Ex-ante Impact Analysis of Financial Inclusion Programs in Developing Economies

by Alexandra Galvin

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Queen's University

Kingston, Ontario, Canada

Contents

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List of Abbreviations

ANDE	Aspen Network of Development Entrepreneurs
BCR	Benefit-Cost Ratio
BIA	B Impact Assessment
BoP	Bottom of the Pyramid
CBA	Cost-Benefit Analysis
CEA	Cost-Effectiveness Analysis
CGE	Computable General Equilibrium
EIA	Economic Impact Analysis
GDP	Gross Domestic Product
GIIRS	Global Impact Investing Rating System
GTAP	Global Trade Analysis Project
I-O	Input-Output
IRIS	Impact Reporting and Investment Standards
MFI	Microfinance Institution
MSME	Micro, Small, and Medium Enterprise
OECD	Organization for Economic Co-operation and Development
PSM	Propensity Score Matching
PPI	Progress out of Poverty Index
RCT	Randomized Control Trial
SAM	Social Accounting Matrix
SEAF	Small Enterprise Assistance Funds
SGB	Small and Growing Business
SME	Small and Medium Enterprise
SNA	System of National Accounts

1 Introduction

The World Bank reports approximately two billion adults around the world lack formal access to the most basic financial services. Access to more sophisticated savings and investment instruments are, consequently, even further out of reach. This prevents small businesses from coping with financial shocks or undertaking necessary investments to improve or expand their business. Research shows that economic activity can be affected through increased access to financial services for low-income individuals in poorer economies (Bruhn & Love, 2009; World Bank, 2008). Therefore, the absence of such access translates to slower economic growth and stagnant living standards for those already struggling in developing countries.

Imperative in a well-functioning economy is the efficient allocation of funds, whereby financial institutions mobilize savings to facilitate investment in opportunities that represent the best productive use of funds. Well-developed financial markets, in turn, stimulate economic activity, diminish income inequality, and ultimately may reduce poverty (World Bank, 2008; Honohan, 2004; Bruhn & Love, 2009). However, the lack of efficiency of financial markets and institutions in the developing world stifles investment opportunities by misallocating funds. In absence of savings and financing opportunities, small firms rely on friends and family or high-priced moneylenders to expand production. Small and medium enterprises (SME) that would otherwise have the potential for growth are then unable to hire additional labour, expand inventory, or invest in their fixed capital stock.

Recognition of the role SMEs are playing in economic development is widespread. The World Bank and the G20 have committed to prioritizing worldwide financial inclusion and have identified it as having the ability to facilitate 7 of the 17 Sustainable Development Goals (World Bank, 2017). Increasingly, however, investors and donors are becoming more adamant of development funds and non-governmental organizations (NGOs) to prove the asserted economic or social impact resulting from financial inclusion interventions they may be funding. Recently, there has been a concerted effort to improve the level of rigorous for impact evaluations in the SME financing sector. Currently, most evaluations estimate the short-run impact of receiving a loan on individual recipients, and fail to address the aggregate economy-wide impacts of the program.

The primary focus of this research is to provide an overview of the shortcomings of impact evaluation methods currently being used in the development financing sector and to explore the use of a modified input-output model to evaluate impact, since it has not been effectively implemented in evaluations of this sort. The paper is presented as follows: in Section 2, I address the state of the SME sector and the increase in development funds being directed at financing small and medium enterprises, as well as discuss their purported contribution to employment. In Section 3, I review and define common program evaluation methods employed in the sector and analyze their use in evaluating SME financing programs. In Section

4, I discuss Economic Impact Analysis (EIA) to serve as basis of understanding for the subsequent model and analysis. In Section 5, I develop a modified two-sector theoretical input-output model which accommodates for the direct effects of capital investment. Section 6 is an application of the theoretical model developed in Section 5 using program data and an input-output table in Sri Lanka. Finally, I offer some concluding remarks on the analysis presented and discuss potential applications of the model in future development financing projects.

2 Background

2.1 Capital Constraints

The financing gap of micro, small, and medium enterprises (MSMEs) in developing countries is estimated at $2.1 to $2.6 trillion (Stein et al., 2013), with almost half of SMEs in developing economies noting access to capital as a major constraint to growth (Bouri et al, 2011; World Bank, 2008). It is estimated that over 200 million formal and informal MSMEs in developing nations demand financial services but face constraints to access (Stein, Ardic, & Hommes, 2013; World Bank, 2017).

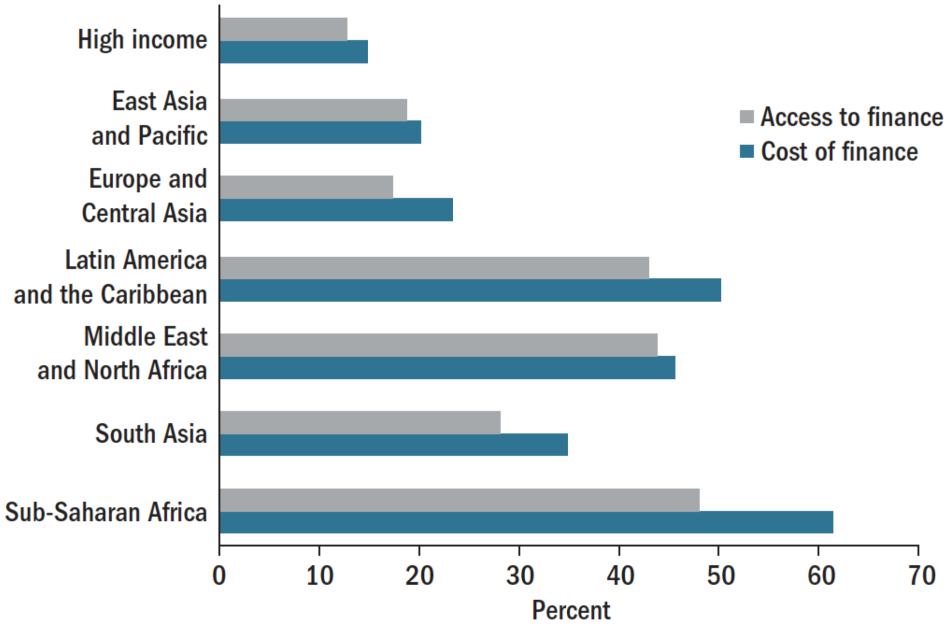
Numerous studies have recognized the importance of financial inclusion for small informal businesses and have noted the obstacles these firms face when searching for the reliable financing necessary to support growth and innovation (Ayyagari et al., 2012). Institutional barriers often prevent small and young firms, in particular, from accessing loans from traditional banks in developing economies. Furthermore, underdeveloped capital markets in these countries suppress the growth of industries which require more external financing when compared to those industries in developed economies (Banerjee & Duflo, 2012; Rajan & Zingales, 1998). Firms seeking financing are hindered by their lack of collateral and limited or no financial history by which to verify profits (World Bank, 2008; Banerjee & Duflo, 2012). This is further compounded by the fact that developing countries tend to have much weaker enforcement of contracts, which increases the risk banks must be willing to undertake to loan to firms that are already considered risky (Banerjee & Duflo, 2012). Since the very nature of banks is to spread risk, they are inclined to loan only to the largest firms which are less risky in order to maximize bank profits (World Bank, 2008). Therefore, to minimize defaults, loan officers typically adhere to strict guidelines on the type of business owner and business to lend to (Ayyagari et al., 2012). This then discourages any subjective judgement of businesses by loan officers. Additionally, corrupt political systems and the lack of powerful or wealthy connections generates unequal access to financing for small businesses (Ayyagari et al., 2012). The culmination of these obstacles results in small and young firms, who are in the most need of external financing, facing a significantly more difficult time accessing capital (Ayyagari et al., 2012; Stein, Ardic, & Hommes, 2013; Beck et al., 2006). Older, more established firms can utilize internal financing and are perceived as much less risky for traditional banks to lend to. By World Bank estimates, small firms access external financing at half the rate of large firms, at less than 20% (World Bank, 2008).

