Essays on the Effects of Informal and Formal Protection Arrangements

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ESSAYS ON THE EFFECTS OF INFORMAL AND FORMAL PROTECTION ARRANGEMENTS

ESSAYS OVER DE EFFECTEN VAN INFORMELE EN FORMELE BESCHERMINGSREGELINGEN

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To those who taught me

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Acronyms

AFD-EUDN	*Agence Française de Développement* (French Development Agency) European Development Research Network
AIDS	Acquired Immune Deficiency Syndrome
ASPIRE	Atlas of Social Protection – Indicators of Resilience and Equity
ATT	Average Treatment Effect on the Treated
BMI	Body Mass Index
BRAC	Bangladesh Rural Advancement Committee
CDI	Centre for Development Impact
CFAF	*Communauté Financière d'Afrique Franc* (Financial Community of Africa Franc)
CRRA	Constant Relative Risk Aversion
DFID	Department for International Development
DID	Difference-in-Difference
EICV	*Enquête Intégrale sur les Conditions de Vie des Ménages* (Integrated Living Conditions Survey)
EPWP	Expanded Public Works Programme
FAO	Food and Agriculture Organisation of the United Nations
FCDN	Food Consumption and Nutrition Division
FIML	Full Information Maximum Likelihood
FY	Financial Year
GIGA	German Institute of Global and Area Studies

GDP	Gross Domestic Product
HAZ	Height-for-Age Z-Score
HH	Household
HIV	Human Immunodeficiency Virus
IDS	Institute of Development Studies
IEG	Independent Evaluation Group
IFPRI	International Food Policy Research Institute
IMF	International Monetary Fund
IV	Instrumental Variables
IZA	*Institut zur Zukunft der Arbeit* (Institute for the Study of Labour)
LATE	Local Average Treatment Effect
LLIN	Long-Lasting Insecticide Treated Bed Net
ME	Marginal Effect
MINALOC	Ministry of Local Government of Rwanda
MINECOFIN	Ministry of Finance of Rwanda
MINEDUC	Ministry of Education of Rwanda
MMI	Military Medical Insurance
MOH	Ministry of Health of Rwanda
N	Number of Observations
NBER	National Bureau of Economic Research
NGO	Non-Governmental Organisation
NISR	National Institute of Statistics Rwanda
NREGS	National Rural Employment Guarantee Scheme
ODI	Overseas Development Institute
OLS	Ordinary Least Squares
P4P	Pay-for-Performance
PCA	*Paquet Complémentaire des Activités* (Complementary Package of Activities)
PMA	*Paquet Minimum des Activités* (Minimum Package of Activities)
PSM	Propensity Score Matching
PSNP	Productive Safety Net Programme

PW	Public Works
QIDS	Quality Improvement Demonstration Study
RAMA	*La Rwandaise d'Assurance Maladie* (Rwanda Medical Insurance)
RCT	Randomized Control Trial
RDHS	Rwandan Demographic and Health Survey
RLDSF	Rwanda Local Development Support Fund
RwF	Rwandan Franc
SD	Standard Deviation
TLU	Tropical Livestock Unit
UNICEF	United Nations Children's Fund
UNU-WIDER	United Nations University World Institute for Development Economics Research
USD	United States Dollar
VHI	Vietnam Health Insurance
VUP	Vision 2020 *Umurenge* Programme
WHO	World Health Organization
WHZ	Weight-for-Height Z-Score

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Abstract

A feature of the development discourse in the past decade has been the emergence of large scale social safety net programmes in developing countries. In this thesis we look at the effects of different safety net mechanisms, whereby the term safety net is considered in a broader sense. The thesis not only looks at formal safety net programmes that are implemented by the government, but also explores the effects of an informal social protection arrangement, i.e. the family, which acts as an important safety net in contexts where formal protection mechanisms are not working or still fully absent.

Chapter 2 of this thesis explores the potential constraints of an informal, family-based safety net mechanism. More specifically we investigate the effect of sharing obligations within the family on investment in small and micro enterprises. The anthropological literature has for a long time suggested that sharing norms, which prevail in many societies, particularly in Sub-Saharan Africa, may imply adverse incentive effects and hamper investment in productive activities. To test this proposition we develop a theoretical model on the interplay between sharing norms and investment. We then test the main predictions of the model with data from tailors in Burkina Faso. Our empirical results support the main propositions of the theoretical model and we can identify two distinct groups of entrepreneurs. Entrepreneurs that opt for an 'insurance regime' make transfers to their kin, get insurance, but forego future earnings because of lower investment. Entrepreneurs that opt for a 'growth regime' break with the norm and step out of the kinship network. This is associated with a social sanction and the entrepreneurs are no longer insured, but they take undistorted investment decisions. In our model the regime choice, i.e. the decision to comply with sharing norms or not, depends on the pressure for redistribution, the degree of risk aversion and the return on investment.

In this chapter we do not deny the positive aspects of family and kinship ties, often referred to as social capital. On the contrary, we are well aware of their importance in contexts where market mechanisms are non-existent or fail. Our aim is to highlight the possible trade-off faced by entrepreneurs due to the coexistence of modern economic activities and traditional norms and institutions. Although we do not explicitly address the issue of efficiency, it is likely that the distortive effects of kinship pressure on investment decisions imply opportunities for pareto-improvements, i.e. both the kinship network and the entrepreneur could be better off if the entrepreneur could realize his investment plans and make lump-sum payments to compensate his social network. Prevailing sharing norms and the associated insurance schemes may not (yet) have adapted to the presence of modern economic activities and the related growth processes that rely on savings and investment. We argue that in a context of such norms and institutions, providing a formal safety net, for example in the form of health insurance, to entrepreneurs and their kin might be an effective means of spurring investment in small and micro enterprises.

Chapter 3 of this thesis explores the effects of health insurance as a formal safety net mechanism. More specifically, we investigate the effects of health insurance on childhood health outcomes. It has been widely recognized that uninsured health shocks can have important negative consequences for income, wealth and labour market outcomes in developing countries. The literature has also shown that in a developing country context, particularly health shocks that are experienced at very young ages have lasting consequences for health, education and lifetime earnings. The presence of a health insurance scheme, however, could limit the potential negative consequences and actually contribute to improve childhood health. We test this proposition with data from children between the ages of zero and five in Rwanda. The empirical results point to a high degree of heterogeneity in the effects on children at different ages and from different wealth backgrounds. Furthermore, the empirical estimates suggest only a weak positive effect of health insurance on childhood health. Nevertheless, the programme estimates suggest that particularly children below the age of two – considered a crucial period in child development – benefit from the programme, i.e. having health insurance contributes to an average improvement in height of the cohort of ca. 0.2 cm.

We also obtain estimates of a similar magnitude for children from poorer backgrounds, which points to a positive pro-poor effect of the health insurance programme in Rwanda. However, there seem to be limitations to the effect and the degree of protection provided by the health insurance. The

estimated effects of health insurance on infant mortality suggest that health insurance might not provide sufficient protection to limit the death of infants in poorer households. Thus, while the insurance scheme lowers the financial barriers to health care, obstacles for poor households seem to remain – these obstacles need to be identified. If they are primarily of a financial nature, there is a risk of reversal of the pro-poor effect due to amendments in the premium schedule of the health insurance programme which lead to an increase in the annual per capita premium of the poorest by 100 per cent. While the increase in insurance premiums improves the financial sustainability of the health insurance scheme, the distributional effects have to be closely monitored.

Chapter 4 of this thesis explores the effects of public works on household welfare in the short-term. Persisting high rates of poverty and underemployment, particularly in rural contexts, together with the possibility of constructing physical infrastructure to promote growth and economic transformation, have made public works programmes increasingly popular among policy makers again in recent years. While it is widely believed that providing poor households with an income opportunity in the form of public works leads to increased consumption and investment and thus also promotes productivity in the long-term, there are also concerns that public works programmes may have adverse effects and actually lower consumption and investment due to a reallocation of labour and reduced incentives to save due to lower income uncertainty. We explore these propositions with data from Rwanda. Double-difference estimates show that households significantly increase food consumption and livestock investment in the short-run. Qualitative evidence however suggests that these improvements are short-lived as households fear falling back to their initial state after leaving the programme. While the public works programme is targeted at the poorest households, the schemes seem to attract relatively better-off households. Removing the barriers for participation could enhance the poverty-reducing effect of the programme.

