td>.90</td>
<td>0.91</td>
</tr>
<tr>
<td>Employment in 1998</td>
<td>.89</td>
<td>.89</td>
<td>0.92</td>
</tr>
<tr>
<td>Employment in 2001</td>
<td>.88</td>
<td>.88</td>
<td>0.92</td>
</tr>
<tr>
<td>Employment in 2004</td>
<td>.88</td>
<td>.88</td>
<td>0.92</td>
</tr>
<tr>
<td>% Jobs in Manufacturing</td>
<td>.34</td>
<td>.26</td>
<td>0.28</td>
</tr>
</tbody>
</table>

**Exhibit 4: Treated District and Synthetic District Employment over Time**
All of the districts included in the synthetic control are in Sekupang, which is located the west of the island and is similarly populated as Kabil, with similar levels of commercial activity.

**Formality**

The model we use includes several years of lagged formality and the average percent of employment in manufacturing over the pre-treatment period. The synthetic control district we obtain from this model roughly follows the treatment district in the pre-treatment period (see Table 3 and Exhibit 5).

<table>
<thead>
<tr>
<th>Table 3: Treated District and Synthetic District Predictor Means</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Formality Rate in 1996</strong></td>
</tr>
<tr>
<td>----------------------------</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Formality Rate in 2005</strong></td>
</tr>
<tr>
<td><strong>% Jobs in Manufacturing</strong></td>
</tr>
</tbody>
</table>

**Exhibit 5: Treated District and Synthetic District Formality over Time**

The synthetic control is made up of a district in Sekupang (which also made up the controls for expenditures and employment) and two districts in Batu Ampar, which are more populated areas.
surrounding the city. While these districts are not as similar to Kabil in terms of population density and types of commercial and industrial activity, we include them, as they are most similar to Batam’s trend of formality. Kabil and Batu Ampar both developed much sooner than the rest of the island due to major investments (Ecogreen in Kabil and McDermott International in Batu Ampar), and thus started with high formal employment levels, evolving to a more diversified economies with more informal employment.

RESULTS

In 2005, both the treatment and control groups had an average monthly expenditure of 545,000 rupiah ($700 per year). We find that monthly expenditures per capita in the treated district grew by 408,000 rupiah (~$520 per year) in the post-investment period of 2005-2009, compared to a growth of 244,000 rupiah (~$310 per year) in the synthetic control district. Because the treatment and control group followed the same trend until the treatment year, households in the investment areas consumed ~$210 per year than in the control district. In a country where the mean monthly expenditure was ~$27 ($325 per year) in 2005, this is a substantial increase. While the monthly expenditure of Kabil in 2005 was higher than the country average due to the fact that the island of Batam is relatively economically developed (with a mean of $700 per year as mentioned above), a $210 increase still represents a 30% increase compared to treatment district in 2005 (at the time of the investment), and a 22% increase compared to the control district as of 2009.

When this $210 is multiplied by the 19,000 people that live in Kabil (the treated district), we calculate a total annual impact in 2009 of $4 million. When the impact for years 2006, 2007, and 2008 are also considered, the aggregate figure increases to a large $6.8 million of additional expenditures.
While this analysis demonstrates 22% higher expenditures in 2009 relative to a control that was very similar to the treated district before the IFC investment in 2005, it is unclear whether this is a significant increase. To test significance, we run series of “placebo tests”. The placebo test replicates the analysis above for every other district, identifying a synthetic control (that matches each district’s pre-2005 period). The placebo test then measures the gap between the districts trend and the synthetic control’s trend. If the Kabil district had among the largest positive gap between Kabil and its synthetic control, we have reason to believe that this investment made a significant impact on per capita expenditures. However, if other districts increased to a greater extent than Kabil in comparison to a synthetic control district with a similar pre-treatment trend, we have reason to believe that this increase was not actually significant.

Exhibit 6 plots the “gaps” for each district. Some of the districts do not find good matches in the pre-treatment period. This is because they exhibit the highest (or the lowest) expenditures, and thus, no average of the other districts can serve as a control that matches the trend. Given that these are not good comparisons for our purposes, in Exhibit 7 we eliminate all districts that do not match the pre-treatment period well. The mean-square predictor error (MSPE) measures how close the synthetic control matches the treatment district, so we eliminate those districts that have over 7 times the MSPE of the treatment district’s optimization. As seen in Exhibit 7, only one district has a higher trajectory than Kabil, and it is barely higher. Additionally, this district’s trend begins to increase before 2005.
Exhibit 6: Placebo Tests for All Districts – Per-Capita Expenditures

Exhibit 7: Placebo Tests for Districts with MSPEs Less than 7 Times the Treatment
MSPE – Per-Capita Expenditures
This analysis is replicated for the other two dependent variables (see Annex 2). For employment, only one district appears to have a positive increase, and the majority of districts decrease relative to their synthetic control. Once the districts that do not match their control well in the pre-treatment are eliminated, this effect remains, and Kabil has the third largest increase in employment out of 8 districts. For formality, Kabil is actually the district that decreased the most of all of the districts. This is one of the reasons the synthetic control does not match it as well in the pre-treatment period. Eliminating districts with high MSPEs will not change this, as Kabil’s rate of formality has decreased more than any of the other districts.