There are differing theories in the literature of the exact relationship between returns to capital and low levels of capital stock. The minimum scale theory argues that if low returns to capital are associated with low levels of capital stock, firms may have a capital stock too low to be able to realize growth from financing (de Mel, McKenzie, & Woodruff, 2008). This would result in a poverty trap, particularly of small firms in developing economies. The alternative theory, that high returns to capital can be realized at low levels of capital stock, suggests that small-scale firms are able to grow with access to internal or external capital investment (de Mel, McKenzie, & Woodruff, 2008). The increasing flow of development funds to SME financing projects recently may be indicative of the perception that firms with very low capital stocks are capable of generating very high returns to capital (de Mel, McKenzie, & Woodruff, 2008). If small firms can afford the extremely high rates paid to moneylenders in developing regions, it follows that their potential returns to capital must also be very high, despite their low levels of existing capital. If this is the case, it may indicate the absence of minimum scale and support the benefits of financing small firms with low capital stock.

2.2 Microcredit and SMEs

Microfinance institutions (MFI) have expanded significantly the past 25 years since the inception of Grameen Bank, and has become one of the leading development

Figure 1: Firms reporting financing as a problem



Source: World Bank (2008) from the Investment Climate Survey (ICS)

programs in the world (van Rooyen et al., 2012). Similarly to SME financing, microfinance organizations aim to provide financial services to capital constrained entrepreneurs. This includes such services as micro-loans, micro-savings, and micro-insurance (Awaworyi, 2014). The scale of financing for these microenterprises is drastically smaller than that necessary to support a small or medium-sized business. Typically, microfinance loans range from less than a hundred dollars to a few thousand dollars. These are often low-skilled subsistence businesses, which garner meager income in order to support their families most basic needs. Although expanding access to these individuals can modestly grow these micro-businesses and improve a household's standard of living, the impact is limited by the size of the loans and scalability of the businesses. There is little evidence, or consensus, to support a casual impact of expanding microfinance operations on stimulating economy-wide growth. Empirical assessments show that despite the many hopes microfinance was the path to poverty alleviation, the modest expansion of these microenterprises do not translate to increased economic growth (Ody & de Ferranti, 2007; Awaworyi, 2014).

Although the definitions vary, SMEs are typically described as small or medium sized businesses with five to 250 employees, with a specific cap on revenue, assets, or annual turnover (ANDE, 2012; Bouri et al., 2011). Presently, researchers and development organizations have recognized the need to progress beyond microfinance. A shift in focus to SME financing after the unconvincing results of microfinance is clearly in hopes to fulfill the promises microfinance failed to materialize. The academic literature does present plenty of evidence of the benefits of SMEs accessing capital, but there is no exact consensus of their indirect effect on economic growth.

2.3 Potential for Growth and Employment

The potential for growth of SMEs is significantly higher than that of microenterprises. The personal characteristics of the entrepreneurs of most microenterprises differ significantly from those of SMEs. The owners of subsistence oriented businesses often lack the entrepreneurial expertise and knowledge to develop a business model which is scalable (ANDE, 2012; Schoar, 2010). Empirical assessments of

SME financing suggest that the positive impact of credit availability is concentrated among those with higher entrepreneurial ambition, and among wealthier or better educated borrowers, typical of SMEs and some more-successful microenterprises (World Bank, 2008; Honohan, 2004; Bruhn & Love, 2009).

Within small businesses, two types of entrepreneurs have been identified. Survivalist entrepreneurs and constrained gazelle entrepreneurs (Grimm et al., 2012). Survivalist entrepreneurs start their businesses because there are not many wage positions available in their location and are thus forced to earn an income by some form of informal self-employment. However, they lack the managerial experience, entrepreneurial spirit, and financial literacy to produce a high rate of return on capital invested to grow their business.

Constrained gazelle's, on the other hand, have high productivity and possess characteristics which survivalists' lack. However, due to low capital stocks and meager profits (in absolute value), they are often confused for survivalists. The predominant factor preventing these gazelles from thriving and growing are in constraints accessing capital. In the social sector these businesses are often referred to as Small and Growing Businesses (SGBs), they are defined just like constrained gazelles in that they are a subset of SMEs that have the greatest potential for growth (Aspen, 2013). Therefore, providing capital to a constrained gazelle will lead to higher returns and overall impact than if funds had been given to a survivalist entrepreneur.

Furthermore, this supports employment for survivalist entrepreneurs who would otherwise prefer to opt for a wage position than run their own business. A primary concern in developing economies is the "missing middle", which refers to the absence of stable formal employment in the middle class (ANDE, 2012). These types of firms are estimated to comprise 20%-35% of the informal business sector in West Africa and likely even more in regions which have more dynamic economies (Grimm et al., 2012). In aggregate, SMEs account for 78% of formal employment in low-income countries. Thus growing informal small businesses and transitioning them to the formal sector should alleviate some of this gap and provide stable middle-income jobs in order to reduce poverty (ANDE, 2012; Ayyagari et al., 2011).

2.4 Additional Barriers to Growth

The focus of this paper centers on development programs that provide access to capital to the firms with the most potential to grow. However, even with access to capital, firms encounter many additional obstacles in expanding their operations.

2.4.1 Expertise and human capital

Often firms do not have the experience or expertise to take full advantage of financing opportunities and manage growth. Managerial expertise, in particular, is glaringly absent from many SMEs in relation to large established firms, further preventing expansion and development (Abor & Quartey, 2010). This is compounded by the fact that consulting firms providing advice and training are too expensive for SMEs to access on their own. However, given access to consulting services, businesses are found to have increased returns on assets and improved productivity (Bruhn, Karlan, & Schoar, 2012).

In addition to building human capital and improving business practices and knowledge (Karlan & Valdivia, 2006), business development and training programs have also been largely successful in spurring the creation of new businesses and expanding existing businesses (Klinger & Schundeln, 2011). Most SME lenders provide these types of business support services to borrowers, it is widely recognized these are valuable tools to compliment financing initiatives and increase "entrepreneurial spirit" (Klinger & Schundeln, 2011). The quality and depth of the training, however, are key contributing factors in the success of any business training program (Bloom et al., 2013).

2.4.2 Gender Norms

Many microenterprises and small businesses are run by female entrepreneurs. In many places, it may be relatively difficult for female entrepreneurs to grow their small businesses into larger enterprises. There are many reasons for this. In some societies, male business owners may be hesitant to do business with female business owners. Additionally, female entrepreneurs may face the additional challenge of juggling their business with the primary responsibility of running their households (Armendáriz & Morduch, 2010; Grimm et al., 2012).

Grimm et al. (2012) found that women entrepreneurs performed significantly worse than their male counterparts in West African capital cities. De Mel et al. (2008) reports that in Sri Lanka female entrepreneurs also performed more poorly than males after receiving a loan, but notes that firms whose owners were better educated performed the best regardless of gender.

This is likely due to the parental and caretaker responsibilities that often harm women's abilities to become successful entrepreneurs. It can also become a barrier in seeking employment at a SME. The obstacles women face participating in the labour market make it significantly more difficult for them to be able to work the long hours required by these firms and compete with male candidates who tend to be more educated and experienced (Bauchet & Morduch, 2012). This may help in understanding why women employed by small and medium enterprises comprise only 7% of employees, compared to 91% of microcredit borrowers that are female (Bauchet & Morduch, 2012). This suggests that gender norms may be able to explain much of the gender gap in entrepreneurship in developing countries. Addressing these barriers would be a cost effective means of improving the overall success of these programs.

2.4.3 Technological Barriers

Another barrier to the growth of small businesses in Ghana and South Africa is the lack of access to technologies, or simply information on technologies necessary to increase their productivity. In many cases where they do obtain access to the technology, they must lease it from large corporations or be content with a small percentage of ownership. Furthermore, if they try to develop their own technology, maintaining ownership of it is difficult as a small business, due to the inefficient and arduous patent process in these countries (Abor & Quartey, 2010).

2.4.5 Cultural norms

Finally, cultural differences in addition to gender norms may be hindering the success of entrepreneurs in developing countries. Iyer & Schoar (2010), through the use of a randomized control trial (RCT), found that certain cultural norms in specific regions in India led to consistently lower prices of their goods. The authors explain that they did so because they valued long term customer loyalty versus profit maximization. This is an area in which business training may be effective in addressing pervasive flawed business practices.

In addition, it was observed by Berggren & Burzynska (2014) that social beliefs have a significant impact on the effectiveness of microfinance lending programs in developing economies. They found a relationship between MFI's financial performance, such as average interest rates and default costs, with the strength of social beliefs and trust in a country.