In this thesis we highlight the potential positive effects of both formal and informal protection mechanisms but equally also point out the constraints. While there has been a global push to expand formal insurance and social protection schemes in low income countries, in practise these countries are still faced with many problems in setting up nationwide schemes. In light of the potential positive effects of the different schemes and mechanisms however, the question is not if they should be implemented, but rather how best to implement formal mechanisms in a sustainable manner given local contexts and constraints.

Essays over de effecten van informele en formele beschermingsregelingen

Samenvatting

Een kenmerkend aspect van het ontwikkelingsdiscours van de afgelopen tien jaar is het ontstaan van grootschalige programma's die een sociaal vangnet bieden in ontwikkelingslanden. Dit proefschrift behandelt de effecten van verschillende 'vangnet'mechanismen, waarbij de term 'vangnet' ruim wordt opgevat. Het gaat in dit proefschrift niet alleen om formele vangnetprogramma's die door de overheid geïmplementeerd worden, maar ook om de effecten van een informele vorm van sociale bescherming: de familie, die fungeert als een belangrijk 'vangnet' wanneer formele beschermingsmechanismen niet werken of nog geheel ontbreken.

In hoofdstuk 2 van dit proefschrift worden de potentiële beperkingen van een informeel, op familiebanden gebaseerd 'vangnet'mechanisme besproken. We onderzoeken in het bijzonder de effecten van het delen van verplichtingen binnen de familie op investeringen in kleine en micro-ondernemingen. In de antropologische literatuur ging men er lange tijd van uit dat gedeelde normen, die in veel samenlevingen heersen, vooral in Afrika ten zuiden van de Sahara, een remmende werking kunnen hebben en investeringen in productieve activiteiten kunnen belemmeren. Om deze hypothese te toetsen hebben we een theoretisch model ontwikkeld met betrekking tot de wisselwerking tussen gedeelde normen en investeringen. De belangrijkste voorspellingen van het model zijn getoetst op basis van data verzameld onder kleermakers in Burkina Faso. De onderzoeksresultaten ondersteunen de belangrijkste hypotheses uit het theoretisch model en we kunnen twee aparte groepen ondernemers onderscheiden. Ondernemers die de voorkeur geven aan een 'verzekeringsregime' dragen bezit over aan hun verwanten en zijn daardoor verzekerd via het netwerk van verwanten, maar hun inkomsten worden lager omdat ze minder investeren. Ondernemers die de voorkeur geven aan een 'groei-regime' doorbreken de norm en stappen uit het netwerk. Hierop

staat een sociale sanctie en de ondernemers zijn niet langer verzekerd, maar ze kunnen daarentegen wel hun eigen investeringsbeslissingen nemen. In ons model is de regime-keuze, dat wil zeggen de beslissing om zich al dan niet te conformeren aan de gedeelde normen, afhankelijk van de druk om herverdeling toe te passen, de mate van risicomijdend gedrag en het resultaat van de investeringen.

De positieve aspecten van familiebanden en verwantschap, vaak aangeduid als sociaal kapitaal, worden in dit hoofdstuk niet ontkend. We zijn ons terdege bewust van het belang hiervan in situaties waarin marktmechanismen ontbreken of niet werken. We willen de aandacht vestigen op de afweging waarvoor ondernemers mogelijk komen te staan in een situatie waarin moderne economische activiteiten samengaan met traditionele normen en instituties. We gaan niet expliciet in op efficiency, maar waarschijnlijk brengt het effect van verwantschap op investeringsbeslissingen mogelijkheden met zich mee voor Pareto-verbeteringen: zowel het netwerk van verwanten als ondernemers kunnen profiteren als de ondernemers hun investeringsplannen waar kunnen maken en lumpsumbetalingen doen om hun sociale netwerk te compenseren. Heersende gedeelde normen en de daarmee verbonden verzekeringsarrangementen zijn wellicht (nog) niet afgestemd op de aanwezigheid van moderne economische activiteiten en de groeiprocessen die daarmee samengaan en die berusten op sparen en investeren. In dit proefschrift wordt betoogd dat het bieden van een formeel 'vangnet' aan ondernemers en hun verwanten, bijvoorbeeld in de vorm van een ziektekostenverzekering, in de context van zulke normen en instituties een effectieve manier kan zijn om investeringen in kleine en micro-ondernemingen te stimuleren.

Hoofdstuk 3 gaat over de effecten van een ziektekostenverzekering als formeel 'vangnet' mechanisme. We onderzoeken in het bijzonder de effecten van een ziektekostenverzekering op de gezondheid van kinderen. Het is bekend dat het doormaken van ernstige gezondheidsproblemen bij onverzekerden in ontwikkelingslanden grote gevolgen kan hebben voor het inkomen, de welstand en de positie op de arbeidsmarkt. Uit de literatuur blijkt verder dat binnen de context van ontwikkelingslanden vooral ernstige ziekten op jonge leeftijd blijvende gevolgen kunnen hebben voor de gezondheid, de opleiding en het inkomen. Een ziektekostenverzekering kan eventuele negatieve gevolgen beperken en daadwerkelijk bijdragen aan het verbeteren van de gezondheid van kinderen. We hebben deze hypothese getoetst aan de hand van data van kinderen van nul tot vijf jaar in Rwanda. Uit de resultaten blijkt dat de effecten sterk uiteenlopen voor kinderen van

verschillende leeftijden en met een verschillend welstandsniveau. Verder wijzen de resultaten op slechts een zwak positief effect van een ziektekostenverzekering op de gezondheid van kinderen. Desondanks zijn er aanwijzingen dat vooral kinderen onder de twee – die een zeer belangrijke ontwikkelingsfase doormaken – profiteren van het programma: een ziektekostenverzekering leidt in dit cohort tot een gemiddelde toename in lengte van ongeveer 0,2 centimeter.

Er zijn gelijksoortige resultaten voor kinderen uit armere gezinnen, wat wijst op een positief effect van het ziektekostenverzekeringsprogramma in Rwanda voor de armen. Het effect van een ziektekostenverzekering en de mate van bescherming die deze biedt lijken echter wel enigszins beperkt te zijn. Een schatting van het effect van een ziektekostenverzekering op kindersterfte wijst erop dat de ziektekostenverzekering wellicht niet voldoende bescherming biedt om kindersterfte in armere gezinnen te verminderen. Hoewel het verzekeringsprogramma de financiële drempel voor de gezondheidszorg verlaagt, lijken er dus belemmeringen voor armere gezinnen te blijven bestaan. De aard van deze belemmeringen moet vastgesteld worden. Als deze vooral van financiële aard zijn bestaat het risico dat het positieve effect voor de armen tenietgedaan wordt vanwege veranderingen in de premiestructuur van het ziektekostenverzekeringsprogramma, die tot een verhoging van 100% hebben geleid in de jaarlijkse premies die de allerarmsten per persoon betalen. De verhoging van de verzekeringspremie verbetert de financiële duurzaamheid van het ziektekostenverzekeringsprogramma, maar de verdelingseffecten moeten nauwlettend in de gaten gehouden worden.

Hoofdstuk 4 behandelt de effecten van openbare werken op het welzijn van huishoudens op korte termijn. Aanhoudend hoge armoedecijfers en werkloosheid, vooral op het platteland, gecombineerd met de mogelijkheid om te investeren in de infrastructuur om economische groei en verandering te bevorderen, hebben openbare werken de afgelopen jaren steeds populairder gemaakt bij beleidsmakers. Algemeen wordt aangenomen dat het feit dat openbare werken aan arme huishoudens de mogelijkheid bieden om een inkomen te verwerven leidt tot een stijging van de consumptie en een toename in investeringen en daarmee ook tot meer productiviteit op de lange termijn. Er bestaat echter ook bezorgdheid dat programma's om openbare werken uit te voeren nadelige effecten kunnen hebben en juist tot minder consumptie en investeringen kunnen leiden vanwege een herverdeling van arbeid en minder prikkels om te sparen omdat er minder inkomensonzekerheid is. We onderzoeken deze hypothesen met data uit Rwanda. Uit 'double-difference' schattingen blijkt dat huishoudens op de

korte termijn significant meer voedsel gaan consumeren en investeren in vee. Resultaten van kwalitatief onderzoek wijzen er echter op dat deze verbeteringen van korte duur zijn omdat huishoudens vrezen terug te vallen in hun oude situatie nadat hun deelname aan het programma beëindigd is. Hoewel het programma van openbare werken gericht is op de armste huishoudens, lijkt het huishoudens aan te trekken die relatief rijker zijn. Het opheffen van participatiebarrieres zou de bijdrage van het programma aan het verminderen van armoede kunnen verhogen.