Therefore, there does appear to be an increase in expenditures per capita following the investment in Kabil, as this variable has grown faster in Kabil than in any other district other than one after the IFC’s investment. As a final test of whether this increase is significant, we conduct time placebo test. The time placebo rest re-runs the synthetic control assuming that the treatment occurred in a prior year to the true treatment year. If the investment was what caused the jump in per-capita expenditures, we should not expect to see a jump before 2005. By running the optimization for the years before 2000, rather than 2005, the optimization identifies districts that match Kabil’s trend only in the years before 2000. This will test whether the model will shows an increase before 2005. As seen in Exhibit 8, there is no jump in per-capita expenditures until 2005. This is further evidence that the intervention was in fact a driver of the jump in 2005.
However, there has been no significant increase in Kabil in employment, and in fact a decrease in formality. Based on qualitative interviews in Batam, this is expected. The investment resulted in the employment of many high-paid workers, as Ecogreen hired mostly skilled labor with college degrees in Chemistry and the natural sciences. These workers generally migrated from outside of Batam to join Ecogreen, thus boosting the local economy through additional demand for products and services from local enterprises. As expenditures per capita is a measure of the welfare of the local economy, this increase is expected to follow from a growing economy. However, employment did not increase faster than the control group, possibly demonstrating that existing local businesses grew, and this growth was not spread to additional businesses and additional employment. Additionally, employment rates in Batam have historically been high (90-95%). This is because Batam only started becoming populated in the 1980’s, and more so once it became a Special Economic Zone. People have largely migrated for employment opportunities. Therefore, increases are not likely to be large and therefore difficult to observe in the data. It is also important to note that employment did not decrease in Kabil, but that its
synthetic control increased around the same amount. Finally, formality actually decreased, likely because much of the job growth in the local economy was in the informal sector. The original employment growth of some districts in Batam was entirely formal sector factories setting up plants. Now that a new generation of families and migrant workers looking for work has developed, the level of informal labor should be expected to decrease in certain districts.

To further examine the root of the changes in either employment and formality, we assess how the industries of the workers have changed from the pre-treatment period. Specifically, we calculate the average percentage of workers in a specific industry in the four years before and the four years after the treatment (2005), and assess whether there is a significant increase or decrease in the industry over time with a two sample t-test. We see a statistically significant increase in mining and the public sector, both of which are industries considered to be largely formal. We also look at the expenditure changes within each industry and find that the industries of agriculture, manufacturing, construction, wholesale/retail and transportation are associated with significant increases in per-capita expenditures. Therefore, there are significant increases in expenditures across industries, including several that are largely informal: agriculture, wholesale/retail, and transportation\(^2\). The fact that the formal sectors of mining and public service have grown in employment seems inconsistent with the finding that overall formal employment decreased, however, overall formality in public service decreased and mining was always a very small portion of the Kabil workforce. The fact that informal sectors grew in terms of expenditures in Kabil is consistent with the fact that overall spending increased even though formality decreased and employment did not grow in comparison to the control group.

\(^2\) These three industries are largely informal in that a large proportion of workers in each industry are classified as informal.
CONCLUSION AND POLICY RECOMMENDATIONS

This evaluation assesses the impact of an IFC investment on three indicators of the local economy: expenditures per capita, employment rate, and formal employment rate. We find strong evidence that poverty has reduced in the sub-district of Kabil, demonstrated by a sharp increase in expenditures per capita relative to the control group. However, while employment did increase after the investment, it did not increase relatively more than the synthetic control sub-district. Therefore, there is no evidence of Ecogreen having an induced impact on the local economy through employment. Furthermore, formality has followed a downward trend in Kabil since 1994, which became more sharply negative after 2005.

Given the nature of Ecogreen and its workforce, these findings are not surprising. Ecogreen did not hire enough employees to make a sizeable dent in the labor force; however, Ecogreen pays its workers very well relative to the average worker in Batam as they are skilled workers with college degrees. Because skilled manufacturing labor is paid higher wages, it generates additional demand for existing goods and services in the local economy. It is possible that manufacturing investments relying on skilled versus unskilled labor have differential effects on the local economy, and thus, the results of this evaluation should not be extrapolated to other investments of very different nature. However, this evaluation demonstrates that skilled manufacturing labor can induce lower poverty in the surrounding community. This contrasts with the theory that the higher inequality from investments requiring skilled labor increases poverty.

This type of evaluation can measure the extent to which the IFC is reducing poverty, a key goal of the institution. This paper also presents a methodological example of how existing household survey data can be used to analyze IFC’s impact.
REFERENCES


ANNEX 1: Treatment District versus Rest of Districts

Exhibit A1: Per Capita Expenditures in Treatment District vs. Rest of Districts

Exhibit A2: Employment Rate in Treatment District vs. Rest of Districts
Exhibit A3: Formality Rate in Treatment District vs. Rest of Districts
ANNEX 2: Placebo Test Results for Employment and Formality

Exhibit A4: Placebo Tests for All Districts – Employment

Exhibit A5: Placebo Tests for Districts with MSPEs Less than 3 Times the Treatment MSPE – Employment
Exhibit A6: Placebo Tests for All Districts – Formality

Exhibit A7: Placebo Tests for Districts with MSPEs Less than 2 Times the Treatment MSPE – Formality