Yetim & Yetim (2006) studied the effect of cultural business norms in Turkey on employee satisfaction in small and medium enterprises. It was found that adapting business culture to Western managerial styles was not conducive in Turkey, and that employee satisfaction was in fact improved with paternalistic entrepreneurs that promoted collectivist work environments. This indicates that the organizational structure of a firm which has a stable, centralized authority and decision-making structure, along with a high power distance was preferred by employees (Yetim & Yetim, 2006). This serves as a reminder that cultural norms of the target country have significant implications when analyzing the growth and success of a SME.

2.4.6 Crowding out

Another interesting issue to consider that was identified by De Mel et al. (2008) is that the firms located near participant firms in lending programs were, in fact, negatively affected. This highlights the potential of financing programs to decrease competition and create crowding out effects when lending to particular segments of small businesses. It also suggests that occasionally, small businesses can be outcompeted by other businesses that may require financing but do not have access, or only have access at higher rates. Therefore, the benefits of this intervention may come at the determinant of other small businesses. In this case, if this loss to other businesses is neglected in the analysis, an overestimation of the program's impact will occur.

3 Current Impact Evaluation Methods

"Impact" refers to the social or economic effects of an intervention on individuals, households, firms, or communities which can be measured by various methods and tools. Providing loans to SMEs may result in a vast array of impacts that can be assessed through a variety of indicators. There may be short-run and long-run impacts, direct and indirect impacts, as well as individual and community-wide impacts. For example, owners of those businesses receiving loans may experience increased profits while their employees experience increased wages. Technological advancement may lead to changes in prices and improved consumer products. Community impacts may include the construction of shared infrastructure, where firms build new roads, wells, or electrical grids and allow public access. Aggregating these impacts is crucial to understanding any program's contribution to business expansion and economic growth.

Providing financing to capital constrained small and medium-sized businesses to expand their production may have the potential to produce these impacts. In addition to financing, the impacts observed in the SME sector are further driven by the co-products and services offered, or mandated, by lenders as a condition of financing. Therefore, the uptake of co-products has the potential to improve the success of financing programs. In the space of microfinance, the prevalent use of peer pressure in lending groups is an example. The use of these types of social pressure as incentives in the SME financing space, however, is still at the experimental stage. Co-products that are commonly offered with SME financing (as well as microfinance) include financial advice, cohort based mentoring, training programs, and workshops for general entrepreneurial skills (Bruhn et al., 2012; Calderon et al., 2013).

Grimm et al. (2012) reports that firms in the informal sector may very well possess the entrepreneurial aptitude and desire of higher performing entrepreneurs, but they may not always have the needed financial skills and training to manage growth. Providing training to such entrepreneurs increases the range of microenterprises and SMEs that may be able to leverage larger loans to drive the growth of their businesses. Karlan and Valdivia (2006) found evidence to support this notion, implying entrepreneurial skills can be taught and consequently lead to a greater overall impact.

There are several methods commonly used by researchers in the SME financing sector to estimate the impact of a program on observable outcomes. World Bank & GPFI (2012) provide an overview of the experimental and empirical techniques available for the ex-post evaluation of a program's impact on observable outcomes. Providing a brief review of commonly employed methods to evaluate the impact of SME financing is necessary for the discussion of alterative aggregate models in the upcoming section.

3.0.1 Counterfactual

Each of the empirical evaluation methods we discuss below utilizes a counterfactual scenario by which the comparison of a control group to a treatment group is made to measure the effect of an intervention. In program evaluation, a counterfactual is employed to estimate the impact or benefits of an intervention. To assess the causal impact of an intervention, it is necessary to compare two scenarios – one in which the intervention occurred, and one in which the intervention did not occur. Such a counterfactual scenario must be constructed either prior to project implementation or with additional data available post intervention to ascertain what would have happened to a group of businesses had they not received financing. It is critical to obtain a proper estimate of the counterfactual so that the impact of a program isn't overestimated. In response to this problem, several methods have been devised to assess the marginal impact of a program.

3.1 Experimental Approaches

The experimental approach to estimating the counterfactual involves assembling an eligible group of small businesses for lending which all possess the same observable characteristics, and then randomly dividing the grouping into two categories – those who will receive funding, and those who will not receive funding. The difference in outcomes between those businesses that receive funding and those who do not is then measured. The random distribution of businesses into these two categories ensures that the difference in outcomes must be due to the intervention (financing), and not to confounding influences or unobservable characteristics, such as motivation. The randomized control trial (RCT) approach is considered by many as the highest standard for estimating the marginal impact of a project due to its rigorous construction of a counterfactual scenario, controlling both for observable and unobservable characteristics of businesses. In addition to planned experiments, researchers often take advantage of "natural experiments". Natural experiments are events not organized by the researchers, that randomly, or seemingly randomly, assign subjects to treatment and control groups. Some examples include changes in laws or policies, or market shocks. Analyzing these incidents are particularly valuable when conducting a full scale RCT would be infeasible, while still providing us inference.

Some RCTs have been performed to assess the impact of services or organizational structure of larger SMEs (Bruhn et al., 2012; Georgiadis et al., 2016), but there doesn't appear to be any literature which studies the overall impact of SME financing programs. However, an extensive literature has been centered on RCTs measuring the impact of microfinance programs (de Mel et al., 2008; Banerjee et al., 2014; Crepon et al., 2011; Karlan & Valdivia, 2006; Carpena et al., 2012; Bruhn et al., 2012).

There are several challenges for performing RCTs to assess the impact of SME lending. Although the portfolios of SME lenders are much larger in their dollar value, there are generally fewer clients per lending institution than MFIs, which limits the sample size obtainable for an experiment of this type.

3.2 Quasi-experimental Approaches

Quasi-experimental techniques involve controlling for observable characteristics among SMEs, without randomization. Occasionally, an analyst would try to control for unobservable characteristics as well, using proxies. These techniques are occasionally easier to implement than RCTs, particularly if the data used to match the control group with the treatment group can be obtained from simple surveys or administrative sources. A common quasi-experimental technique is known as propensity score matching (PSM). This method can be utilized when a control group has not been established at the outset of the program and there is ample information on the selection criteria of the participating firms. This approach matches each small business in the treatment group with a business that had not received financing (the control group) based on their propensity scores, which are constructed from the observable characteristics of the firms. Identifying the observable characteristics of the treatment group allows the selection of a statistically equivalent control group, and thus suggests that any differences in outcomes of businesses are attributable to the financing initiative. Since propensity scores reflect observable characteristics of firms, there may be unobservable traits of the treatment group, such as self-selection, which may influence the results.

In the case of SME financing, it is highly probable that details of the firm selection process is known which enables the identification of a control group. There have been some uses of quasi-experimental methods in practice. Matching has been used to investigate the impact on households who served as suppliers to SMEs that received financing (I-Dev International & ANDE, 2016). As well, Klinger & Schundeln (2011) utilized quasi-experimental techniques to study business training for small business entrepreneurs in Central America.

Difference-in-difference is another common quasi-experimental method which can be used to evaluate the impact of SME financing programs. Similarly to PSM, difference-in-difference identifies a control group that is comparable to that of the treatment group, and then analyzes the change in outcomes of the two groups over a period of time. To account for unobservable characteristics that may bias the estimates, such as self-selection, difference-in-difference can be used in cases where financing is available only in certain municipalities or in cases where the timing of the roll out is staggered (World Bank & GPFI, 2012). Many studies have utilized difference-in-difference methods for evaluating SME initiatives (Lopez-Acevedo & Tinajero, 2010; Bruhn, 2011; Alvarez & Crespi, 2000; Benavente & Crespi, 2003).

3.3 Qualitative Approaches and Scorecards

There are a vast array of qualitative impact methods that cannot be covered exhaustively in this review. However, nearly all impact investing funds provide qualitative "impact stories" which show, in an anecdotal fashion, how the lives of the business owners, their employees, and the community at large were improved through the support of the funds. Nevertheless, qualitative impact stories can be problematic. This is highlighted in Banerjee and Duflo (2011), where they examine how local MFIs can be subject to hostile borrowers or community members with false anecdotal evidence of their collection practices. This greatly undermined the sustainability of the lending organization due to a surge in mistrust and thus a spike in default rates (Banerjee & Duflo, 2011). Therefore, impact stories, in and of itself, are not a very reliable method of conveying project impact. However, when used in conjunction with quantitative impact analysis, they can provide valuable insights as to why certain outcomes were achieved.