Dit proefschrift vestigt de aandacht op de potentiële positieve effecten van zowel formele als informele beschermingsmechanismen, maar wijst ook op de beperkingen. Wereldwijd wordt de uitbreiding van formele regelingen voor verzekering en sociale bescherming in landen waar de inkomens laag zijn gestimuleerd, maar in de praktijk komen deze landen nog veel problemen tegen bij het opzetten van landelijke regelingen. In het licht van de potentiële positieve effecten van de verschillende regelingen en mechanismen is het echter niet zozeer de vraag óf ze moeten worden geïmplementeerd, maar moet de aandacht gericht zijn op het op een duurzame manier implementeren van formele mechanismen, uitgaande van de lokale context en lokale beperkingen.

1 Introduction

'Nor is there any reason why the state should not assist the individuals in providing for those common hazards of live against which, because of their uncertainty, few individuals can make adequate provision. Where in the case of sickness and accident, neither the desire to avoid such calamities nor the efforts to overcome their consequences are as a rule weakened by the provision of assistance, where, in short, we deal with genuinely insurable risks, the case for the state helping to organize a comprehensive system of social insurance is very strong.'

Friedrich A. Hayek (1944:125)

'There is no reason why in a free society government should not assure to all protection against severe deprivation in the form of an assured minimum income or a floor below which nobody needs to descend. To enter into such an insurance against extreme misfortune may well be in the interest of all; or it may be felt to be a clear moral duty to assist, within the organized community, those who cannot help themselves. So long as such a uniform minimum income is provided outside the market to all but those who, for any reason are unable to earn in the market an adequate maintenance, this need not lead to a restriction of freedom, or conflict with the Rule of Law.'

Friedrich A. Hayek (1973:87)

1.1 General introduction

Friedrich A. Hayek was an influential figure in economics and a representative of classical liberal thinking in the 20th century. Despite his liberal conviction however, he still advocated state organized schemes of social insurance and protection in situations where individuals are unable to make an adequate provision against risk and to prevent people from severe deprivation.

While Hayek was writing in the context of 20th century Europe and the United States, in recent years social protection has also become an area of increased attention in the development discourse. In the development debate, the question in general is not if social insurance and safety nets should be implemented but rather how they should be organized and realized in light of the context and constraints in developing countries. The increased interest in social protection policies in developing countries is also accompanied by a rapid expansion in empirical research in this area, which focuses to a large extent on the documentation and assessment of the effects of the insurance and safety net mechanisms implemented.

This thesis is set within the broader debate on the effects of insurance and safety net mechanisms in developing countries. The thesis does not, however, only consider the effects of state organized schemes and interventions. Instead we also take a step back and consider a scenario in which formal insurance and risk protection mechanisms are largely absent. In such a situation the family often fulfils an important insurance function. While there is ample evidence on the positive effects of family ties (see e.g. Fafchamps, 2006; La Ferrara, 2007; Alesina and Giuliano, 2010; 2013), the norms upon which the reciprocal informal social insurance provided by the family is based might also have adverse consequences (see e.g. Platteau, 2000). This thesis explores the potential constraints arising from such an informal risk-sharing arrangement.

The inefficiencies in informal social insurance mechanisms also strengthen the case for formal, state organized schemes of insurance and protection. In light of the frequency and importance of health shocks in developing countries, in recent years there has, for example, been a global push to expand health insurance – as a formal insurance mechanism – to low income countries (see World Health Organization, 2005). Past research has shown that uninsured health shocks have significant negative consequences for consumption, income, wealth and labour market participation and outcomes in developing countries (see e.g. Schulz and Tansel, 1997; Dercon and Hoddinot, 2003; Lindelow and Wagstaff, 2005; Schultz, 2010) and as such also pose a major obstacle to poverty reduction and development. The empirical literature on the effectiveness of health insurance in developing countries is still very much concerned with assessing the immediate objectives of the insurance, i.e. improving the access to health care services and reducing the financial burden on

households. The potential wider contribution of health insurance to health outcomes, labour market participation and investment in developing countries still remains less studied. This is also the result of a lack of longitudinal data in developing countries which is required to explore these aspects in a more systematic way. In light of the still limited empirical evidence, this thesis explores potential effects of health insurance coverage on health outcomes, with a focus on the health of young children. Recent findings from long-term longitudinal studies in developing countries highlight the importance of early childhood health and development for adult outcomes (see e.g. Gertler et al., 2013). These findings have also revived the policy debate and there is currently an increasing interest in early child development interventions as a means of breaking the intergenerational transmission of poverty in the policy discourse (see e.g. World Bank, 2012).

In addition to the global push for health insurance, an intervention that has also been increasingly popular with policy makers is public works. In light of persisting high rates of poverty and underemployment, particularly in low income countries, public works schemes are attractive as they provide employment opportunities while at the same time construct physical infrastructure, both of which are believed to be growth enhancing. At the household level, the wage income earned through public works is believed to ensure a minimum income and to lift household budget constraints. This thesis explores the potential welfare-enhancing effects of public works at the household level. Due to data restrictions however, the investigation concentrates only on the short-run implications.

Against this background and the three areas broadly outlined, this thesis specifically aims to address the following three research questions:

1. To what extent do informal sharing obligations within the family hamper investment in small and micro enterprises?

2. To what extent does health insurance contribute to improvements in childhood health?

3. To what extent does a non-contributory safety net – here in the form of public works – contribute to improvements in

household welfare in the short-run?

The three research questions are explored within specific country contexts. Question 1 is analysed within the context of Burkina Faso. Questions 2 and 3 are explored with respect to specific interventions in Rwanda. Background information on the respective contexts and the interventions under consideration are presented as part of the analyseanalyses in Chapters 2 to 4.

In setting the scene for the following chapters of this thesis, Section 1.2 provides an overview of the state of safety net mechanisms, including health insurance, in developing countries. Section 1.3 outlines the productive linkages of social safety net mechanisms, both formal an informal, to economic growth. The focus is here on the mechanisms subject to this thesis, i.e. the family, health insurance and public works.

