Microfinance Plus – Impact of the 'plus' on customers' income in rural India

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Abstract
Microfinance, and its impact, have received considerable attention over the last few decades. Several studies confirm a positive impact on the customers. Nevertheless, these studies only consider the effect of a micro-loan whilst microfinance nowadays incorporates much more than just credit. This study attempts to fill this gap by estimating the effect of additional services offered. These are non-financial services such as training and the establishment of market linkages designed specifically to match the purpose of the loan.
Taking these services as randomly given when estimating program effect, is shown to result in significant overestimation. This paper applies an instrumental variable approach to account for the endogeneity of participation in these additional services. Doing so results in a sign change of the estimated effect, suggesting that customers that chose to take extra services have a negative effect on their income. This effect remains negative but becomes slightly insignificant when accounting for the existence of market linkages.

1. Introduction

"Credit is important for development. It capitalizes farmers and entrepreneurs to undertake new investments or adopt new technologies." (Khandker & Faruquee, 2003) Nevertheless, a huge part of the population (perhaps the part most in need) has no access to formal financial services. These are the poor – often also referred to as the 'unbankable': 'unbankable' in the sense that they are deemed to be too risky and too expensive to serve, having no collateral to offer, demanding very small loans, and often living in difficult to access areas.

Such unmet demand in combination with new delivering technologies led to what is sometimes referred to as the 'microfinance[1] revolution'[2]. Almost forty years ago, the foundation stone for the now observable microfinance hype was laid. It was in the 1970s when experimental programs in Bangladesh, Brazil and a few other countries extended tiny loans to the poor to invest in micro-businesses. The best known of these programs is undoubtedly the Grameen (Village) Bank in Bangladesh, initiated by Professor Muhammed Yunus and today holder of the Nobel Peace Prize 2006. Grameen's story is often cited as the spark of microfinance, being the first one to make small loans to poor local villagers who lacked access to traditional formal financial institutions. The Bank's track record then stimulated the establishment of numerous other microfinance institutions, major ones being BRAC ASA, and Proshika in Bangladesh.

Unfortunately, it is estimated that still only 16 per cent of those that could benefit - only one sixth of the three billion poor people of working age - have access to such formal financial services (CGAP, 2005).[3]

Studies show that it is typically the very poor who are being left out of microfinance (Coleman, 1999, 2000). Such observations lead practitioners and academics alike to the realization that not only microcredit but also microfinance alone is not enough; that microfinance is not a replacement for jobs that are not there, education and skills that do not exist, or markets that are inaccessible. For example Oxfam, a UK-based development, relief and campaigning organization, notes that "Poverty alleviation is rarely an issue of simply improving access to financial resources. Poverty is more than a lack of material resources - it also concerns the denial of basic rights, control, access and power."

A new approach to microfinance developed. It carries names such as 'holistic', 'integrated' or 'credit plus'. Typically, microfinance is combined with complementary services with the aim of having an impact on the lives and livelihoods[4] of poor men, women and their families.

Such holistic approaches are complex but more and more examples can be named. There exist programs that address problems of degraded watersheds, hence taking a spatial approach, programs that take a segmental approach by addressing problems of the landless or the disabled and programs that take a sectoral approach, addressing aspects of work in various sectors of economic activity.[5] Common to all approaches is that complimentary services, such as informal training and business and financial management, evolve around the client and aim

[1] The Asian Development Bank defined Microfinance as "the provision of a broad range of financial services such as deposits, loans, payment services, money transfers, and insurance to poor and low-income households and, their microenterprises. Microfinance services are provided by three types of sources: (1) formal institutions, such as rural banks and cooperatives; (2) semiformal institutions, such as nongovernment organizations; and (3) informal sources such as money lenders and shopkeepers. Institutional microfinance is defined to include microfinance services provided by both formal and semiformal institutions. Microfinance institutions are defined as institutions whose major business is the provision of microfinance services."

[2] Robinson (2001) believes the term to have been coined by María Otero and Elisabeth Rhyne in 1993.

[3] The estimate of how many poor people are not being reached differs by sources and country considered. Muhammed Yunus states at the International Seminar on Attacking Poverty with Microcredit in Dhaka, Bangladesh, January, 2003, that "In most countries it [microfinance] has not even reached 10% of the poor families within that country."

[4] *Livelihood* is typically defined as "a set of economic activities, involving self-employment and/or wage-employment by using one's endowments (human and material) to generate adequate resources (cash and non-cash) for meeting the requirements of self and the household, usually carried out repeatedly and as such become a way of life".

[5] http://www.ruralfinance.org. Accessed 30th of October 2007.

to develop practical and relevant skills and knowledge. Some institutions, like the one under consideration in this study, go a step further and incorporate aspects such as the establishment of market linkages.
This study concentrates on an intervention that takes the sectoral approach, and estimates the effect of services that address the specific problems of clients involved in the dairy sector.

A few studies exist that address the impact of microfinance programs on their clients. The greatest problem to overcome is the so-called endogeneity bias. This bias stems from the fact that whilst a measured effect might result from the program, it could also reflect unobservable characteristics of a borrower or issues such as program placement. A typical example is that income of a borrower might be higher *not* due to having been able to engage in an extra income generating activity, but because he had higher motivation and entrepreneurial spirit to begin with. McKernan (2002) finds that such (self-selection) bias can result in an overestimation of program benefit of up to 200 per cent. One of the perhaps most often cited impact assessment that accounts for such selection bias is that of the Grameen Bank. The authors, Pitt and Khandker (1998), investigate the impact of a microfinance program on poor households, focussing on female participants. Next to a quasi-experimental survey design, their results rely on an instrumental variable approach to account for self-selection. One of their findings is that both men and women benefit from the program but women do to a greater extend. Other interesting studies with similar results include Coleman (1999, 2002), Binswanger and Khandker (1995) and Khandker & Feruqee (2003).

These studies, almost exclusively, address only the effect of loans from a microfinance institution. If other services are being offered, then the effect of these is engulfed in the overall program impact. The only known exception is McKernan (2002), who looks at the overall program impact and also the non-credit effects of the programs by controlling for the level of productive capital. These non-credit aspects are mainly the general training of the customer, including issues such as vocational training, information in areas of health and civil responsibilities and rights. McKernan (2002) finds these to have a positive impact on productivity.
The contribution of this paper lies in adding to the existing literature on program impacts by explicitly concentrating on whether microfinance credit has a higher impact on the customers' productivity if non-financial support related to that activity is provided as well.[6]

Results suggest that these services have a negative effect on clients' income. In other words, customers who purchase non-financial services designed to support their loan-related income generating activity experience a lower income compared to customers that only avail credit. An instrumental variable approach is applied that takes the endogeneity of these extra services into account. Comparing to simple ordinary least square regression results, not accounting for endogeneity would underestimate this negative effect significantly.