In the social sector, less rigorous metrics and certifications have been developed to report impact to potential investors. Some of these tools are B Impact Assessments (BIA), the Global Impact Investing Rating System (GIIRS), Impact Reporting and Investment Standards (IRIS) metrics, and Progress Out of Poverty index (PPI), to name a few. As part of the non-profit organization Global Impact Investing Network (GIIN), IRIS is a catalogue of metrics which "are designed to measure the social, environmental, and financial performance of an investment"

(Gelfand, 2012). Many international development funds and foundations are turning to IRIS metrics to report the impact of their funds. The practice of reporting these types of metrics creates a standardized method to convey impact in order for donors to easily compare amongst funds.

B Impact Assessment is an online tool also used to assess the social and environmental impact of a fund. Funds that use BIA can then be accredited as "B corporations" or become GIIRS rated, both of which (BIA and GIIRS) utilize IRIS metrics along with additional criteria to determine a rating. The BIA tool was created by B Lab in 2012 to offer a certification for businesses that produce significant social impacts, as well as to funds which invest in these businesses (Richardson, 2012). The process requires inputting data into the B-Analytics platform and subsequently being reviewed independently by Deloitte & Touche (Richardson, 2012). If this step is successful, the fund is given a GIIRS rating between 0 and 200. This signals to investors the degree to which the businesses funded by the institution are producing social impact (B Lab, 2017a). Subsequently, if a fund or business obtains a GIIRS above 80, it can apply for status as a B corporation, which B Lab claims "meet the highest standards of verified social and environmental performance, public transparency, and legal accountability, and aspire to use the power of markets to solve social and environmental problems" (B Lab, 2017b).

The Progress Out of Poverty index provides an estimate of the likelihood an individual is living in poverty based on an assigned score of 0-100 through a series of questions. This index is not informative of the impact of a financing program, nor the nature of how a family is lifted out of poverty. Furthermore, the transparent procedure may result in perverse incentives of the respondents who understand the benefits of answering questions to appear in poverty.

Aside from not being an actual measure of impact, these frameworks are highly subjective and susceptible to bias. They also fail to capture many of the indirect benefits stemming from financing programs to value chains, employees, or the community. This may be evidence that the feasibility of full-scale impact assessments is an obstacle for development funds and NGOs, who typically have limited empirical expertise and limited budgets.

4 Economic Impact Analysis (EIA)

4.1 Direct and Indirect Effects

Impacts that result from programs or policies can be classified into one of two categories, direct or indirect effects. Direct effects occur from the program's initial expenditure, this includes operating expenses, inputs into production, wages, etc. The indirect effects incorporate all additional spending that is indirectly caused by the direct effects of the program, such as increased spending and transactions between businesses. The most common method to examine these economic impacts is with Economic Impact Analysis (EIA). EIA is an evaluation tool which encompasses a number of methods to measure impact, this typically includes traditional

Input-Output (I-O) models, Social Accounting Matrices (SAM), and Computable General Equilibrium (CGE) models. EIA is commonly used for ex-ante impact analysis for a wide range of projects and policies. Naturally, estimating expected impacts ex-ante is less precise than ex-post evaluations as they rely more heavily on assumptions and best guesses about the way that individuals and firms will respond to a new program. EIA can also be used for ex-post impact assessment, in which the project or policy has already occurred and the evaluator uses updated data to approximate the impact.

All EIA models are founded in a basic input-output structure and can examine the impact of a project as it percolates through different sectors and institutions of an economy. The key economic indicators it measures are employment, household income, industry expenditure, and government tax revenues. Moreover, these types of models are particularly valuable in identifying the sector or industry in which investment will result in the greatest economic impact. The most prevalent uses of EIA in the literature and in real-world application are in economic development projects, environmental studies, international trade, transportation planning, as well as government infrastructure projects. Their use in evaluating SME financing initiatives or microfinance projects, however, is quite limited. The following section discusses the underpinnings of I-O, SAM, and CGE models to illustrate the benefits and shortcomings of impact analysis for SME financing programs. This will be followed by a theoretical I-O framework I construct to adjust for capital investment. Practical application of an I-O model is then performed to gain further insights into the economic impacts of the program and the usefulness of I-O models in analyzing impacts.

4.2 Basic Input-Output Framework

Developed by Wassily Leontief in 1936, input-output (I-O) analysis examines the interdependencies of industries within an economy in order to illustrate the backward and forward linkages in a supply chain, as well as to serve as a system for examining the structure of the economy as a whole. The inter-industrial relationships are described in table format, each column of which illustrates the composition of inputs in that sector and each row representing the flow of the sectors' output to other industries throughout the economy. Ultimately, input-output tables are a national accounting framework commonly utilized in economic analysis. They are now an integral part of the System of National Accounts (SNA) which are produced in almost all developed countries. Global organizations including the OECD and the Global Trade Analysis Project (GTAP) also produce or gather tables for most developing countries. I-O tables can encompass diverse geographic regions, ranging from national levels to city or neighbourhood levels.

The basis of analysis using input-output tables is computing the multiplier effects, which estimate the total effects of a project or policy. The matrix of multiplier values are obtained by computing the Leontief inverse, which solves the model to find the change in output given constant technical coefficients and varying final demands. Multiplier effects, also referred to as total effects, encompass direct effects, indirect effects, and induced effects which result from a change in program expenditure or exogenous demand (Miller & Blair, 2009). Direct effects measure the immediate increase in industry output to meet the increase in demand from a project or policy. For example, if demand for automobiles increased by $5 million in one year, the direct effect would be the dollar amount of manufactured parts required to satisfy that demand, exactly $5 million. Indirect effects measure the impact on the forward and backward supply chain linkages due to the program spending. From the previous example, this would include new demand for all the sectors which produce the required inputs of the automobile sector. Thus, indirect effects illustrate the ripple effect in the economy. Induced effects are only relevant in a closed input-output model, a common modification of the basic framework which inhibits changes in exogenous household demand. Induced effects, therefore, measure the impact of increased household expenditure resulting from increased labour income earned from the businesses directly or indirectly affected by a program.

As can be observed from Figure 2 in the Appendix, the I-O table is comprised of three fundamental sub-tables. This includes the intermediate demand, primary inputs, and final (or exogenous) demand. The intermediate demand table illustrates the domestic inter-industrial transactions mentioned previously. The value-added table incorporates all primary inputs of production for each sector, such as labour, imports, capital, gross operating surplus, etc. The final demands sub-table is comprised of all exogenous demand sectors – these sectors purchase goods for final consumption and not as an input into production. This typically includes household and government expenditures, exports, etc. The columns in the table represent the cost structure of an industry. Every value in the column denotes the dollar value of inputs required from each industry, as well as the dollar value of primary inputs required from the value-added sector (labour, capital, etc.). This is often described as a "recipe" for every sector's output, as this ratio is assumed constant for every output produced in the sector. The rows indicate the value of output sold to each industry, including output sold to final demand sectors such as sales to households or exports. The sum of rows, therefore, is the total sales of that industry.

The mathematical representation of the production function in the input-output model can be illustrated as a function of intermediate inputs z_{1j}, value-added inputs v_j, and imports m_j.

$$x_j = f(z_{1j}, z_{2j}, ..., z_{ij}, v_j, m_j)$$

The relationship between output and the flows of intermediate inputs for production of output is in fixed proportions. Output, x_j, is the total output of sector j, with z_{ij} denoting the dollar value of output which flows from sector i to sector

j in a given year. The ratio $a_{ij} = \frac{z_{ij}}{x_j}$, therefore, is the proportion of input i that is required to produce one dollar of output j. The a_{ij} are defined as the technical coefficients or the direct input coefficients, which replace intermediate inputs, z_{ij}, in the inter-industry matrix during analysis (Miller & Blair, 2009). The matrix which contains these coefficients is fittingly named the technical coefficients matrix, or the direct requirements matrix. Since production is assumed to occur using inputs in fixed proportions, these coefficients are also assumed to be unchanging, which consequently, also holds the state of technology constant.