1.2 A bird's-eye view of formal safety net mechanisms in developing countries

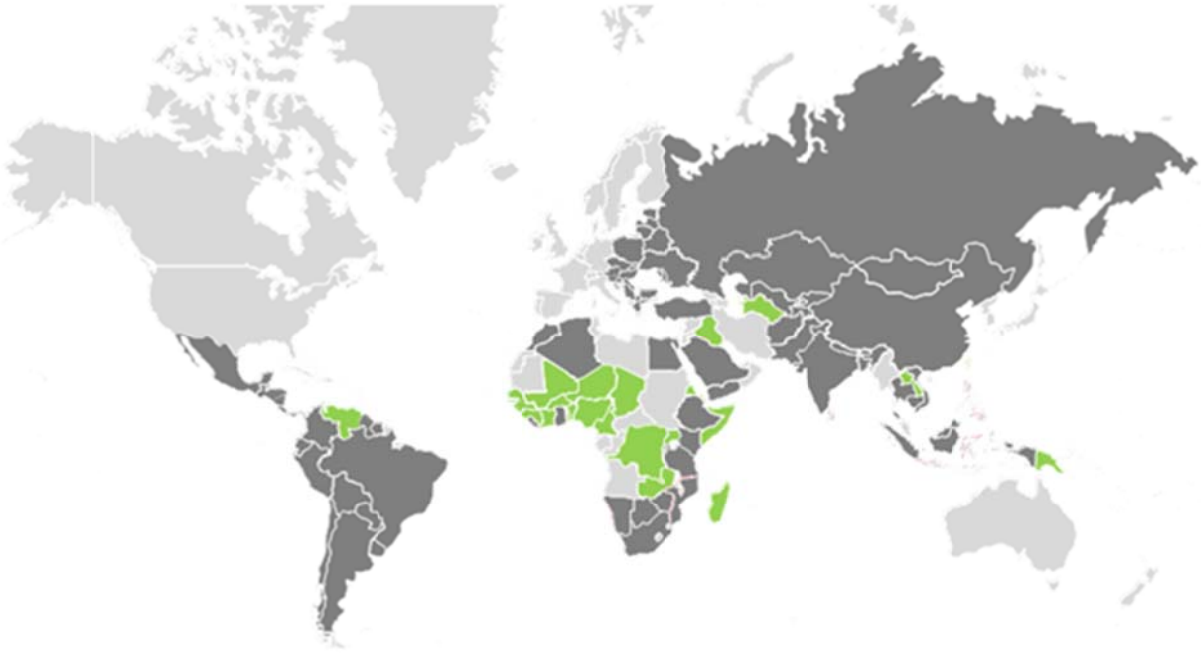
Over the past decade the number of social protection policies and programmes implemented in developing countries has increased rapidly. Safety net programmes, which commonly describe programmes that provide a direct non-contributory transfer in cash or kind and under which public works programmes are also subsumed, have been particularly popular. According to World Bank estimates, the number of countries running at scale safety net programmes increased from 72 programmes in 2000 to 98 by 2013 (see Figure 1.1) (World Bank, 2013a). By 2013 an additional 33 countries had initiated pilot schemes. While in 2000 nationwide safety net programmes were mainly operated in Latin America and Asia, transfer-based safety net programmes are now also increasingly implemented in Sub-Saharan Africa, with 22 of the 33 pilot schemes currently tested there (World Bank, 2013a). Following estimates based on information from the Social Assistance in Developing Countries database, between 0.75 to one billion people in developing countries are currently benefiting from social transfers (Barrientos, 2012).

Despite the expansion of safety net programmes in low income countries, the largest transfer programmes are operated in middle income countries. For example, in 2010 the National Rural Employment Guarantee Scheme (NREGS) in India reached approximately 48 million households; *Bolsa Familia* in Brazil supports approximately 12 million households; and *Oportunidades* in Mexico assists approximately 6.5 million households (Barrientos, 2012). In South Africa about half of the households benefit from the Child Support Grant, the Old Age Grant, the Disability Grant and the Expanded Public Works Programme (EPWP) or a combination of these (see Devereux, 2010a; Barrientos, 2012). But there are also examples of at scale safety net programmes in low income countries. The Productive Safety Net Programme (PSNP) in Ethiopia, for example, reaches approximately 1.7 million households.

Safety net programmes are considered to have positively contributed to poverty reduction. According to estimates from the World Bank ASPIRE database, safety net programmes in developing countries lift approximately 50.3 million people each year above the poverty line income of 1.25 USD/day (World Bank, 2013a). Yet, despite the growing number of initiatives in low income countries, safety net coverage in these countries is still limited with safety net-induced poverty reduction mainly occurring in middle income countries (World Bank, 2013a). A review of safety nets in 20 African countries found that safety nets in Sub-Saharan Africa, where the majority of low income countries are located, are mainly focused on short-term emergency relief in the event of shocks. Furthermore, they are generally targeted at specific vulnerable groups and not the chronic poor and therefore are still underused as a tool for poverty reduction (World Bank, 2013b). According to monitoring and evaluation information compiled by the World Bank (2013b), the effectiveness of the safety net programmes reviewed is still low due to low coverage, benefit levels and targeting efficiency (World Bank, 2013b). Scattered donor support, weak coordination and low institutional capacity leave many low income countries operating several isolated, small-scale programmes rather than at scale schemes. Liberia and Madagascar, for example, have more than five different public works programmes, operated and supported by different agencies and donors (World Bank, 2013b).

Figure 1.1
Evolution of safety net programmes in developing countries

1.1a: Safety net programmes in 2000 (dark grey)



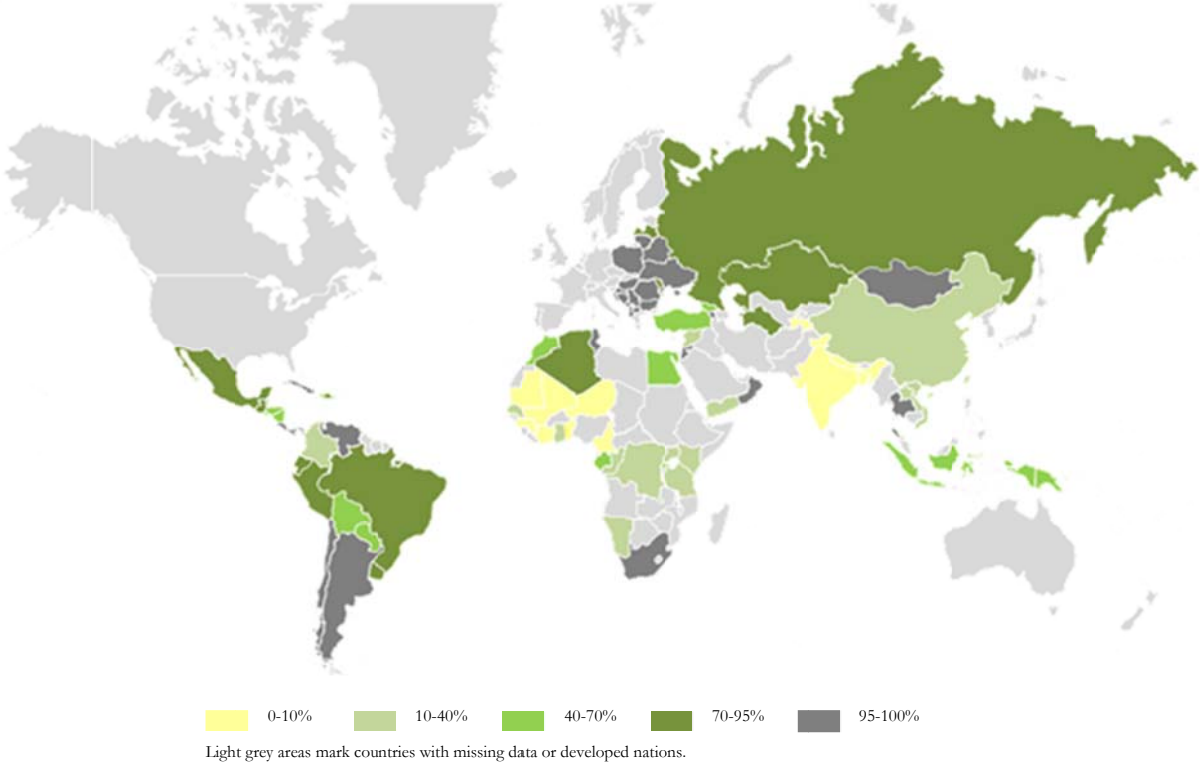
1.1b: Safety net programmes in 2013 (pilot schemes in green)

Source: Author's illustration based on World Bank (2013: 1).

Taking a system-wide approach to social protection, another instrument, which in addition to social transfers has received increasing worldwide attention, is health insurance. Despite an increasing push for health insurance in low income countries since 2005 (see World Health Organization, 2005), national health insurance schemes in low income countries are still rare and the share of the population covered by health insurance in low income countries, particularly in Sub-Saharan Africa, is still low (see Figure 1.2). Developing countries which have implemented national insurance schemes in the past decade include, for example, Ghana, Indonesia, the Philippines, Rwanda and Vietnam; efforts to implement large scale schemes are currently also under way in Ethiopia, India, Kenya, Mali and Nigeria (see Lagomarsino et al., 2012). Despite the increasing efforts in developing countries to expand health insurance coverage and thus improve health care access and reduce financial impoverishment, there is still little consensus on how developing countries should proceed and structure reforms in order to move towards univer-

sal insurance coverage (Lagomarsino et al., 2012). Taxation and premium collection in developing countries is challenging due to the large informally-employed population. As a consequence, in most developing countries, insurance implementation is largely financed through an expansion in government spending. In Ghana, Indonesia, Rwanda and Vietnam, for example, government spending as percentage of total health expenditure has increased between five and eleven percentage points (Lagomarsino et al., 2012). On the beneficiary side, out-of-pocket spending as a percentage of total health expenditure in these countries has decreased by three to six percentage points (Lagomarsino et al., 2012). A systematic review of the impact of health insurance schemes in Africa and Asia find strong evidence of improved financial protection and health care usage due to health insurance (Spaan et al. 2012). However there is mixed evidence on the inclusion of vulnerable groups. While different initiatives are undertaken, including discount cards, subsidies and free enrolment, gaps in inclusion and utilization among the poor remain in almost all schemes.