The paper is organised as follow. The next section describes the program under consideration, followed by a description of the data used to estimate its impact on customers' income. Section four goes on to present results and the final section concludes.

[6] Since the sample only includes information on clients of the organization, the analysis is limited to looking at the effect of additional services on income given that observations have a loan with BASIX. Nothing can be said about the program impact in comparison to not being involved with the organization at all.

2. The program under consideration

The program under consideration is an intervention in the Indian dairy sub-sector offered by BASIX India.

Milk production plays a pivotal role in the livelihoods of the rural poor, particularly women, in India. It is one of the few possible means of supporting themselves and their families. Especially in areas that are dominated by agricultural activities characterized by high seasonal dependency, milk production offers a way of ensuring an additional income stream. In fact, underprivileged families constitute about 70 to 80 per cent of total livestock production in India (Kurup 2004). But it is not only the milk production that offers return to the families; "all body parts are used including horns and hair. Buffalo forms a part of the property, possession and profession of rural farmers. Not only that, they are an easily 'convertible currency' and a reliable 'living bank' to serve the immediate needs of the rural masses in several communities." (Nanda & Nakao, 2003)
Nevertheless, a study undertaken in Pondicherry, India, reveals, for example, that "the poor landless livestock keepers do not possess knowledge on many aspects of livestock rearing especially on animal health. […] Lack of information on animal health practices (ignorance, one of the prime constraints of development) ultimately results in production losses through morbidity and sometimes mortality - all resulting in economic losses to the livestock owners."[7]

The intervention designed and offered by BASIX India[8] therefore concentrates not only on distributing loans with the purpose of livestock investment, but also on additional financial (insurance) and non-financial services that address issues such as knowledge dissemination, risk mitigation and productivity enhancement. The involvement in the dairy sub-sector includes:

Financial services
- the provision of credit for the purchase of buffaloes/cows;
- the provision of insurance for animals, collaborating with insurance companies.

Non-financial services
- training and awareness camps
- monthly medical check-ups, vaccination,… for the animals;
- the identification of areas where collection efficiency can be improved;
- the purchase of electronic milk testing kits for quick fat testing;
- assisting milk-chilling-plants in the automation of accounting and payments.

The second set of services is the one whose effect is estimated in this study. These fall under what BASIX calls 'Agricultural and Business Development Services' and will henceforth be referred to as Ag/BDS-dairy services or just dairy services.

[7] Final Technical Report on "Dissemination of animal health knowledge for development of landless dairy cattle owners in the peri-urban regions of Pondicherry, India, DFID/RLD Animal Health Programme No (2002-2004).
[8] BASIX India is a new generation livelihood promotion institution in Hyderabad, India. It was established in 1996 and is one of the first institutions to follow the holistic approach, adopting it after an impact study conducted by Indian Market Research Bureau (IMRB). Assessing BASIX services revealed that about 52% of clients expressed a positive impact, 23% no change and approximately 25% reported decline in their income. Clients ascribed this decline to the presence of unmanaged risk. To address this, BASIX chose the strategy of offering programs that combine aspects of Livelihood Financial Services (Savings, short and long-term Credit,, Insurance - for lives and livelihoods, Fund transfers, Commodity Derivatives, Financial Orchestration – ranging from grants to equity for livelihoods), Institutional Development Services (Formation of producers' groups, federations, cooperatives, mutual benefits, etc., Capacity building, including entrepreneurship development.), and Agricultural/Business Development Services (Credit Productivity enhancement, Risk mitigation (non-insurance), Alternate Market Linkages – Input supply, output sales), the latter ones being the main interest of this study.

While BASIX offers these services in several regions in India, this paper will focus on the district of Anantapur[9].
This district was chosen for several reasons. For one, it is one of BASIX's oldest units, having been established in 2000. This results in BASIX having a certain presence in the state, which implies more customers and hence a bigger sample which facilitates econometric analysis. More importantly, BASIX started its operation in that district due to the opportunity to become involved in the dairy sub-sector and the potential it saw for livelihood promotion. Furthermore, Anantapur is one of the most backward provinces in the state of Andhra Pradesh, which for a great part results from it being the second most drought-affected district of India. This makes living conditions very hard; people are extremely vulnerable and poverty is highly prevalent. Aspects such as these make holistic microfinance interventions even more important but at the same time much harder to implement.

3. The Data

In order to assess the impact these additional non-financial dairy services have on BASIX's clients' income, a data set was constructed from four different sources. The first source is the Management Information System (MIS) of the organisation. This system collects data on all BASIX clients, including socio-economic information as well as all data related to the loan, its repayment and on insurance or other services taken by the client. The second source is a separate list from BASIX, providing the name, village and application date of customers who bought Ag/BDS-dairy services. This information was at the time not integrated into the MIS and needed therefore to be matched with loan-client information.
This data was then merged with official statistics[10] of Anantapur district as provided in the "*District Hand Book of Statistics"*. These statistics are available from the *Directorate of Economics and Statistics*, Government of Andhra Pradesh, Hyderabad. It is an extensive data set on population, industries, housing, employment, price indices, state finance, five year plans, tourism, environment and almost any other area, some of which is disaggregated on the mandal level.[11] The data is collected from various central/state government departments, public sector undertakings, corporation and other agencies and is available on a yearly basis from 2000 to 2006. For this study, data for the financial year 2003/04 and 2004/05 was used in the analysis. Finally, data on alternative (non-BASIX) milk vendors was collected specifically for this study and integrated in the analysis.[12]

The client data was extracted in January 2007 so that the final sample consisted of clients who became customer of BASIX in the time period of the first of April 2003 to the 30th of December 2006 (reducing the sample from 15,557 to 12,570 observations). While BASIX offers loans for different investment purposes[13], only clients that took a loan for the purpose of buying a cow or a buffalo were considered as these had the possibility to opt for additional services[14] (reducing the sample to 4,410 observations). The sample needed to be further

[9] BASIX opened its unit in Anantapur city in 2000. It was a split from the unit office in Adoni, which had been established about two years before, in April 1998. As of December 2006, Anantapur unit's staff includes three field executives (FX), seventeen Livelihood Service Assistants (LSA) and four Livelihood Service providers (LSP) as well as ten other employees. Every LSA was responsible for 471 accounts, of which the unit had distributed 4,431 (44,045,000Rs) by the end of Dec 2006. The disbursed average loan size was 9,940 Rupees, as compared to an overall average for BASIX of 10,315 Rupees. The unit had an on-time repayment rate (OTRR) of 88.7%, which lay below the general average of 98.2%.
[10] Handbook of Statistics, 2004-05 Anantapur District, available for purchase at the Directorate of Economics and Statistics, Hyderabad, Andhra Pradesh, India.
[11] India is divided into several subnational administrative units. Mandals form the third such subdivision below states and districts (www.wikipedia.org).
[12] I would like to thank Ramanjaneya Reddy P., unit head Anantapur, for making this extra data collection possible.
[13] See Appendix A for the different loans and their distribution given the final sample.
[14] Ag/BDS is also offered for crop-loans which make up only 7.5% of all Ag/BDS-clients though.

restricted due to non-availability of income figures (excluded were 416 observations had a annual income of zero Rupees, 468 of less than 1,000 Rupees, and 63 of more than 500,000 Rupees) as well as the non-availability of the loan size (for 131 clients the loan size was stated to be below 500 Rupees – a loan size not given by BASIX). The final sample consists of 3332 observations.