The common specification for the inter-industrial relationships in input-output models is the Leontief production function,

$$x_j = min\{\frac{z_{1j}}{a_{1j}}, \frac{z_{2j}}{a_{2j}}, ..., \frac{z_{ij}}{a_{ij}}\} \tag{1}$$

This suggests that if all z_{ij} inputs are doubled except for z_{1j}, which increased 50%, the total output in sector j would only increase by 50% (Miller & Blair, 2009). The implicit complementarity of inputs in Leontief production functions restrict any substitutability between industrial inputs, including the substitutability between capital and labour.

4.2.1 Assumptions

The core criticisms of input-output and SAM models lie with the strict assumptions by which the model is founded upon. Some of these assumptions have already been referenced, but include homogeneity, fixed technical coefficients, no substitution, constant returns to scale, no constraints on resources, and fixed prices (Miller & Blair, 2009; Raa, 2005; Liskova, 2015; PwC, 2012).

Homogeneity

The assumption of homogeneity implies all goods produced within a sector are identical, or that on average a good has a particular input and output structure. This stems from the fact that the structure of the input-output table implies each sector produces one output on average. This leads to another underlying feature of the model in which each firm within a sector is assumed to have, on average, a particular input structure. This is often referred to as a "recipe," in that the column of inputs reflect a specific recipe for a sector's output (Miller & Blair, 2009; Raa, 2005). The degree of homogeneity can be adjusted by disaggregating the number of sectors included in the model, based on available data. For example, instead of a sector for agriculture, the industry can be further broken down into crop farming, livestock farming, etc.

Fixed technical coefficients and no substitution

The fixed technological coefficients in the transaction table implicitly suggests that there is one way, on average, to produce a good, and thus does not allow for substitution among inputs or outputs in the model. Of particular concern in the SME context is that the full impact of lending programs aimed at stimulating capital investment are not incorporated in the model since labour-capital substitution–essential with technological advancement–is ignored. Hence, technological change cannot be integrated into models of this nature, limiting its applicability to analyze lending programs over time.

Fixed prices

As I-O tables illustrate the structure of an economy at a particular time, prices from that time are fixed, thus designating one price per output. This framework implies there are no price effects that occur due to an increase or decrease in demand. Leontief price models are an alternative way to view this relationship, whereby technical coefficients indicate input prices (as opposed to the dollar value of quantities). Implying an increase in input price would lead to a price increase in output (Miller & Blair, 2009). Some instances in which price models have been utilized include examining price effects of technological change (Duchin & Lange, 1995) and water consumption (Dietzenbacher & Velázquez, 2007).

Constant returns to scale

The assumption of constant returns to scale implies that doubling the production of all inputs will exactly double output. Furthermore, the specification of the Leontief production function requires all inputs to increase in order to increase output as they are assumed to be produced in fixed proportions (Miller & Blair, 2009). This would preclude a firms' ability to utilize economies of scale and wholesale benefits, resulting in serious implications for measuring the growth of SMEs due to financing. This is an obstacle for impact assessment as the model cannot capture economies of scale, particularly relevant when analyzing the effect of small and medium enterprises accessing capital.

No capacity constraints

Lastly, input-output models are demand-driven, suggesting the only source of change in the model occurs from changes in demand. Therefore, firms are assumed to have no capacity constraints and are able to meet any increase in demand (Miller & Blair, 2009). In response to the demand-driven nature of the Leontief model, Ghosh (1958) presented a supply-driven input-output model. This is relevant in particular industries such as the Alaskan fishing industry, by which changes in demand are not always clear, but the reduction of fish stocks impact the economy through their value chain linkages (Seung & Waters, 2009). However, it is argued that the Ghosh model is only appropriate when interpreting it in the same manner as the Leontief price model, in that the price of inputs, not the quantities of inputs, may cause changes in output (Seung & Waters, 2009). In the context of labour, capacity constraints are likely not of great concern for many firms in developing countries as unskilled labour is typically in excess supply.

4.2.2 General Limitations

The limitations of input-output models surround its fundamental assumptions, principally those surrounding the fixed technical coefficients and no substitution. Other important limitations to note when using these models, which may severely impact reliability of results, include the extensive resource and time requirements to compile the data necessary to construct an input-output table. In particular, the availability of data, depth of data, and the frequency in which tables are constructed limit their applicability for impact assessment in developing economies. For example, from a specific reference year, it may take up to 2-3 years to compile the data for an input-output table (McLennan, 1995). Analysis is further complicated if the only table available for a target country or region is very old and significant technological change has occurred in the industries of interest. This would imply that the composition of inputs necessary to produce output may have drastically changed. There are several methods to update existing tables using survey and non-survey approaches, but is beyond the scope of this paper (Miller & Blair, 2009; Oosterhaven, 2003).

Furthermore, employment impacts, in particular, are often overestimated. Accordingly, they should be treated as an upper bound, taking into consideration that forecasts can potentially end up far off a projected figure (Hughes, 2003). Therefore, measuring job creation using the calculated employment multipliers of a project can be misleading. This is because employment increases have been proven to change less than one-for-one with output (Grady & Muller, 1988). In fact, Grady and Muller (1988) argue using input-output analysis for impact assessment of a project is misguided. They contend that multipliers consistently overestimate impacts and the assumptions intrinsic in I-O models are highly unrealistic. The central argument posed by Grady and Muller (1988) is that project evaluations ignore feedback effects that occur which reduce the impact of the multiplier. In addition, impacts estimated with I-O models are often confused with benefits of the program, and the economic activity calculated during project evaluation is frequently falsely attributed to the economic impact that is due to the program (Grady & Muller, 1988). Lastly, the attribution of a program is particularly difficult to ascertain with these models as there is no objectively appropriate counterfactual scenario against which to measure the results.

4.3 Social Accounting Matrix (SAM)

A social accounting matrix (SAM) is a comprehensive and disaggregated framework derived from input-output tables and the SNA to describe the circular flow of income and expenditure (Wijerathna et al., 2013). The key distinction of a SAM is that instead of emphasizing the flows of expenditure between industries, a SAM details the flows of income between production, factors of production (such as labour), and households. The matrix is constructed as an extension of the basic input-output table, it can thoroughly analyze the socio-economic effects of a program or policy, such as the impact on social institutions, distribution of income, and effects on labour force demographics (Miller & Blair, 2009). By viewing the economy through the flows of income and disaggregating sectors of interest, (such as breaking down employment into skilled and unskilled labour, for example) a clearer view of the distributional effects of a program can be observed.

In recent decades, SAMs have been more commonly employed than traditional I-O tables when studying the impacts of international development projects or government policies, where the social and distributional implications are of importance. However, SAMs have had a diverse application in the academic literature including analyzing the impacts of tourism in Mozambique (Jones, 2010), fisheries in Alaska (Seung & Waters, 2009), financial institutions in the Brazilian Amazon (Carvalho, 2015), energy consumption in Indonesia (Hartono & Resosudarmo, 2007), income inequality in India (Pieters, 2010), as well as multiple studies on construction sector projects (Acquaye & Duffy, 2010; Huang & Bohne, 2012; Kofoworola & Gheewala, 2008; Selin, 2011). SAMs are also often used by integrating environmental accounts to assess environmental impacts of programs (Franco Solis, 2016, Miller & Blair, 2009). The literature indicates that research has been successful at incorporating economic data and social statistics to distinguish the way in which social groups interact with the economy as a system (Round, 2003).

The key outputs estimated by SAMs are generally output, income, and employment, in varying detail to the extent the data entered in the model permits. Compiling a SAM requires data from input-output tables along with household surveys with labour specifications as well as national income statistics and may take several months to compile given a moderately up-to-date input-output table (World Bank, 2008).

SAMs suffer from the same shortcomings as I-O tables in impact assessment, in that the tables are a static representation of the economy, and thus, cannot trace changes in flows over time. The lack of dynamic modeling capabilities is the basis of extending this model to general equilibrium frameworks. However, input-output and SAM models remain popular as they are accessible and operational for relatively low cost.

4.4 Computable General Equilibrium (CGE)

A more comprehensive model than the basic input-output and SAM frameworks are Computable General Equilibrium (CGE) models. CGE models are typically used to analyze economy-wide or regional impacts of policies (Wing, 2004). The foundation is similar to SAM or input-output tables but allows for price adjustments and optimization in the economy – and can in some instances render more precise results. Many of the stringent assumptions inherent in input-output and SAM models can be relaxed in CGE analyses as it allows for optimization of non-linear production and consumer preference equations. Therefore, enabling substitution among goods and primary inputs that would result from price changes in the real world (Hughes, 2003).