Figure 1.2
Health insurance coverage in developing countries



Source: Author's illustration based on Garrett et al. (2009).

1.3 Selected safety nets and their productive linkages

In the early stages of the discourse, the primary role assigned to social protection in developing countries was to prevent and reduce poverty. Following their success in Latin America, social protection programmes have also been increasingly recognized as a tool for redistribution (see World Bank, 2006). In developed countries, particularly in countries with extensive welfare systems, there has been a longstanding debate on the positive and negative effects of social security for productivity and growth (see Sala-i-Martin, 1997). In the debate on social protection in developing countries, the potential macro-level contributions of safety nets have only recently been discussed more systematically (see Alderman and Yemtsov, 2012; 2013; Barrientos, 2012).

Alderman and Yemtsov (2012; 2013) and Barrientos (2012) have attempted to structure the debate on the impact of safety nets on growth. They have identified four channels through which safety nets contribute to an expansion of productive capacities and growth: first, they help to overcome capital market imperfections and thus improve household resource allocation and promote the accumulation of assets and human capital; second, they assist in household risk management (*ex post* and *ex ante*) and thus ensure consumption and asset security; third, they promote the creation of community assets and enhance labour markets and demand at the local level, and fourth, at the macro level they facilitate policy reform and social cohesion (Alderman and Yemtsov, 2013).

In the following we use the framework provided by Alderman and Yemtsov (2012; 2013) and Barrientos (2012) to discuss the potential productive contributions of the safety net mechanisms under scrutiny in this thesis in more detail. While the review by Alderman and Yemtsov (2012; 2013) and Barrientos (2012) is mainly focused on social transfers, in this thesis we also consider the family as an institution for informal risk management and public health insurance as a formal protection mechanism. We therefore expand the review to also include these mechanisms. Furthermore, we also consider aspects that potentially hinder growth. Figure 1.3 provides a graphic representation of the channels considered.

In the absence of functioning credit and insurance markets, the family can play an important role in overcoming these market failures. The positive role of the family as a safety net in the event of shocks has, for example, been discussed and documented by Fafchamps and Gubert (2007), Akresh (2009), and Mazzucato (2009). On the role of the family as means of overcoming capital market imperfections, Au and Kwan (2009) show that family funding forms an important part of the initial capital structure of Chinese start-up firms. However, they also point out that initial funding from the family is only contemplated if interference in the business is expected to be low. The potential positive effects of the family on entrepreneurship and enterprise development are also discussed by Bertrand and Schoar (2006). Betrand and Schoar (2006) show that stronger family ties are also associated with less reliance on external finance. However, linking family ties to economic outcomes, the authors find that that strong family ties are negatively associated with economic outcomes i.e. firm size, for example. This latter observation largely ties in

with the idea presented in more detail in Chapter 2 of this thesis, i.e. that the family could also work as a constraining factor for enterprise development and growth. Thus while the family might fulfil an important function in contexts where insurance and credit markets are incomplete, their role for economic growth might be ambiguous.

Health insurance is thought to contribute to growth mainly by improving human capital. There is strong evidence that health insurance improves the utilization of health care services (see e.g. Jütting , 2004; Wagstaff, 2007; Wagstaff et al, 2009; King et al, 2009; Aggarwal, 2010; Devadasan et al., 2010; Sparrow et al, 2012) which is considered an important pathway through which human capital improvements are manifested. Direct effects of health insurance on the actual heath status of enrolees have, for example, been identified by Wagstaff and Pradhan (2005) and Quimbo et al. (2011). Quantifying the precise effect of improved health on growth is still difficult. Weil (2007) provides the most recent account. He compiles different estimates from the literature to assess the return to health and finds, for example, that an elimination of the health differences between countries would reduce the variance in log GDP per worker by approximately 9.9 per cent (Weil, 2007). However, his estimates do not account for potentially important non-linearities in the relationship between health and growth. Bloom et al. (2010) estimate the implications of population aging, as a result of better health and health care, on growth and conclude that population ageing might have modest negative effects on growth in OECD countries but will not significantly offset growth in developing countries. In these countries the potential growth- reducing effects of population ageing are likely to be offset by higher female labour force participation.

While endogenous growth theories predict that investment in human capital has a positive effect on economic growth (see e.g. Romer, 1990) the empirical investigations on the potential productive effects of the family and health insurance are still largely confined to the micro level. Public works, however, are expected to contribute to growth both through productive improvements at the micro as well as the wider community level. At the micro level, public works transfers are thought to increase household investment. Positive evidence of this is, for example, provided by Berhane et al. (2011) who show a positive effect of public works on livestock holding in Ethiopia. Furthermore, Berhane et al. (2011) also provide evidence on the role of public works programmes as

risk management instrument in the event of shocks. They show that households participating in public works in Ethiopia required fewer distress sales of assets (Berhane et al, 2011). Sumarto et al. (2007) also document a similar positive effect in Indonesia. Alternatively, Datt and Ravallion (1994) point out that public works programmes could have crowding out effects which could imply a reduction in employment and productivity. Investigations into the labour market effect of the public works programme in India however, find no evidence of negative employment effects (see Papp and Imbert, 2012; Zimmermann, 2012).

At the community level, public works programmes contribute directly to an expansion in community assets and infrastructure. Subbarao et al. (2013) show, for example, that local irrigation projects realized through public works have a positive effect on agriculture in Ethiopia. Evidence on income growth at the community level is available for other safety net programmes (see e.g. Angelucci and de Georgi, 2009) but specific evidence from public works programmes is still missing.

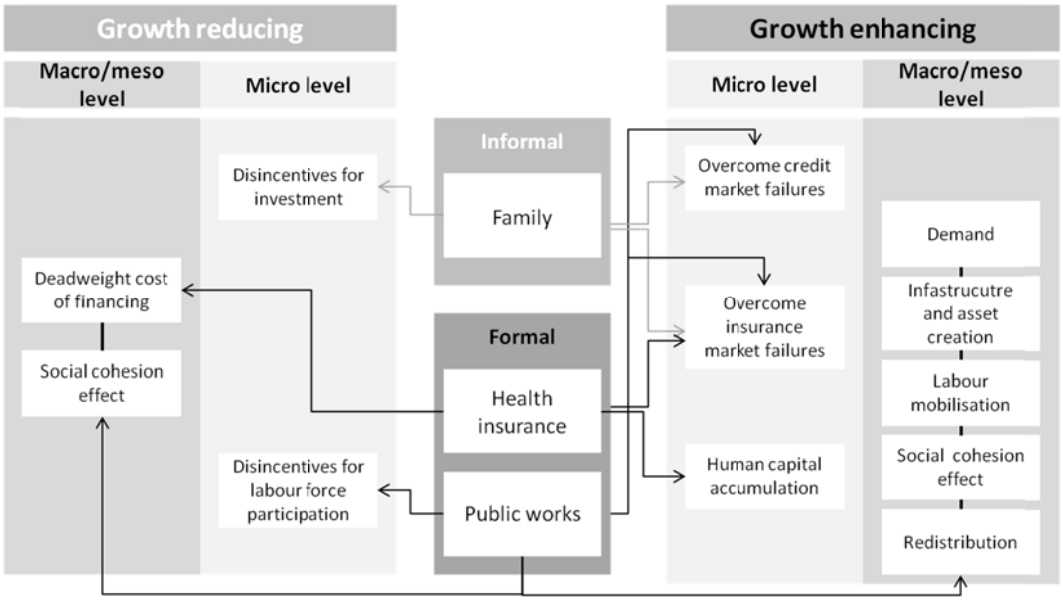
At the macro level, Alderman and Yemtsov (2013) present the positive effects of transfer programmes: enforcing redistribution, improving social cohesion and facilitating policy reform. Positive evidence on the effect of public works on social cohesion is, for example, provided by Blattman et al. (2012) in Uganda. On the other hand, using the example of a transfer programme in Mexico, Adato (2000) points to the potential negative effects of targeted programmes on social cohesion at the community level. Thus overall the effect of public works on cohesion and subsequently growth might actually be ambiguous. For completeness, one further aspect that also has to be considered when assessing the contribution of safety nets to growth is the deadweight cost of financing these mechanisms e.g. in cases where the formal social protection mechanisms are tax financed (see e.g. Levy, 2007; Barrientos, 2012; Alderman and Yemtsov, 2012; 2013). Thus far however, there is little detailed discussion on this aspect.