Table 1 provides information on the customer's socio-economic background as well as on their financial relationship with BASIX.
The great majority (about 65 per cent) are female clients in their mid thirties belonging to Other Backward Classes (OBC)[15] or other castes. Only 1.2 per cent of all clients belong to the scheduled castes (ST) and eight per cent to scheduled tribes (SC). On a district basis, these percentages are only available for SC and ST for more recent years. According to the census of 2001, two per cent of Anantapur's population belonged to the ST and eight per cent to SC and proportions are hence almost identical to the sample proportions.[16]
It can be seen that clients with Ag/BDS tend to be wealthier than those without, while on the other hand they are more likely to have a thatched roof as compared to one made of stone for clients without Ag/BDS.

Table 1: Socio-Economic Characteristics of sample

Variable	Dairy				t-stat for equivalence of means across two groups
	WithOUT Ag/BDS		WITH Ag/BDS		
	mean	std.dev.	mean	std.dev.	
Observations	**2056**		**1397**		
Yearly income (Rs.)	86,451	1,460	108,080	1,908	-9.13
Age	35.89	0.18	35.03	8.34	-2.08
Female	0.67	0.01	0.71	0.01	-2.31
Familysize	4.19	0.03	1.66	0.04	51.2
Other Backward Caste, %	0.40	0.01	0.36	0.01	2.62
Other Caste, %	0.47	0.01	0.51	0.01	-2.59
Scheduled Caste, %	0.09	0.01	0.10	0.01	-1.38
Scheduled Tribes, %	0.02	0.00	0.01	0.00	3.46
Minority caste, %	0.02	0.00	0.02	0.00	-0.97
Roofmaterial: Stones, %	0.64	0.01	0.03	0.00	47.33
Roofmaterial: Tiles, %	0.04	0.00	0.00	0.00	7.23
Roofmaterial: Thatched, %	0.25	0.01	0.96	0.00	-59.24
Roofmaterial: Sheets, %	0.04	0.00	0.00	0.00	6.95
Roofmaterial: RCC, %	0.03	0.00	0.00	0.00	6.39

Table 2 shows the average loan size of clients is about 11,500 Rupees (approximately US$ 290) – covering the cost of a cow or a buffalo. On average, clients with Ag/BDS repay the loan in less instalments, all other loan characteristics (security amount, amount overdue and number of days overdue) do not seem to differ systematically between the two groups. Most of the observations in the sample have taken only one loan, while clients without Ag/BDS are more likely to have had an earlier loan with BASIX.

[15] Other backward classes – as well as scheduled tribes and scheduled castes – are Indian communities that are granted special status by the constitution of India in order to extend positive discrimination against these groups.
[16] Data on OBC are available only in the 1931 census. There, OBCs are estimated to make up 52 per cent of the population, as compared to 60 per cent of the client sample under consideration.

Table 2: Loan information of sample

Variable	Dairy				t-stat for equivalence of means across two groups
	WithOUT Ag/BDS		WITH Ag/BDS		
	Active		Active		
	mean	std.dev.	mean	std.dev.	
Observations	**2056**		**1397**		
Loansize (Rs.)	11,489	109	11,573	82	-0.57
Nr of Loans with BASIX	1.11	0.01	1.00	0.00	10.64
Number of instalments	18.76	0.13	15.75	0.10	16.94
Amount overdue (Rs.)	20.66	6.87	5.03	3.81	1.76
No. Of Days overdue	5.49	1.19	3.55	0.25	1.34
Security Amount	1149	10.85	1157	8.22	-0.56

4. Ag/BDS impact assessment

4.1 Strategy to address endogeneity

The fact that a program itself, as well as participation in the program, is not assigned randomly, can create substantial problems in assessing the effect of an intervention. In this setting, a comparison between villagers lending from BASIX that receive Ag/BDS and villagers lending from BASIX that do not receive Ag/BDS, even when controlling for observed characteristics, can yield very misleading results – as highlighted by McKernan (2002). This is due to participation in an intervention being neither on the demand nor on the supply side at random. Both, the placement of the intervention by the institution and participation by clients are choice variables that give rise to endogeneity problems.

Several strategies can be followed to tackle (and solve) this problem of endogeneity, one of which being an instrumental variable approach applied in this paper. That is, at least one variable will be identified that is likely to affect the participation in the intervention of interest but is unlikely to affect directly the outcomes of interest.

Typically, one looks either on the demand or supply side for appropriate instruments.
According to demand theory, the price can be a good instrument for predicting a product's demand. The price of BASIX charges for the Ag/BDS services changed twice during the sample period: in the initial testing phase, the fees were set at 50 rupees, then 100 rupees and 200 rupees, in 2004-05 at the end of financial year Ag/BDS took off with a fee of Rs 150 and was standardized to Rs 300/- in 2006-07. Since from the data it is not apparent who was charged which amount, this variation in costs is not a useful predictor of the demand for the service.
This study turns to the supply side for identification of instrumental variables. Most often, eligibility criteria are used as instruments (see for example Pitt and Khandker, 1998). Nevertheless, since BASIX does not have any exogenous eligibility criteria for Ag/BDS, a different instrumental strategy will have to be adopted which was first proposed by Khandker and Faruqee (2003). It is based on the assumption that resources of the organisation[17] as well as other resources (such as milk-chilling plants in the area) are constrained, and the demand for services is much greater. This implies that BASIX needs to make two sets of choices in the process of lending and delivering services. The first set of choices relates to *where* to operate. The second set of choices relates to *whom* to take on as customers within the chosen areas. This latter choice becomes irrelevant for matter of this study as only customers and no non-customers are considered in this study.

[17] Resources in the form of staff, such as number of field executives and hence nr of villages they are able to cover; in the form of veterinarians that can serve the village and so on.

It is the first set of choices made by the organisation – *where* to operate – that is made used of in this study to identify suitable instruments, which can account for the endogeneity of dairy Ag/BDS services.

The idea is that given the fixed resources, BASIX can only operate in a constrained number of areas and hence chooses those that have greatest potential for the intervention to be successful. BASIX staff calls such areas 'areas with dairy potential'. Phansalkar & Gosh (2001) point out that BASIX strives to allocate resources to the best possible borrowers and to operate in areas with favourable factor conditions (like availability of power, roads, milk chilling plants, etc.), demand conditions (size of domestic/local market, presence of buyers, general growth rate of domestic demand, etc.) and related and supporting industries.
This approach implies that the more promising other areas are (as perceived by BASIX), the less likely a client will be to be receive the additional services. In other words, given the available resources of BASIX, whether a client receives additional services or not depends not only on its own demand but also on the area the client lives in as well as on the area other clients live in; these 'other areas' can hence be seen as competitors to ones own.