Impact assessments have largely gravitated toward more sophisticated CGE models for these reasons. However, they are most commonly employed to assess the macroeconomic and distributional impacts of fiscal policy, trade policy, development planning, and increasingly, environmental policy (Bandara, 1991; Mitra-Kahn, 2008; Weerahewa et al., 2006). Regional CGE models have also become more widely used, allowing for regional analysis to inform policy development. However, as with the national level CGE, they are limited by extensive data and time requirements, in addition to the more complex nature of constructing the model in relation to I-O models (World Bank, 2003). These issues can be significantly mitigated if a SAM or an existing CGE model built for similar purposes are available (World Bank, 2003). This, therefore, limits their application in regional policy analysis for developing economies, where policy makers and researchers are electing for input-output and SAM models instead (Partridge & Rickman, 2010).

At the same time, these arguments suggest that there may be substantial value in developing a CGE model of relaxing credit constraints among SMEs in a developing economy. Such a model once developed could calibrate data for different developing economies and loan portfolios (subject to data availability) in order to estimate the impact of alternative SME financing programs in a variety of countries. The assumptions inherently made when employing CGE models represent the other end of the spectrum to I-O models. CGE models also require assumptions which can also arguably be unrealistic. These types of models enable wages and prices to automatically adjust. However, certain markets, particularly in developing economies, may experience frictions which do not allow prices or wages to adjust. Similarly, strong assumptions need to be made when constructing CGE models, just like I-O models. Assumptions on production, consumption, and price elasticities, for example, impose a specific structure on the model that will determine the results obtained. Hence, there is no flawless or agreed upon model which best evaluates the impact of SME financing projects.

5 Two-Sector Theoretical I-O Model

5.1 Direct Effects

To illustrate the input-output model's use in SME financing initiatives, I will construct a two-sector theoretical framework. External financing programs act as a supply shock to firms, injecting investment to expand production. This suggests that adjustments to the Leontief production function will be necessary, in part to minimize the strong complementarity assumptions and in part to account for the supply-driven nature of capital financing. As discussed in the previous section, traditional I-O models are demand-driven models which trace the expenditures in industries due to an increase in exogenous demand. In this case, I argue that production from sector i is a function of capital investment as well as the demand of the other sector's good in the economy, the input of that good in sector i's production, and all other value-added inputs and imports. Extracting the investment component from the value-added sector creates another channel through which production can be directly influenced. The increase in output through the production function represents the direct effects of the capital investment.

This function can be defined in many alternative ways, for our purposes we will refer to the classic Cobb-Douglas production function in the following section's example.

$$
\begin{aligned}
&Y_i = f(k_i, z_{1i}, z_{2i}, v_j, m_i) \qquad\qquad i = 1, 2 \\
&Y_i = f(k_i, \psi_i) \qquad\qquad where \quad \psi_i = f(z_{1i}, z_{2i}, v_i, m_i)
\end{aligned}
\tag{2}
$$

According to the production specification, a capital investment of \$1000 should not treated as equivalent to an increase of \$1000 in exogenous demand. Traditionally in I-O models an increase in demand of \$1000 directly stimulates at an increase of \$1000 in production in that sector. In this model, an increase of \$1000 in capital investment in sector i (k_i) results in more than a \$1000 increase in production in sector i (Y_i) over the lifetime of the capital. This model assumes diminishing marginal returns and some rate of capital depreciation. Allowing a channel through which capital investment can directly increase a firms' production illustrates the direct effects of the financing program. The explicit addition of capital in the production function results in a more realistic estimate of the impact of capital on production throughout the economy. To estimate the change in production resulting from an investment in capital, the marginal product of capital (MPK) accumulated over a period of time must be approximated. In perfectly competitive, classical models, a firms' marginal product of capital is equal to the real interest rate (r) plus depreciation (d) (Caselli & Feyrer, 2007). This reflects the cost of capital. In the steady-state, optimal investment levels still must be sufficient to cover the rate of depreciation. In an economy with no credit frictions, it is assumed firms in a sector i borrow up to the point that their marginal product of capital is equal to the real market rate, thus $MPK_i = r + d$. However, if in the case borrowing firms are capital constrained, their marginal product of capital would be higher than in the steady state. Therefore,

$$MPK_i > r + d \tag{3}$$

Thus the return of a dollar invested in industry i in the steady state can be calculated by,

$$Return = \frac{MPK_i}{r + d} \tag{4}$$

This is a proxy for the present discounted value of the MPK over the lifetime of capital for one dollar invested, since investment generates additional production over its lifetime until the capital fully depreciates. As well, given the firms knowledge of the nominal interest rate charged for their financing, the opportunity cost of capital may be approximated with that value.

In reality, determining the MPK is difficult, particularly for small firms in developing countries. There is sufficient literature estimating the returns to capital for small enterprises in low income economies (de Mel, McKenzie, & Woodruff, 2008; Banerjee & Duflo, 2005; Udry & Anagol, 2006; Kremer, Lee & Robinson, 2007). For instance, McKenzie & Woodruff (2006) found Mexican firms with a capital stock of over US$500 realized returns of 40-60%, whereas those with capital stock under US$900 were estimated between 250%-360%. A study conducted by Udry and Anagol (2006) found small Ghanaian agricultural producers experienced returns of 50%-250% by farming traditional or non-traditional crops, respectively. Kremer, Lee and Robinson (2007) found returns of rural retail shops in Kenya to reach at least 113% per year. Lastly, Banerjee and Duflo (2012) estimated the marginal product of capital for a sample of firms in India at 89%. However, for nation-wide marginal product of capital, Banerjee and Duflo (2005) estimate the upper bound of the economy wide MPK at 22%. This not only indicates that some small-scale firms in developing countries are severely capital constrained and can produce substantially higher returns than average, it also gives realistic ranges of what the suspected MPK of a capital constrained firms for a particular country and sector would be.

5.2 Indirect Effects

To examine the indirect effects of a financing program, the traditional I-O mechanism for a two-sector economy is employed. Each sector's increased production resulting from the newly invested capital is entered into the I-O model as increased exogenous demand. Accordingly,

$$x_1 = z_{11} + z_{12} + f_1$$

$$x_2 = z_{21} + z_{22} + f_2$$

This equation describes the total output of sector i through its sale as inputs in other industries and as final consumption goods in foreign and domestic markets. Final demand f_i for $i = 1, 2$ encompasses all final demand sectors, including exogenous investment demanded. The increase in production Y_i resulting from the direct effects of capital investment is entered into the equation to calculate the indirect effects. Therefore, $\Delta Y_i = f_i$ Keeping in mind that $z_{11} = a_{11}x_1$, it follows,

$$x_1 = a_{11}x_1 + a_{12}x_2 + f_1$$

Rearranging,

$$x_1 - a_{11}x_1 - a_{12}x_2 = f_1$$

$$(1 - a_{11})x_1 - a_{12}x_2 = f_1$$

Repeating this rearrangement for sector 2, two equations below result with the final demand categories isolated on the right-hand side.

$$(1 - a_{11})x_1 - a_{12}x_2 = f_1$$

$$-a_{21}x_1 + (1 - a_{22})x_2 = f_2$$

This can be represented in matrix form,

$$\begin{bmatrix} (1 - a_{11}) & -a_{12} \\ -a_{21} & (1 - a_{22}) \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} f_1 \\ f_2 \end{bmatrix} \tag{5}$$

Therefore,

$$(I - A)x = f$$

Where A is the technical coefficient matrix, and I is the identity matrix. In order to solve for the indirect increase in industrial production x, the inverse $(I - A)^{-1}$ needs to be calculated and post-multiplied. This term is often referred to as the Leontief inverse, denoted L.

$$x = (I - A)^{-1}f = Lf \tag{6}$$

Solving for the Leontief inverse matrix and multiplying it by the increase in final demand yields the indirect increase in production from the financing program. The existence and further details of the computation of the Leontief inverse matrix can be found in the Appendix.

6 Application of Input-Output Analysis in Sri Lanka

The following is the practical application of the modified, open input-output model described for a SME financing program in Sri Lanka. This analysis will only include the generated direct and indirect effects of the program as I will not be closing the model to compute induced effects. This is due to the imprecision of such projections, which is discussed in the general limitations.