As more and more micro level evaluations on the effects of safety nets are becoming available, efforts to estimate the potential macroeconomic impacts are also increasing. However, due to a lack of monitoring data, few long-term studies on the effects of safety nets, and the methodological challenge of aggregating the benefits from different instruments and at different levels into a single figure, there are as yet hardly any estimates of the potential growth effects available (Alderman

and Yemtsov, 2012). Zawan and Tiwari (2013) have recently made an effort to estimate the potential growth effects of social protection using cross-country data. Their estimates suggest that an increase in social protection spending from zero to 2 per cent of GDP would increase growth by 0.1 to 0.4 percentage points (Zawan and Tiwari, 213). At the country level, Mallick, (2000) estimates that between 1995 and 1997 the Bangladesh Rural Advancement Committee (BRAC) contributed between 0.7 to 1.15 per cent to the GDP in Bangladesh. McCord and van Seventer (2004) estimate that an increase in labour intensive public work in South Africa by 0.2 per cent of GDP would lead to an increase in GDP by 0.34 per cent. Finally, Ladim (2009) estimates that a 10 per cent increase of *Bolsa Familia* increases the municipal GDP in Brazil by 0.6 per cent. For the reasons mentioned before, the methodological rigour of these studies is limited. The estimates should thus be viewed with caution. Nevertheless the figures suggest only moderate effects of social protection policies on growth in developing countries.

Figure 1.3

Selected mechanisms and their links to growth



Source: Author's illustration.

2 Does Forced Solidarity Hamper Investment in Small and Micro Enterprises?

Sharing is a norm in many societies. In this chapter we derive a theoretical model on the trade-off between sharing and enterprise investment, which we test on data from tailors in Burkina Faso. The empirical results support the idea that there are two behavioural patterns: entrepreneurs following an 'insurance regime' comply with sharing norms, are insured but reduce investment in their firm, whereas entrepreneurs in the 'growth regime' are not insured but take undistorted investment decisions. The choice of regime depends on the redistributive pressure, the willingness to take risk and the return on investment.

2.1 Introduction

Previous research has shown that small and micro entrepreneurs in poor countries achieve relatively high marginal returns to capital but show very low reinvestment rates (see e.g. McKenzie and Woodruff, 2006, 2008; De Mel et al., 2008; Kremer et al., 2010; Fafchamps et al., 2011; Grimm et al., 2011). The literature is rather inconclusive on the possible causes of the observed pattern. While capital market imperfections have been shown to be related to high marginal returns (McKenzie and Woodruff, 2006; De Mel et al., 2008), they do not explain why these returns are not retained and reinvested. Risk, as another factor, has also been associated with high returns, whereby low reinvestment rates are explained by households being required to hold onto cash if investments are largely irreversible (see e.g. Fafchamps and Pender, 1997). One aspect which has received less attention so far is whether obligations to share constitute an important cause of low reinvestment rates.

In a context where people are frequently exposed to severe shocks but were the possibilities for smooth consumption are limited, sharing might be necessary to secure subsistence at all times. At the same time, sharing obligations or 'forced solidarity' might cause disincentive effects in respect to productive activities. Specifically, under strong sharing norms it may be difficult to save and invest, in which case sharing obligations can become an important deterrent to economic growth and development.

The idea that family and kinship ties may imply adverse incentive effects on economic activity is relatively old, particularly in the context of Sub-Saharan Africa. It was, for example, often mentioned in anthropological literature (see e.g. Barth, 1967) and was emphasized by modernization theorists but with very different nuances and clearly distinguished conclusions (see e.g. Lewis, 1955; Meier and Baldwin, 1957; Bauer and Yamey, 1957; Hirschman, 1958; Rostow, 1960). Negative incentive effects are also discussed in the field of economic sociology and social network analysis as the downside of 'strong ties' which are also often referred to as 'bonding ties' (Granovetter, 1973, 1983, 1985; Barr, 2002).

More recently, the topic has been taken up again by a few economists (see, for example, Platteau, 2000; Hoff and Sen, 2006; Alger and Weibull, 2008, 2010). While acknowledging that family and kinship ties can be a vehicle for mutual insurance in contexts where formal insurance markets do not exist, these authors also argue that these ties may become an important obstacle in the process of economic transition when economically successful members within the kin may be confronted with sharing obligations by less successful ones. These obligations may require successful members to remit money, find jobs or host relatives in the city home (see, for example, Hoff and Sen, 2006). The main hypothesis that can be derived from these considerations is that these demands – or forced solidarity – can adversely affect the incentives of otherwise successful relatives to pursue and develop their economic activity. While opting out of the kinship network and refusing to comply with sharing obligations is possible, it may result in sanctions and high psychological costs (as in Hoff and Sen's (2006) model).

To date, there has been very little empirical backup for the existence of negative effects associated with family and kinship ties though there is some evidence that successful individuals do indeed tend to use various strategies to hide their income. Di Falco and Bulte (2011), for instance,

find evidence that kinship size is associated with higher budget shares for non-sharable goods. Baland et al. (2011) analyse borrowing behaviour and find that some people take up credit even when they don't suffer from a liquidity constraint just to signal to their kin that they are unable to provide financial assistance. Brune et al. (2011) arrive at similar conclusions concerning saving, whereby commitment saving arrangements are found to lead to larger savings than ordinary saving arrangements. The authors further explain the positive impact of commitment saving with the desire to keep funds from being shared with one's kin. Adverse incentive effects due to redistributive pressure are also identified by Jakiela and Ozier (2012). They conducted lab-experiments in rural Kenyan villages in which they randomly vary the observability of investment returns to test whether subjects decide to hide income under certain conditions and indeed find that participants who know that the outcome of their investment will be made public make decisions that are expected to be less profitable. Similar results are also reported in an experimental study by Hadnes et al. (2011) who find that sharing obligations and expectations on future demands for financial support lead to a significant reduction in labour input and productivity. In a real-life setting, Duflo et al. (2011), point to sharing obligations as one explanation why impatient Kenyan farmers forgo highly profitable investments in fertilizer. They argue that the impatience is partly rooted in the difficulty of protecting savings from consumption demands. Finally, Fafchamps (2002) also finds a negative association among agricultural traders in Madagascar between perceived 'fear of predation by relatives' and value added.[1]

Against this background, the purpose of this chapter is to explicitly investigate whether family and kinship ties reduce the incentive and ability to invest in enterprise capital. We start from a theoretical model in which entrepreneurs have to decide whether they want to invest and rely on themselves or whether they share their income with their family and kin, and hence forgo investment opportunities but are insured against business and household-related shocks. A sanction that is imposed if sharing is refused may force entrepreneurs to comply even if, from their individual perspective, investing would be the better alternative. In other words, sharing becomes the norm and can be interpreted as a compulsory informal insurance, non-compliance with which is costly. Predictions derived from that model are then tested empirically using data on small and micro enterprises in Burkina Faso. Sharing norms are generally

strong in the Burkinabé context, in particular within the ethnic group of the Mossi which is the dominant ethnicity in Ouagadougou (Fiske, 1990; Englebert, 1996).