Competitors in this context are spatial areas – those that the organisation chooses to, or not to, operate in. As described in the data section, the smallest unit for which official statistics are available are mandals. The district Anantapur is divided into 63 mandals. In 29 out of these does BASIX offer loans for the purpose of buying a cow or a buffalo.
Variables to be included in the model are hence, among others, certain mandal indicators X_{m} and the proposed instruments are averages of these same indicators for all other mandals in Anantapur district excluding mandal m, $\overline{X}_{A-m}$.[18]

To give an example: In BASIX's choice of where to establish and hence offer additional services related to dairy activities, the number of veterinarians per household can be seen as one determining factor. Nevertheless, once services are in place, the impact of BASIX's intervention on customers' income will not be dependent on the number of veterinarians (per household) in another area within the district. The characteristics of other areas therefore fulfil the requirements of valid instruments – namely that they are correlated with the endogenous explanatory variable but are uncorrelated with the error term of the regression equation.

The basic point of departure for impact estimation is then the following reduced welfare equation:

$$(1a) \qquad y_{im} = \alpha_1 X_{im} + \beta S_{im} + \varepsilon_{im},$$

with y_{im} indicating the outcome variable of interest (here income) for client i in mandal m, X_{im} are customer characteristics as well as mandal characteristics, S_{im} denoted whether a client receives Ag/BDS or not and ε_{im} is an unsystematic error term. α_1 and β are unknown parameters to be estimated. If no problem of endogeneity was encountered and all determining variables were observed, estimated β by OLS would measure the impact of having Ag/BDS on income without any bias. Nevertheless, receiving Ag/BDS or not, S_{im}, and the error term of the equation, ε_{im}, are correlated – the source of the described endogeneity bias.
In the Instrumental Variable approach that accounts for this bias and that is applied in this paper, the determinants of Ag/BDS are estimated in a first stage; Ag/BDS being modelled as follows:

[18] Within-area competitor's characteristics can be dismissed as most likely being poor instruments because of 'spill-over' and 'social capital' arguments.

(2) $$S_{im} = \alpha_2 X_{im} + \alpha_3 \overline{X}_{A-m} + \upsilon_{im}.$$

where α_2 and α_3 are again unknown parameters, $\overline{X}_{A-m}$ is as defined above and υ_{im} is the error term, assumed to have an expectation of zero given the explanatory variables.
Predictions from this estimation are then used as an explanatory variable (replacing the initial indicator) in the second stage estimation, which changes the welfare equation to:

(1b) $$y_{im} = \alpha_1 X_{im} + \beta \hat{S}_{im} + \varepsilon_{im},$$

$\hat{S}_{im}$ being the predictions from the first stage.

4.2 Validity the proposed instruments

Official statistics from Anantapur district provide an enormous range of information. In order to narrow down the potential instruments, an analysis of which regional characteristics play a determining factor in the number of loans taken from BASIX per 1,000 households in each mandal was undertaken. Average regional characteristics of other mandals turned out to be highly significant in the regression analysis, implying that the results described in this section provide significant support for the strategy proposed,
Table 4 displays the regression results, where the dependent variable is the number of dairy loans per 1,000 households in a mandal. Please note that the unit of analysis here is *mandals*, of which Anantapur district has only 63. This small number of observations limits the degrees of freedom and not many variables could be included in the final model specification. Here, the average difference in rural domestic electrification is, for example, one of the highly significant variables that will later be used as an instrument in the impact analysis.
Three different models are being estimated. The first of which looks at all BASIX clients, the second one examines only BASIX dairy clients and the third is further constrained to dairy clients with Ag/BDS. In this analysis, the influence of neighbouring mandals on the number of clients was also specifically tested for by incorporating a weight matrix, as is common practice in spatial econometrics. This weight matrix indicates neighbouring mandals and it captures the (potential) presence of spatial dependence between them. Its significance suggests that the number of clients in one mandal is not independent of what is happening in its neighbouring location.
Interesting in the context of this study is that the weight matrix ceases to be significant when concentrating on dairy clients only (with or without Ag/BDS). This suggests that the explanatory variables – including the proposed instruments - capture well potential influence from other mandals – here to be interpreted as variables capturing well their role as ‘competitors’.

Table 3: Estimation Results -

	(1) active BASIX customers per 1000 hh		(2) active dairy customers per 1000 hhs		(3) active Ag/BDS dairy customers per 1000hhs	
	coeff.	**std.err.**	**coeff.**	**std.err.**	**coeff.**	**std.err.**
literacy rate, males	-0.402	0.083	-200.927	51.247	-0.086	0.026
literacy rate, females	0.351	0.075	193.246	41.734	0.082	0.022
milkanimals per hh	0.019	0.006	8.405	3.163	0.004	0.002
rural population, %	-0.025	0.011	-5.934	5.668	-0.003	0.003
female pop per area	-0.135	0.030	-59.998	18.094	-0.024	0.008
nr of households per area	0.291	0.069	128.871	41.099	0.052	0.019
growth in grazing land (I)	**14963**	**8938**	**4319711**	**4885394**	**2200**	**2226**
growth in grazing land	9.572	5.601	2803.027	3056.545	1.419	1.394
diff in rural domestic electrification (I)	**0.203**	**0.071**	**78.186**	**40.107**	**0.043**	**0.023**
diff in rural domestic electrification	12.697	4.494	4858.913	2531.468	2.678	1.449
growth in uncultivated land	**-0.396**	**0.125**	**-180.724**	**74.396**	**-0.071**	**0.037**
growth in uncultivated land	-24.678	7.830	-11261.130	4655.588	-4.424	2.286
constant	10.267	5.365	3133.558	2915.442	1.595	1.343
rho	0.4641009	2.742264831				
Wald test of rho=0:	chi2(1)=	7.52 (0.006)				
Lagrange multiplier test of rho=0:	chi2(1)=	6.03 (0.014)				
Nr of Observations:	63		Nr of Observations:	63		63
Variance Ratio =	0.555		F(20,42)=	2.87		1.81
Squared Corr. =	0.606		Prob > F =	0.0044		0.0712
Sigma =	0.01		R^2 =	0.4473		0.4144
			Adj. R^2 =	5.9733		0.00272

Note: Variables in bold and indicated by an (I) are proposed instruments. Model (1) includes a spatial weight matrix (appropriate tests for the significance were taken out – results can be obtained). Models (2) and (3) are a simple OLS model.