6.1 Data

Utilizing program data on a small SME financing initiative in Sri Lanka, we can obtain estimates of the direct and indirect effects of capital investment by industry. The program data available consists of 107 loans with an average loan size of approximately $4000. The data details the firm's nature of business, however, the descriptions did not correspond exactly to the industries specified in the Sri Lanka I-O table. Therefore, the data was categorized to fit the sectors specified in the table. The financing program provided loans for 18 identifiable industries, the largest concentration in fisheries and agricultural activities, such as coconut processing and livestock.

The only known I-O table for Sri Lanka contains 48 sectors and was compiled for the year 2000, by Amarasinghe & Bandara (2005). Databases that produce input-output tables such as GTAP or the OECD did not have more recently updated input-output tables or SAMs for Sri Lanka. Generally, input-output tables for developing countries are produced much less frequently and due to difficulties in data collection, the tables are typically less detailed and reliable than those for developed countries. Therefore, there are limitations to the reliability of the results obtained. However, the majority of industries in the table and those who received financing are agricultural and fishery sectors, thus it likely these industries have experienced less drastic changes over the years compared to other industries such as Information and Communication Technology (ICT). No value-added input-output tables were available for Sri Lanka from Amarasinghe & Bandara (2005), hence output tables were used for analysis. Output tables detail the dollar value of gross output sold and purchased by each sector. Gross output tables do suffer from double counting when summing total sectoral production., so care must be taken when interpreting the impacts. The analysis could be improved significantly if value-added data at each stage of production were available. This allows better understanding of the economic impact and the contribution to the growth of an economy. Therefore, in this study no value-added multipliers could be computed and the results are reflective of the output multipliers.

6.2 Methodology

6.2.1 Direct Effects

I follow the methodology outlined in the two-sector theoretical model from Section 5. In this application, I use the Cobb-Douglas specification for the production function. From equation 2 the function was,

$$Y_j = f(k_i, \psi_i)$$

Now with the Cobb-Douglas specification, I define the MPK as,

$$Y_i = k_i^{\alpha}, \psi_i^{1-\alpha}$$

$$MPK_i = \frac{\partial Y_i}{\partial k_i}$$

$$MPK_i = \frac{\partial Y_i}{\partial k_i} = \alpha(\frac{\psi_i}{k_i})^{1-\alpha} = \alpha\frac{Y_i}{k_i}$$

As was defined for capital constrained firms in sector i in equation 3,

$$MPK_i > r + d$$

Obtaining an appropriate estimate of the returns to capital and depreciation is necessary to evaluate the potential impacts of SME financing programs. Research conducted by Schundeln (2007) estimates the depreciation rate for SMEs in Indonesia at 8%-14%. Aligning with this study, the figure of 2.5% per quarter was applied by de Mel, McKenzie & Woodruff (2008) for their study on microenterprises in Sri Lanka. Accordingly, I also select a middle range figure of 10% for this illustration. The interest rate obtained from program data that was charged on the loans in this program is approximately 24%. It has been argued that in developing economies with weak financial systems, the return on financial instruments is a poor proxy for the cost of capital experienced by firms (Caselli & Feyrer 2007). However, it does reflect the opportunity cost of financing, which I denote r. The MPK must be greater than the opportunity cost of financing, that is $MPK > r$ as firms are assumed to be constrained and will thus earn returns larger than the cost of financing capital.

To obtain an estimate for the marginal product of capital for capital constrained firms in this lending program, I once again refer to the literature. Caselli & Feyrer (2007) produce cross-country estimates of the marginal product of capital for several high and low-income countries, including Sri Lanka. They compute aggregate MPK in three approaches, beginning with a naïve approach and modifying the regression to reflect a more exact input structure. The naïve estimate is derived from a single sector model, with only inputs of labour and capital included. Caselli & Feyrer (2007) generated the MPK at 19% for the naïve approach, the highest estimate they report. These estimates are the average returns for all firms, not ones which are credit constrained. More likely an appropriate estimate is from de Mel, McKenzie, Woodruff (2008), where they calculate average monthly real return to capital for microenterprises in Sri Lanka at 4.6%-5.3%, or 55%-63% annually. Since constrained firms should produce much higher returns to capital, I estimate the returns to capital for SMEs to correspond to that found in de Mel, McKenzie & Woodruff (2008). Therefore, I input a marginal product of capital figure of 50%. Due to the lack of detailed data on MPK by industry, I use one figure for the average return of all firms that receive funding. This rate is far above the Sri Lankan economy-wide "naïve" average since firms are credit constrained, however, is slightly below the microenterprise estimates. Since microenterprises have substantially lower levels of capital stock than SMEs, this may result in marginally higher returns to capital. Nevertheless, microenterprises are not able to provide many of the benefits and knock-on effects that SMEs are able to generate due to their scale and dynamism.

Therefore, the total direct effects for 48 industries in the steady state are computed as,

$$Direct \quad effects = \sum_{i=1}^{48} \frac{MPK_i * I_i}{r + d} \tag{7}$$

Where MPK=0.5, the average of all industries. I reflects the vector of investment in industry i (to obtain the change in production due to investment), the depreciation rate $d = 0.1$, and $r = 0.24$ represents the opportunity cost of capital. To estimate the total effects, the direct effects computed for each sector are entered into a new final demand vector.

6.2.2 Indirect Effects

After generating the direct effects, I compute the Leontief inverse matrix from the technical coefficients table provided in the input-output data. The final demand vector obtained from the direct effects is multiplied by the inverse matrix. The columns of all sectors are summed, revealing the estimated direct and indirect effects of the financing program. To extract the indirect effects separately, the direct effects can be subtracted from the total effects. The results are the effects of the SME financing program on total output in each sector.

6.3 Results and Analysis

The direct and indirect effects of the program in all sectors of the Sri Lankan economy based on the input-output table can be observed in Table 1. These results are subject to double counting as was discussed previously. It is still valuable to analyze these results to get a sense of how investing in particular industries impact the economy and observe the trickle effect throughout other industries. From Table 1 it is evident that the direct effects are the largest effects resulting from the program. However, the indirect effects also constitute a significant portion of the total effects, approximately 30%. It is interesting to note that due to the strong forward and backward supply linkages in some industries, sectors that received little or no loans produced greater indirect effects than industries with very large loans. This can be observed in industries such as Post and Communication, Hotels and Restaurants, Mineral Products, and Textiles. For example, Hotels and Restaurants generated \$14,706 as the direct effect of financing but generated \$28,455 in indirect effects along the supply chain. Therefore, it is apparent that the industries that received the largest direct funding are not necessarily the industries that generate the greatest indirect effects. An important feature to keep in mind when analyzing these impacts is that the program data is quite limited, even as these amounts represent much larger values in developing economies, the program data is comprised of only 107 loans. Therefore larger impacts would be present with more extensive program data.

Table 1: Impact of SME Financing in Sri Lanka

Industries	**Direct Effects**	**Indirect Effects**	**Total Effects**
Tea Growing-High Elevation	0	625	625
Tea Growing-Medium Elevation	0	431	431
Tea Growing-Low, Elevation	0	1,807	1,807
Rubber Growing	0	2,094	2,094
Coconut and Toddy	7,843	3,349	11,192
Paddy	0	1,751	1,751
Vegetables	31,373	3,032	34,404
Fruits	0	2,945	2,945
Highland Crops	0	1,932	1,932
Potatoes	0	400	400
Minor Export Crops	0	3,109	3,109
Tobacco	0	2,134	2,134
Betel and Arecanuts	7,353	2,695	10,048
Miscellaneous Agriculture Products	0	8,592	8,592
Livestock	115,686	3,124	118,810
Plantation Development	38,235	7,634	45,869
Firewood	0	2,163	2,163
Forestry	0	2,430	2,430
Fisheries	153,431	9,137	162,568
Mining and Quarrying	4,902	1,378	6,280
Tea Processing	4,902	2,046	6,948
Rubber Processing	0	4,411	4,411
Coconut Processing	189,706	6,524	196,230
Rice Milling	55,882	2,134	58,016
Flour Milling	0	5,525	5,525
Food, Beverages, and Other	4,902	7,324	12,226
Textiles, Footwear, and Leather Products	0	8,925	8,925
Garment Industry	26,961	5,534	32,495
Wood and Wood Products	0	1,798	1,798
Paper and Paper Products	4,902	3,438	8,340
Chemicals and Fertilizer	0	4,717	4,717
Petroleum Industry	0	10,227	10,227
Plastic and Rubber Products	7,353	3,098	10,451
Non-Metallic & Other Mineral Products	0	10,802	10,802
Basic Metal Products	0	4,564	4,564
Fabricated Metal Products	3,431	7,061	10,492
Other Manufacturing	20,098	3,057	23,155
Electricity, Gas, and Water	0	873	873
Construction	0	9,264	9,264
Wholesale and Retail Trade	75,980	6,394	82,374
Hotels and Restaurants	14,706	28,455	43,161
Tourist Shops and Travel Agents	0	9,589	9,589
Transport	0	9,890	9,890
Post and Communication	0	21,078	21,078
Banking, Insurance, and Real Estate	0	7,104	7,104
Ownership of Dwellings	0	2,013	2,013
Public Administration and Defense	0	4,627	4,627
Other Personal Services	0	4,735	4,735
Total:	**767,647**	**255,968**	**1,023,615**