It is important to note that in this chapter we focus on family and kinship ties as opposed to social networks. The main difference between family and kinship ties on the one hand, and the social network as a generic set of individuals who interact, on the other, is that family and kinship ties can be seen as largely exogenous and cannot be changed freely or only at a high psychological costs (La Ferrara, 2007). There are hence different types of ties and the family and kinship network can be considered an important sub-network of the larger social network. This distinction largely overlaps with the distinction made in the field of economic sociology and social network analysis referring to 'weak' and 'strong ties' (Granovetter, 1973, 1983) whereby strong ties describe those links to the immediate family and kin and refer to rather closed networks. Strong ties may be important for risk-sharing or social insurance. Weak ties, in contrast, go beyond the own social circles and play, for instance, a central role in the circulation of and access to information, concerning, for example, information on factor and product markets.

The remainder of this chapter is organized as follows. In Section 2.2 we develop a theoretical model of investment and transfers in a context of strong sharing obligations. In Section 2.3 we present the data and key variables. In Section 2.4 we translate the theoretical model into a set of structural equations to be estimated econometrically. In Section 2.5 we discuss the results and in Section 2.6 we conclude.

2.2 A model of investment under redistributive pressure

Although the model is intended to have broader relevance, we call, in what follows, entrepreneurs simply 'tailors', as this group of entrepreneurs will be the subject of our empirical analysis later in the chapter. The tailor operates in an urban setting. It is assumed that the tailor maximizes the present value of expected utility over two consecutive periods. At the beginning of the first period, he has to decide whether he wants to stay in his kinship network $(q = 1)$. The network provides him with perfect insurance against a catastrophic shock S that occurs with probability π $(with\ 0 < \pi < 1)$ in each period.[2]

The loss S and the distribution of π is known to the tailor. In turn, the tailor has to pay remittances, R, to the kin at the end of period 1. If the tailor decides to step out of the kinship network $(q = 0)$, he has no insurance, does not have to pay R, but bears a disutility, D, in the first period. The disutility results from sanctions imposed on him because of his refused solidarity with the kin. Such sanctions may comprise a loss of social status, harassment or the exclusion from ceremonies.

The tailor's expected welfare, W, is given by:

$$W = \sum_{t=1}^{2} \beta^{t-1}\left[E\left(U(C_t)\right)\right] + (1 - q)D. \tag{2.1}$$

We assume that the underlying utility function is of the CRRA[3] type which, in its most general form, can be written as follows:

$$U = \frac{C^{(1-\theta)}}{1-\theta} \text{ with } 0 < \theta < 1, \tag{2.2}$$

where the parameter θ measures the degree of the tailor's risk aversion.

C_t stands for consumption, derived from income from the production activity, Y_t, minus investment, I. In those cases in which the tailor remains in the kinship network $(q = 1)$, he remits R and is not affected by the shock S. If he opts out, no remittances are made but the tailor may incur a financial loss related to a shock in period 2. In period 1, the tailor's consumption is hence:

$$C_1 = Y_1 - I - qR, \tag{2.3}$$

and in period 2 the (expected) consumption is:

$$E(C_2) = Y_2 - (1 - q)\pi S. \tag{2.4}$$

Output is produced using only capital, K. We focus on capital inputs in the model and in our empirical study although we acknowledge that

the allocation of other inputs, in particular labour, may also be affected by kinship pressure.[4] The tailor produces according to a standard neo-classical production function with standard properties, i.e. $f'(K_t) > 0$, $f''(K_t) < 0$, $\lim_{Kt \to \infty} f'(K_t) = 0$ and $\lim_{Kt \to \infty} f'(K_t) = \infty$. Income is then given by:

$$Y_t = f(K_t). \tag{2.5}$$

The price of the goods produced by tailors is the numeraire and hence equal to one.

At the beginning of period 1 the tailor has a capital stock, K_1. K_1 is exogenous and may differ across tailors. K_1 can only be used for production. It cannot be depleted or rented out. After period 1, the tailor can use his income to finance additional investment to adjust his capital stock in the second period, i.e.

$$K_2 = K_1 + I. \tag{2.6}$$

We make the strong, but not necessarily implausible, assumption that all tailors are credit constrained.[5] Hence, any investment at the end of period 1 needs to be financed out of earnings.

The tailor's income in the first period is, however, not only the source of liquidity for investment, but also subject to remittances extracted by the kin through imposing a 'tax' on the tailor's income. The tax rate, t, is assumed to depend on the pressure for redistribution, N, which is in turn determined by the size of the kin that potentially seeks support. Pressure for redistribution may also be influenced by the intensity of sharing norms prevailing in the tailor's kin, the extent to which potential recipients behave as free-riders and the costs of observing the tailor's income. These factors are not explicitly modelled. It is important to note that t is not a function of income, as it would probably be in a formal insurance system. The remittances, R, that have to be paid in those cases in which the tailor stays within the kinship network are hence given by:

$$R = t(N)Y_1 \text{ with } 0 < t < 1. \tag{2.7}$$

This formulation with a tax rate that does not take account of the network's welfare may imply that improvements in the tailor's aggregate welfare and in the tax-imposing network may be possible. Taxes may prevent the tailor from undertaking investments that in the long run would allow for higher transfers. We think that allowing for such inefficiencies is plausible in the context that we are considering. First, the kin in the village may, in particular, need assistance to cope with short-term shocks. Second, the network may have a different discount rate, as transfers in this context typically go from younger to older cohorts. This is backed-up by anecdotal evidence from fieldwork. However, we suppose that t must be such that remittances always ensure that the tailor still has at least a subsistence income, hence:

$$t < 1 - \frac{Y^{Sub}}{Y_1}. \tag{2.8}$$

The tax rate, t, is known to the tailor.

The sanction, D, imposed on the tailor in the event of non-compliance with the risk-sharing network is also assumed to depend on the pressure for redistribution, N, thus:

$$D = \gamma(N) \quad with\ \gamma < 0 \text{ and hence } D < 0. \tag{2.9}$$

Hence, the tailor maximizes welfare, W, over periods 1 and 2 choosing q and the optimal size of I given the credit constraint and the tax that needs to be paid under $q = 1$:

$$\begin{aligned} Max_{q,I} W &= U(C_1) + \beta E[U(C_2)] + (1-q)D \\ &= U\big(Y_1 - I - qR\big) + \beta E[U(Y_2 - (1-q)\pi S)] + \\ &\quad (1-q)D \end{aligned} \tag{2.10}$$

s.t. Equations (2.5), (2.6), (2.7), (2.8) and (2.9).

As illustrated below, optimal choices of capital stocks differ between exiting $(q = 0)$ and staying $(q = 1)$ in the kinship network. These optimal choices will be denoted $*$ for $q = 0$ and $**$ for $q = 1$. The tailor will thus stay in the network if the difference, ΔW, between given optimal choices under each regime is positive.

$$\begin{aligned}\Delta W &= W(q = 1) - W(q = 0) \\ &= U(Y_1^{**} - I^{**} - R) + \beta U(Y_2^{**}) \\ &\quad -(U(Y_1^{*} - I^{*}) + \beta E[U(Y_2^{*} - \pi S)] + D).\end{aligned} \tag{2.11}$$

We can now also examine the optimal conditions for investment under the two regimes, i.e. the growth and insurance regimes. If the tailor opts out of the kinship network $(q = 0)$, and hence opts for growth, his decision on capital stocks will follow standard intertemporal decision rules equating the expected marginal rate of substitution between present and (discounted) future consumption to the marginal rate of transformation between present and future production. Maximizing W according to Equation (2.10) with regard to I then yields:

$$\frac{1}{\beta}\left(\frac{f(K_1+I)-E(\pi S)}{Y_1-I}\right)^{\theta} = f'(K_1 + I) \tag{2.12}$$
$$(\text{growth regime, i.e. } q = 0).$$

The optimality condition under the insurance regime reads:

$$\frac{1}{\beta}\left(\frac{f(K_1+I)}{(1-t)Y_1-I}\right)^{\theta} = f'(K_1 + I) \tag{2.13}$$
$$(\text{insurance regime, i.e. } q = 1).$$

This latter condition shows that the tailor's investment decision – if he chooses to stay in the network – is distorted by the tax levied on income from his entrepreneurial activity.