5. Estimation Results

5.1 Estimates of Ag/BDS Impact on income - Simple OLS Results and Testing for Endogeneity

Observable customer characteristics included in the model are the age (squared) and sex of the customer, information on the family size, an interaction term between the latter two variables. Information on the caste of the household is included as well as information on the type of the household's roof. All other customer characteristics captured in the MIS (such as primary occupation and asset value) could not be used as the number of clients for whom this was recorded is very limited.

Further included were variables providing information on the borrowing-relationship between the client and BASIX, namely the number of loans taken, the size of the latest loan and whether or not a customer was active at the time the data was extracted from the MIS.

Finally, mandal characteristics used in the model include information on percentage deviation from normal rainfall in the mandal over the last four years and as well as government expenditure and receipts in the mandal in the financial year 2004-05 per 1,000 households. The variables on rainfall were chosen due to the strong dependence on agriculture in the study area in combination with low availability of irrigation facilities for poor households.

Government receipts and expenditures can be interpreted as a proxy of wealth as well as availability of other services and infrastructure in the region.
The dependent variable is the logarithm overall annual household income. BASIX reports annual income of the household in its MIS due to most household being, as already stated, highly dependent on agriculture – and hence seasonal income. This makes annual income much more informative in terms of wealth of the household than monthly income.[19]

As a first step, the outcome equations (1a) is estimated by simple OLS, which takes the services as randomly given.

Table 4: Simple OLS regression Results

	Ordinary Least Squares	
Dependent Var: log(Income)	**Coef.**	**Std.Err.**
Ag/BDS	0.203	0.037
Age²	0.000	0.000
Female	-0.299	0.042
Female*Familysize	0.061	0.011
log(Familysize)	-0.035	0.031
Caste: OC	-0.103	0.023
Caste: ST	-0.226	0.085
Caste: SC	-0.235	0.045
Roof: Stones	-0.064	0.031
Roof: Tiles	-0.084	0.070
log(Loansize)	0.378	0.043
no. Of loans taken with BASIX	-0.343	0.038
Active customer	0.248	0.032
% deviation rainfall 2004	-0.412	0.069
% deviation rainfall 2003	0.854	0.118
% deviation rainfall 2002	-0.162	0.041
Gvnmt expenditure per 1,000 households (04-05)	-58.57	24.9
Gvnmt receipts per 1,000 households (04-05)	64.790	23.840
Constant	7.407	0.401
Number of obs.: 3332	**F(18,3313)**	33.31
	Prob>F	0.00
	Centered R2	0.153
	Uncentered R2	0.149

Nevertheless, these results might be biased due to a correlation of the indicator whether a customer receives Ag/BDs or not and the error term of the welfare equation (1a). The Wu-Hausman as well as the Durbin-Wu-Hausman test were applied in order to test for this endogeneity. Results are presented in Table 5. Both of these tests indicate that there are systematic differences between the two models. This means the OLS results show that whether a client receives Ag/BDS or not cannot be taken as given and IV estimates are to be preferred over the simple OLS estimates.[20]

[19] The results for the logarithm of annual household income *per capita* are currently being analyzed. Results support, if not strengthen the results presented here.
[20] Sargan statistic (overidentification test of all instruments): 12.921, Chi-sq(8) P-val = 0.11461

Table 5: Test statistics for the endogeneity of Ag/BDS

Tests of endogeneity of: Dairy-Ag/BDS services				
H0: Regressor is exogenous				
Wu-Hausman F test:	6.964	F(1,3312)	P-value:	0.008
Durbin-Wu-Hausman chi-sq test:	6.992	Chi-sq(1)	P-value:	0.008

5.2 Estimates of Ag/BDS Impact on income - Instrumental Variable Regression Results

Given the confirmation of Ag/BDS being an endogenous variable, the instrumental variable approach is now estimated. This is done in a two-step procedure, first estimating equation (1b), taking the Ag/BDS indicator as a dependent variable and then using these estimates in the welfare equation (1a).

The first stage regression includes – in addition to all variables used in the OLS-model, average 'competitors' characteristics as instruments. As described above, these are variables that influence whether services are being available in a certain area or not, but have *no* influence on the customer's income. Table 6 lists the variables used in the final model and provides a brief explanation why they were chosen and an interpretation of the sign of the estimated coefficient. Note that all these variables are averages in *other* mandals than the one a customer lives in.

Table 6: Instrumental Variables

Instrument	Explanation
- the average number of milk animals per 1,000 households,	BASIX does not offer dairy-loans in areas where hardly any households are engaged in dairy activities. A certain presence of these is important for the success of the intervention. Nevertheless, part of the services in the dairy intervention includes the establishment of market linkages in areas where BASIX sees potential. This explains the positive coefficient of the variable in the model.
- the percentage of villages on a main road,	BASIX for example establishes milk-routes on which milk is collected and brought to milk chilling plants. If possible these are established where people do not already have access to buyers. The percentage of villages at a main road are an indicator for this. The estimated coefficient suggests that the more villages lie on a main road in a mandal, the less likely it is that customers have Ag/BDS services there.
- the difference of veterinarian staff in 2003-04 and 2004-05 per 1,000 households,	Also part of Ag/BDS are regular check-ups for the animals. The estimated coefficient suggests that if the difference in veterinarian staff between two financial years is on average bigger in other mandals than in the one the customers lives in, he/she is more likely to have Ag/BDS services. T
- the number of females per	Although BASIX does not, like many other

area	microfinance institutions, concentrate on delivering services to women, the majority of dairy customers are female – and an even higher percentage of these takes Ag/BDS. This led to the choice of the variable females per area as an instrument.
- the number of banks per 1,000 households	BASIX is one of the few microfinance institutions working on a financially self-sustainable basis. This implies that to a certain extend, a business approach is taken, which includes the consideration of competitors in the decision-making process. Banks as well as post-offices offer lending facilities and their presence in a mandal are hence used as instruments.
- the percentage of villages having a post office.	
- the growth in area used for food production from 2003-04 to 2004-05,	Availability of fodder for the animals is for many customers a big risk factor. Some customers get fodder from their own land or purchase it. Most collect fodder though which makes the availability of grazing or bare land important. The growth in land used for food production can be seen as a proxy of how much land is unused and hence available for fodder collection.

In addition to the competitors' characteristics, one further variable was used as an instrument. This is the distance of the mandal capital to Anantapur – the district capital and at the same time the town where BASIX has its main office in the district. This variable is an important variable in BASIX service supply decision. The typical approach is to first serve areas that are closer to the main office and then expand into areas further away. Once the distance gets too big, a branch is being established in those areas. This approach is reflected in the estimated coefficient of the variable: the further away a customer lives, the less like it is that he or she has Ag/BDS services.

Results of the first stage regression are presented in Table 7. All instruments are significant on a 10 per cent significance level, most even on a one per cent level.
Please note that although the dependent variable is a binary indicator, a linear model is used for estimation. Angrist (2001) provides evidence that a linear instrumental variable approach can be used in the context of a binary endogenous variable.