In US$

6.3.1 Limitations

This impact analysis could be significantly improved given more updated value-added data. In the context of SME lending programs, this model is imperfect in many regards. Incorporating data on the MPK of different sectors would improve the reliability of the results. The analysis also does not explicitly consider or measure the profitability of a business receiving a loan (Hughes, 2003). Therefore, if a business is not already profitable, financing their capital investments will not result in production growth and the anticipated knock-on effects. An analysis of profitability may be a complementary component of a study, but it is critical to ensure businesses are profitable in order to assume growth will result from financing (Hughes, 2003). Furthermore, diverse businesses are treated equivalently with respect to achieving average levels of growth from their investment. Consequently, the marginal impact of a firms' investment in capital cannot be captured. In addition, the impact of a program on market prices is also a critical concern, particularly since investment in fixed capital is the main driver of funding. Small and medium enterprises are targeted due to their capability to scale up their production processes and utilize economies of scale. This enhanced efficiency frequently lowers costs. When taken in aggregate, these loans may lead to large price effects that cannot be modeled within the basic framework (Grady & Muller, 1988; Hughes, 2003). The aggregate economic impacts from input-output models may benefit from complementary analysis such as case study sampling or experimental approaches to examine the marginal impact of funding and determine the causal relation of business growth from financing initiatives.

6.3.2 Targeting Sectors

The most salient results from Table 1 suggest that targeting financing to sectors which have the strongest supply chain linkages will produce the greatest economic impact in the economy. This analysis can occur prior to full computation of impacts by assessing the values in the Leontief inverse matrix. The industries with the highest values in the Leontief matrix indicate they have the strongest supply chain linkages to other sectors in the economy and that other sectors are highly dependent on the production and inputs of this sector. Examining the structure of an economy to observe the supply chain linkages is a useful exercise when planning a financing project ex-ante. The precise estimates of the model may be less important in some cases than understanding the potential impacts on industrial growth and community development.

Additionally, targeting industries which require a larger amount of external financing are able to grow production more rapidly with the help of financing programs. IResearch has showed that the dependence of external financing alternates vastly across industries (Rajan & Zigales, 1998). Industries that demand the most external financing include drugs and pharmaceuticals, plastic products, and office and computing. This indicates that targeting financing to particular industries that are known to be highly dependent on external financing can yield higher returns to capital investment and thus better facilitate economic growth within a country. Considering the financial dependence of industries when lending aids in properly allocating funds in countries rife with financial market imperfections. The lack of financial development in low-income economies will affect some industries more than others. This is one approach to help direct capital to its most productive use.

7 Conclusion

I present here an overview of the potential impacts of financing small and medium enterprises in developing economies in order to gain insight into the constraints firms face. I follow this discussion with an ex-ante impact analysis of a financing initiative in Sri Lanka to explore the application of EIA in the development financing sector. Admittedly, the results and methodology of the input-output analysis are not the major contribution of this paper. More important than the application of the model is the path set forward here to incorporate EIA into the design and evaluation of SME financing programs.

Initially, this paper shed light on some of the valuable micro-level considerations that should be made to maximize impact. I have reviewed the evidence that suggests small and young firms with low capital stocks are more than capable of generating very high marginal returns to capital. This indicates these are the firms that are most severely credit constrained and are in most dire need for external financing. Of these firms, I identified a particular set of credit constrained entrepreneurs that have the most potential for growth. Constrained gazelles (or SGBs) should be targeted due to their entrepreneurial ambition and their natural business acumen. Given access to credit, it is evident these types of firms will expand business operations and provide employment for other poor individuals.

I proceed with a discussion of EIA frameworks and construct a two-sector theoretical model. Subsequently, I employ this model using data from a small financing program in Sri Lanka. Going through this process illustrates the applicability and limitations of input-output models and some of the macro-level considerations that are crucial to maximize impact of financing programs. Given current aggregate national or regional economic data, the application of macro-level analysis for financing programs enables the targeting of finance toward sectors with the strongest supply chain linkages. This can be coupled with an industry analysis such that finance is also targeted towards industries which require the most start-up funding, or those that are more dependent on external finance. These macro-level considerations are crucial to maximize the impact of the program and consequently maximize economic growth. However, it is evident that further work is necessary to improve impact assessment methods in order to measure the aggregate and economy-wide impacts of financial inclusion programs. Current experimental methods are extremely useful in examining the casual relation between

SME financing programs and growth, but they are still not able to measure the full impact of a program. The missing indirect effects stemming from value chain impacts and community development can be analyzed through economic impact analysis models. I obtain those estimates for credit constrained firms with a modified input-output model in a theoretical framework and as a practical exercise in Sri Lanka. Although ex-ante evaluations are generally less precise, due to the imposed assumptions and predictions of behavior, they still generate critical insights into potential impact. It was shown in the results that the indirect impacts of a program can be quite substantial. Overall, the use of EIA promotes lending strategies that capitalize on existing structural links of an economy. In and of itself, input-output models may not be the ideal impact assessment tool for these particular programs, but they are nonetheless informative for design and feasibility studies. Further improvements and modifications of the model presented would be valuable for future research.

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Appendix

I Existence of Leontief Inverse

For a set of n linear equations, there may not be a unique solution. In order for there to be a unique solution, $(I - A)^{-1}$ must exist. Therefore, $(I - A)$ must be singular. Since the A matrix consists of strictly positive numbers, $(I - A)^{-1}$ exists and is nonnegative.

II Tables

Figure 2: Input-Output Table

Input-Output Table

		Intermediate demand			**Final demand**				**Output**
		Sector 1	…	Sector 34	Households	Investment	Gov't	Exports	
Intermediate demand	Sector 1	$z_{1,1}$	…	$z_{1,34}$	c_1	i_1	g_1	e_1	X_1
	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
	Sector 34	$z_{34,1}$	…	$z_{34,34}$	c_{34}	I_{34}	g_{34}	e_{34}	X_3
Primary inputs	Imports	$m_{35,1}$	…	$m_{35,34}$	m_C	m_I	m_G	m_E	M
	Labour	$l_{36,1}$	…	$l_{36,34}$	l_C	l_I	l_G	l_E	L
	Taxes	$t_{37,1}$	…	$t_{37,34}$	t_C	t_I	t_G	t_E	T
	Gross operating profit & capital	$v_{38,1}$	…	$v_{38,34}$	v_C	v_I	v_G	v_E	V
Output		X_1	…	X_3	C	I	G	E	X

Figure 3: SAM

Social Accounting Matrix

			Expenditures						
			Endogenous			**Exogenous**			**Total**
			Factors	HH	Commodities /activities	Gov't	Rest of world	Capital account	
Receipts/Income	**Endogenous**	Factors	0	0	T_{13}	X_{14}	X_{15}	X_{16}	Y_1
		Households	T_{21}	T_{22}	0	X_{24}	X_{25}	X_{26}	Y_2
		Commodities/ activities	0	T_{32}	T_{33}	X_{34}	X_{35}	X_{36}	Y_3
	Exogenous	Government	L_{41}	L_{42}	L_{43}	t_{44}	t_{45}	t_{46}	Y_4
		Rest of world	L_{51}	L_{52}	L_{53}	t_{54}	t_{55}	t_{56}	Y_5
		Capital account	L_{61}	L_{62}	L_{63}	t_{64}	t_{65}	t_{66}	Y_6
	Total		Y_1	Y_2	Y_3	Y_4	Y_5	Y_6	