The last two columns of Table 7 display estimation results of the second step of the instrumental variable approach - the approach that was shown to be preferred over simple OLS estimates.

When accounting for the endogeneity of the additional (Ag/BDS) services, the effect of having Ag/BDS on a customer's income is estimated to be negative – significant on a seven per cent significance level. The estimated coefficient changes from a positive value of 0.203 to negative one of size 0.537. This is a considerable change and shows by how much a program effect might be overestimated when not accounting for endogeneity.

Table 7: First Stage & 2SLS (IV) Regression Results

		1st stage Dependent Var: Ag/BDS		2SLS (IV) Dep. Var: log(Income)	
		Coef.	**Std.Err.**	**Coef.**	**Std.Err.**
	Ag/BDS			**-0.537**	**0.299**
	Age²	0.000	0.000	0.000	0.000
	Female	-0.008	0.020	-0.305	0.045
	Female*Familysize	0.006	0.005	0.066	0.012
	log(Familysize)	-0.349	0.013	-0.292	0.108
	Caste: OC	0.017	0.011	-0.088	0.025
	Caste: ST	-0.117	0.040	-0.304	0.096
	Caste: SC	-0.022	0.021	-0.248	0.048
	Roof: Stones	-0.295	0.014	-0.285	0.094
	Roof: Tiles	-0.303	0.033	-0.298	0.114
	log(Loansize)	0.213	0.020	0.540	0.079
	no. Of loans taken with BASIX	-0.086	0.018	-0.408	0.048
	Active customer	0.181	0.015	0.38	0.06
	% deviation rainfall 2004	-0.057	0.047	-0.417	0.073
	% deviation rainfall 2003	-0.007	0.079	0.827	0.125
	% deviation rainfall 2002	0.01	0.02	-0.121	0.046
	Gvnmt expenditure per 1,000 households (04-05)	7.06	15.37	-55.53	26.35
	Gvnmt receipts per 1,000 households (04-05)	-14.918	15.286	63.619	25.201
Instruments	Distance (km) to Anantapur (district capital)	-0.002***	0.00		
	Average no. of milk animals per household in OTHER mandal	6.72***	1.67		
	Average no. of rural domestic electrification per household in OTHER mandals	39.64***	8.88		
	Average % of villages on a main road in OTHER mandals	-4.98*	2.59		
	Average difference of veterinarian staff per household in OTHER mandals	8.92***	3.13		
	Average growth in area used food production in OTHER mandals	4.78***	1.74		
	Average number of females per area (ha) in OTHER mandals	2.41**	1.14		
	Average number of banks per 1,000 households in OTHER mandals	-17.54***	5.24		
	Average number of villages with a postoffice in OTHER mandals	7.21*	4.02		
	Constant	-40.28891	6.952443	6.481799	0.5629517
	Number of obs.: 3332 **F(26,3332)**	244.19		28.30	
	Prob>F	0.00		0.00	
	Centered R2	0.66		0.05	
	Uncentered R2	0.80		0.996	

Most other estimated coefficients in the model have the expected sign given the cultural setting of the area. Belonging to scheduled tribes or a scheduled caste for example has a negative effect and also being female translates into lower income. Being older on the other hands increases income, all else being equal.

One unexpected result is the coefficient on the number of loans a client took out. This variable is estimated to have a highly significant negative effect, which is unexpected in the

sense that one would assume long-term benefits from taking part in such a program (with time the loan size increases and opens up more opportunities, and clients would be expected to slowly mature into higher income brackets). Nevertheless, some support for the finding comes from Khandker and Pitt (2003). In their paper they examine the impacts of microfinance on a number of outcomes using panel household survey from Bangladesh. More specifically, they considered issues such as whether the effects of microfinance are saturated or crowded out over time, whether programs generate externalities, and whether the estimated impacts of microfinance found earlier with cross-section data analysis can be corroborated using an alternative method. They find a declining long-term impact of microfinance as well as the possibility of village saturation from microfinance loans. Since the average number of loans taken by the clients under consideration is only 1.1 loans it is unlikely that customers would already experience declining long-term effects, but village saturation might be what drives the results.

5.3 Estimates of Ag/BDS Impact on income – Including information on milk vendors

Nevertheless, given that the estimated negative effect of Ag/BDS on income is very counterintuitive, the issue was further investigated.

Personal observations and preliminary primary data collection in autumn 2006 for a survey[21] had indicated that in some cases milk agents[22] that operate on milk routes initiated by BASIX pay a lower price per litre of milk than local vendors.

In addition, in some villages the milk agent would take a sample of the customers' milk for testing but would not return it to the customer. By doing so, he could make a personal profit through selling the samples as his own milk but would at the same time reduce the customers' income.

Such practices led to an average loss of 2 Rupees per litre of milk for the customer. While two Rupees, which is just 0.05 US Dollar might sound like a negligible amount, it is not considering the price of milk: A milk agent pays on average 10 Rupees for one litre of buffalo milk and eight for one litre of cow's milk – a customer can consequently experience losses up to 20-25 per cent. Why would a customer still sell milk to the milk-agent and not directly to the local vendor? In an interview one woman explained that she sold some of her milk to the local vendor – since he would pay a higher price - and some to the milk agent – in order not to jeopardize BASIX's presence in the village.

Based on these observations in combination with the above estimation result, BASIX staff in Anantapur was asked to collect data on the presence of local and private milk vendors in intervention villages. Due to workload of field staff, only 21 out of 30 mandals could be covered. Therefore, including the collected information resulted in a further loss of observations, reducing the sample size to 2150 customer.

Table 8 gives information on average numbers of private milk vendors in villages where BASIX customers have Ag/BDS and where they do not. No significant differences between the villages in terms of number of private vendors as well as number of all vendors before and after BASIX started operations are to be observed.

[21] This survey is currently being undertaken.

[22] A milk agent collects milk from customers and sells it on to a milk chilling plant. Mostly, these agents use – or are supposed to use - an instrument for fat and SNF-testing which is purchased through a loan from BASIX. The higher the fat and SNF percentage of the milk, the higher the price per litre should be.

Table 8: Information on Milk Vendors in Sample Villages

Variable	Dairy-Villages				t-stat
	WithOUT Ag/BDS		WITH Ag/BDS		for equivalence of means across two groups
	mean	std.dev.	mean	std.dev.	
Observations	**56**		**28**		
private vendor present in the village	0.86	0.35	0.89	0.31	-0.45
number of private vendors in the village	4.70	4.59	4.64	5.04	0.05
nr of vendors before BASIX started operations	2.91	3.32	2.89	3.55	0.02
nr of vendors after BASIX started operations	1.91	2.03	1.81	2.09	0.19
nr of years BASIX is in operation	4.64	1.93	4.38	1.70	0.59

The previous analysis was repeated with the reduced sample, integrating information on milk vendors.
First Step estimation results as well as test results for the endogeneity of Ag/BDS are to be found in Appendix C. Only half of the previously used instruments turned out to be significant in this analysis. The distance to Anantapur, the difference in veterinarian staff, the number of banks and the rural domestic electrification per 1,000 significantly influenced the endogenous variable Ag/BDS in this sample (all estimated coefficients having the same sign).

Table 9 presents OLS and IV results.

Table 9: Estimation Results – Model including Information on milk vendors

	Ordinary Least Squares		2SLS (IV)	
Dependent Var: log(Income)	**Coef.**	**Std.Err.**	**Coef.**	**Std.Err.**
Ag/BDS	**0.192**	**0.046**	**-0.669**	**0.420**
Age²	0.000	0.000	0.000	0.000
Female	-0.350	0.056	-0.371	0.060
Female*Familysize	0.087	0.015	0.102	0.017
log(Familysize)	-0.094	0.040	-0.408	0.158
Caste: OC	-0.068	0.029	-0.052	0.032
Caste: ST	-0.182	0.102	-0.270	0.118
Caste: SC	-0.209	0.056	-0.228	0.060
Roof: Stones	-0.094	0.039	-0.358	0.135
Roof: Tiles	-0.119	0.088	-0.377	0.157
log(Loansize)	0.337	0.057	0.556	0.123
no. Of loans taken with BASIX	-0.338	0.048	-0.421	0.066
Active customer	0.227	0.043	0.402	0.096
Presence of local vendor	**0.188**	**0.075**	**0.188**	**0.081**
No pf private vendors	**-0.010**	**0.003**	**-0.011**	**0.004**
% deviation rainfall 2005	-0.065	0.167	-0.094	0.180
% deviation rainfall 2004	-0.139	0.140	-0.157	0.150
% deviation rainfall 2003	0.346	0.203	0.300	0.218
% deviation rainfall 2002	-0.113	0.056	-0.089	0.061
Gvnmt expenditure per 1,000 households (04-05)	-39.0788	34.34484	-48.71591	37.15496
Gvnmt receipts per 1,000 households (04-05)	40.535	33.180	49.864	35.896
Constant	7.986	0.540	6.661	0.865
Number of obs.: 2150 **F(21,2128)**	17.77		14.68	
Prob>F	0.00		0.00	
Centered R2	0.15		0.01	
Uncentered R2	0.14		0.99	

The effects of milk vendors being present in a village on customers' income are highly significant. The presence of a local vendor is estimated to be positive while income of customers decrease, the more private vendors operate in a village. These are results in line with the observations from the field.
The negative coefficient on the number of private vendors in the village can be interpreted as additionally support for the hypothesis that village saturation might drive the negative effect of number of loans taken, brought forward in the previous section.

As before, when taking Ag/BDS as randomly given, the interventions impact on customer's income is estimated to be positive and highly significant but changes its sign as soon as the problem of Ag/BDS being endogenous is accounted for. The sign changes and the magnitude of the impact increases significantly.

Nevertheless, this result is only significant when considering a significance level of 11 per cent.
Other reasons besides having omitted important information on market linkages that might explain the negative effect can be brought forward. On the operational side it is important to consider that the intervention is relatively new and in its development phase – the pricing has been changed in the process and might not yet be optimized and not all processes necessarily run as smoothly as is needed for the intervention to have the desired impact. The aspect of vendors and their practices was discussed above and is one example of how losses can occur due to deviations in implementation from program design.

More importantly though, while clients that receive the additional services might indeed have a lower income than those that do not, they might at the same time have a lower variability in their income streams. This would translate into lower risk and vulnerability, one desired result from such an integrated microfinance intervention. Whether this process is taking place can unfortunately not be tested with the available data. A survey is currently being conducted on dairy clients and controls which is designed so that these issues can be addressed.

6. Conclusion

Microfinance and its impact have received considerable attention over the last few decades, with most studies confirming a positive impact on the customers. However, these studies only consider the effect of credit. Today, the term 'Microfinance' involves much more than just credit. Over the last decades enormous developments and innovations have taken place in the microfinance sector, resulting in a much broader approach taken. Training is being given, insurance products and saving possibilities are offered, market linkages are being established – to name just a few of the developments that can be observed.

One program that takes such a holistic approach is the intervention under consideration in this study. The effect of services offered for customers engaging in the dairy sector have been estimated. Customers of the microfinance institution BASIX India that take a loan for the purpose of buying a cow or a buffalo can choose to additionally purchase so-called Agricultural/Business Development Services. These include for example a training of how to keep and feed the animal or a monthly check-up by a veterinarian.

Estimating the effect of these services on the customer's income by simple OLS, hence taking them at random, overestimates the effect significantly. The bias which results from the program-variable being endogenous leaves one to believe that the services influence income positively. Nevertheless, taking account of this endogeneity shows that the customers actually experience a negative effect on their income as compared to customers who only avail themselves of credit.

This effect remains negative but becomes slightly insignificant once market linkages are accounted for. This points to the importance of issues such as improving milk quality and reducing the risk of animals falling sick or dying – the profit margin of dairy activities is typically very small so that even a minute reduction in prices can reduce profits significantly for producers. In rural areas for example, where customers need to purchase fodder for the animal, profit can only be attained when mixing milk with water one to one.

Once accounting for the presence of types of vendors in the market, the estimated effect becomes slightly insignificant. Nevertheless, while slightly insignificant, results still suggest that customers who purchase additional services experience a negative effect on their income. This might reflect that these customers pay a price for a lower variability in their income, which can hence be interpreted as a form of insurance. The services might not have an immediate effect on the income of the clients, but they influence the health of the animal and by doing so reduce risk. An animal falling ill or dying can have severe consequences for the people that are subject of this study. These individuals are extremely poor, owning hardly any assets so that incurring medical expenses for their animal or losing them is very difficult to cope with. Consequently, reducing risk is crucial if they are to maintain and improve their livelihoods.

Currently, a survey on 500 dairy customers of BASIX and 500 non-customers (in program villages as well as non-operating villages that have dairy potential) is being undertaken. Data collection is estimated to be concluded by the end of February. The survey is designed in such a way that also questions that arose in this study can be addressed.

APPENDIX A:

Purpose of loan	Freq.	Percent	Cum.
House Repairs / Extensions	2	0.02	0.02
General Purpose - S.H.G	4	0.04	0.06
S.H.G.S without C.S	4	0.04	0.1
Federation of S.H.G.S/MACTS	8	0.08	0.18
Vehicle loans for employees/LSAs	9	0.09	0.27
Agri Investment loans	11	0.12	0.39
Housing & Infrastructure loans	42	0.44	0.83
Crop Loans (JLGS)	510	5.37	6.2
General Purpose Women (JLG)	521	5.49	11.69
AGRI-ALLIED LOANS	3,454	36.4	48.09
Non-farm Micro-Enterprises	4,924	51.89	100
Total	9,490		

APPENDIX B
The role of BASIX in the context of Credit Markets and in Anantapur (Andhra Pradesh, India)

As mentioned above, the district Anantapur is not only one of the most backward provinces in the state of Andhra Pradesh but also the second most drought prone area in all of India. Having been hit by a series of droughts in recent years, the population - of which 95 per cent depends on agriculture - is extremely vulnerable. For the past ten years, India has experienced an epidemic of farmer suicides, and Anantapur is one of the areas with the highest incidence of farmer suicides. Data from the National Crime Records Bureau (NCRB) reveal that on average, one farmer took his or her life every 53 minutes between 1997 and 2005 in just the States of Maharashtra, Andhra Pradesh, Karnataka and Madhya Pradesh (including Chhattisgarh) - totalling 16,770 deaths in Andhra Pradesh over that period.

A study undertaken by Vidyasagar and Chandra in 2004 classifies the district of Anantapur belonging to the 'suicide belt', regions where instances of farmers' suicide was (and is) particularly high. They find that the main driving force for farmers to commit suicide is the debt trap they experience. This debt trap has two main reasons – the agrarian crisis due to repeated droughts and the inaccessibility of institutional credit. Fear of non-repayment leads commercial banks to deny credit to many farmers. In fact, many commercial banks operating in the district were extending less than 50 per cent of their deposits as credit against the RBI norms of maintaining 60 per cent credit deposit ratio in 2004 (Chandrashekhar, 2004). In the same year, the cooperative system led by the District Cooperative Central Bank was not able to cover farmers' credit demand either: Poor loan recovery rates resulted in 85 per cent of Primary Agriculture Cooperative Credit Societies (PACS) not being refinanced by the National Bank for Agricultural and Rural Development (NABARD) (Chandrashekhar, 2004). Consequently, farmers, who are already highly dependent on credit have to turn to non-institutional credit – a source known to charge typically much higher rates of interest. In 2005, the National Sample Survey Organisation published a report on the Indebtedness of Farmer Households (January – December 2003). It revealed that, when India was taken as a whole,, 48.6 per cent of farmer households were in debt, this incidence being highest in Andhra Pradesh with 82 per cent. Of these 4.9 million indebted farmer households in Andhra Pradesh, 57 per cent had turned to moneylenders as their main source of credit.

Results of studies estimating the effect of formal versus informal financial services are mixed. Most of the few that make the distinction (by looking at one or both sources) find that access to formal services have a positive effect on borrower's outcome (Nguyen, 2007 for Vietnam; Vilei & Chisholm, 2003 for Ethiopia; Diagne, 1998 for Malawi, Kochar, 1997 for India). Diagne (1998) using data from Malawi, finds this to result from a lesser dependence on

informal sources, hence suggesting that these have a negative impact. Nguyen (2007) finds mixed results for informal credit sources. Somewhat more anecdotal evidence is given in Vilei & Chrisholm (2003) whose respondents agreed that "informal credit consisted of too small sums and regarded formal credit to have a greater impact".

A response by the government of Andhra Pradesh to this situation was a deliberate expansion of the Self-Help Group Bank Linkage Program[23], a program that has gained national and international recognition as a success story in poverty alleviation and capacity building especially for poor women. And indeed, the figures are impressive. Through NABARD credit-linkage commercial banks had provided 587,238 groups with a loan by 2006 and by doing so had linked approximately nine million households to formal financial services. A further measure most often used to highlight the program's success is its low default rate. In 2001-02, only 2.29 per cent of all groups failed to repay their loan.
Nevertheless, these numbers do not relieve the burden that the repayment of the loans imposes on borrowers – mainly women. They have to work extremely hard and may even deny themselves food in order to make the repayments.
Menon (2002) calls SHGs "structures that facilitate credit disbursals to poor women who, in the majority of the groups, spend it on the immediate needs of the family." He goes on stating that "For SHGs to act as agencies of poverty alleviation and 'empowerment', there needs to be a far more supportive environment."

This evidence suggest that linking households in areas such as Anantapur to the formal sector while at the same time providing additional services that support their income generating activity, should help them increase their living standard and escape poverty.
It would hence be expected that borrowers of BASIX experience a higher impact on their income when receiving additional services as compared to having taken a loan on its own.

[23] A SHG is a homogeneous group of on average fifteen poor people that voluntarily forms to save small amounts. These pooled resources are on-lent to members for meeting their credit needs, either for consumption or income generating activities. The process helps them to imbibe the essentials of financial intermediation including prioritisation of needs, setting terms and conditions, and account keeping. Once the groups show such mature financial behaviour, banks are encouraged to make loans to the SHG. The bank loans are given without any collateral and at market interest rates. Peer pressure generally ensures timely repayments (Seibel and Dave 2002).

APPENDIX C – Test for Endogeneity and 1st Stage Regression Results: Model including information on Milk Vendors

Tests of endogeneity of: Dairy-Ag/BDS services				
H0: Regressor is exogenous				
Wu-Hausman F test:	4.917	F(1,2127)	P-value:	0.027
Durbin-Wu-Hausman chi-sq test:	4.959	Chi-sq(1)	P-value:	0.026

		1st stage	
	Dependent Variable: Ag/BDS	**Coef.**	**Std.Err.**
	Age²	0.000	0.000
	Female	-0.031	0.026
	Female*Familysize	0.017	0.007
	log(Familysize)	-0.369	0.017
	Caste: OC	0.011	0.014
	Caste: ST	-0.114	0.048
	Caste: SC	-0.036	0.026
	Roof: Stones	-0.303	0.017
	Roof: Tiles	-0.324	0.041
	log(Loansize)	0.257	0.026
	no. Of loans taken with BASIX	-0.100	0.023
	Active customer	0.196	0.019
	Presence of local vendor	0.005	0.037
	No pf private vendors	-0.003	0.002
	% deviation in rainfall 2005	-0.295	0.097
	% deviation rainfall 2004	0.058	0.078
	% deviation rainfall 2003	-0.158	0.120
	% deviation rainfall 2002	0.08	0.03
	Gvnmt expenditure per 1,000 households (04-05)	-3.79	18.79
	Gvnmt receipts per 1,000 households (04-05)	-7.595	18.079
Instruments	Distance (km) to Anantapur (district capital)	-0.0014	0.00
Instruments	Average difference in rural domestic electrification per household in OTHER mandals	48.69	9.09
Instruments	Average difference of veterinarian staff per household in OTHER mandals	17.59	4.24
Instruments	Average number of banks per 1,000 households in OTHER mandals	-22.10	7.00
	Constant	-37.0325	6.625465
	Number of obs.: 2150		
	F(24,2125)	174.06	
	Prob>F	0.00	
	Centered R2	0.66	
	Uncentered R2	0.81	

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