Each of these conditions imply optimal investment amounts, $I^{*}$and I^{**} respectively, for a given set of parameters. These optimal amounts in

turn can be substituted into Equation (2.10) and yield the optimal welfare levels, W^* and W^{**}, that will be compared by the tailor to decide whether to stay in the network or not. I, and thus W, are implicit functions of the various exogenous variables, θ, N, S and K, and Equations (2.12) and (2.13) cannot be solved to isolate I. However, it is possible to comment on some comparative static results.

With respect to the choice of q, a risk neutral tailor with a given initial capital stock K_1 would have no preference between the two regimes if the sanction that applies if the tailor leaves the network (D), together with the expected losses due to possible shocks (S), exactly outweighs remittances (R). At this indifference threshold a (more) risk-averse tailor will, ceteris paribus, opt for staying in the kinship network; so will a tailor with a lower initial capital stock and a tailor facing a higher expected loss, S. The maximization problem is more complicated if pressure for redistribution, N, varies, as N affects both R and D. In this case, optimal investment (in the insurance regime) and the choice of staying in the network depend on the exact parameterization of the model.

In the following we consider the investment decision conditional on having chosen a specific regime. The above conditions show that the tailor's investment decision – if he chooses to stay in the network – is distorted by the tax levied on the income from his entrepreneurial activity. This distortion increases with N: the denominator on the left hand side of Equation (2.13) will be smaller, the marginal product of capital hence larger, i.e. the capital stock, K_2, and investment, I, smaller, ceteris paribus. The investment decision by the entrepreneur outside the network is not affected by N. Under both regimes, investment will be lower the higher the initial capital stock, as a consequence of assuming a neoclassical production function. Similarly, the choice of the utility function implies that investment by more risk-averse entrepreneurs will also be lower. Finally, the size and the probability of the shock will negatively affect investment by the tailor who opted out of the network.

Within each regime our problem implies the following signs of the partial derivatives of the optimal amounts of investment $I^*$and I^{**}.

Growth regime $(q = 0)$:

$$\frac{\partial I^*}{\partial N} = 0, \quad \frac{\partial I^*}{\partial K_1} < 0, \quad \frac{\partial I^*}{\partial \theta} < 0, \quad \frac{\partial I^*}{\partial(\pi S)} = 0.$$

Insurance regime $(q = 1)$:

$$\frac{\partial I^*}{\partial N} < 0, \quad \frac{\partial I^*}{\partial K_1} < 0, \quad \frac{\partial I^*}{\partial \theta} < 0, \quad \frac{\partial I^*}{\partial(\pi S)} = 0.$$

From these results we derive the following five hypotheses, which will be tested in our empirical analysis:

- Investment decreases with the initial size of the capital stock.
- Risk-averse tailors tend to choose the insurance regime.
- Redistributive pressure has an ambiguous effect on regime choice.
- For tailors in the insurance regime, redistributive pressure reduces investment.
- For tailors in the growth regime, redistributive pressure does not affect investment.

2.3 Data

2.3.1 General description of the data

In January 2011 we interviewed 380 tailors in Ouagadouou, the capital of Burkina Faso, with a focus on their kinship networks and questions about their business. The same tailors were re-visited in January 2012 to collect supplementary information. We selected tailors as the target group as this is a very well defined profession and thus covers a relatively homogeneous group. Most tailors employ some physical capital, most importantly one or more sewing machines; hence investment decisions are an important part of their economic activity.

The questionnaire used was organized around 17 modules covering the following areas: characteristics of the entrepreneur; his firm and his household including questions about his origins and links to that origin; household assets; a module on the structure of the kinship network including transfers sent and received; a module about the start-up phase of the firm; the employed labour force; production; expenditures and fees; savings; physical capital; investment and sources of finance; plans for the future; a module on problems and perspectives; a module on abilities and risk attitudes; the family background; and a module on attitudes toward sharing norms and obligations. The three latter modules were part of the questionnaire in 2012.

The survey was implemented using a two-stage random sampling procedure selecting 400 tailors in 10 out of the 30 sectors of Ouagadougou. The response rate to the survey was 95 per cent. Of the interviewed tailors, 321 reported that they came from a village or another town in Burkina Faso to the capital. Of this group, 278 could be re-interviewed in 2012 to collect further information.[6]

In our empirical analysis, we focus on these internally migrating entrepreneurs since we are particularly interested in the link that these urban tailors have with their family and kin in their village of origin.

Table 2.1 shows some key characteristics of these tailors. About 80 per cent of the tailors in our sample are male. They are on average 35 years old and 75 per cent belong to the dominant ethnic group in Ouagadougou, the Mossi. The education level is generally low but 33 per cent of the tailors in our sample completed at least primary school. On average, the tailors remit to about 2.4 persons either in cash or in-kind, mainly to relatives, in particular parents and siblings, and to people in their village of origin. The average value of these remittances amounts to about 240 Euro per year.[7] Most of the remittances are given for food, education and other items including health care. Remittances to co-finance investments other than education are relatively rare. Remittances for ceremonies are frequent, but in terms of their total amount they are rather unimportant.

When the tailors were asked whether they experienced a shock (up to three could be reported), almost 80 per cent reported that a shock occurred in the 12 months preceding the survey, mostly health shocks and other household related shocks. Customers not paying their bills accounted for about 25 per cent of all reported shocks. These shocks are

all idiosyncratic in nature and can in principle be insured through informal insurance networks. When asked about their coping devices (again up to three were asked), 21 per cent reported that they received some help from relatives or friends.

With respect to their entrepreneurial activities, the average monthly turnover (derived from their reported sales) amounts to about 225 Euro. The average reported monthly profit is about 20 Euro (not reported in Table 2.1). Note that this implies that average annual remittances would be as high as annual average profits. Yet, both sales and profits are probably somewhat underestimated. We tried to compute earnings by subtracting all costs for intermediate inputs, taxes, charges and labour from turnover. However, this did not lead to plausible numbers.[8] The sampled tailors report having an average physical capital of about 665 Euro (valued at replacement costs). However, the variance is quite pronounced. Physical capital comprises tools, machines, furniture and the workshop. 76 per cent of the tailors invested an average amount of 222.50 Euro in the past 12 months, an amount close to remittances.[9] 97 per cent of all investment items were financed out of own savings. Neither transfers from relatives or friends nor credit are a prominent source of finance. This also holds for start-up investment which is mainly financed out of savings.

Table 2.1
Descriptive statistics (N=278)

	Mean	SD

Owner characteristics		
Male (=1)	0.81	
Age (years)	34.8	9.3
Household head (=1)	0.75	
Primary school completed (=1)	0.33	
Married (=1)	0.62	
Mossi (=1)	0.75	
Muslim (=1)	0.55	
Number of persons remitted to (past 12 months)		
Siblings	0.9	1.1
Any direct family member	1.9	1.3
Any person from village (incl. family in that village)	1.2	1.4
Any person (i.e. all persons remitted to)	2.4	1.4
Amounts remitted in Euro (past 12 months)		
Siblings	77.7	257.9
Any direct family member	163.2	330.2
Any person from village (incl. family in that village)	79.5	132.7
Any person (i.e. all persons remitted to)	237.9	909.5
Share of total remittances given for		
Food	0.48	0.40
Education	0.15	0.21
Investment	0.06	0.21
Drugs	0.03	0.13
Ceremonies	0.02	0.11
Other (incl. health care other than drugs)	0.26	0.33
Tailor reported shock that occurred to him/her (=1)	0.79	
Type of problem for three most important shock (shares)		
Medical problem with high financial costs	0.29	
Death of a household member	0.12	
Wedding, baptism, other ceremony	0.13	
Customer didn't pay	0.24	
Other	0.21	
Household receives help following a shock (=1)	0.21	

Table continues next page.

Table 2.1
(… continued)

	Mean	SD
Firm characteristics		
Age of firm (years)	7.4	6.7
Firm is registered (=1)	0.31	
Works from a workshop (=1)	0.84	
Has access to electricity (=1)	0.85	
Has electric sewing machine (=1)	0.68	
Monthly turnover in Euro	225.3	645.5
Physical capital in Euro	664.2	1,320.8
Firms size (staff, incl. owner and fam. helpers)	3.8	1.8
Total monthly hours worked	868.9	457.4
Invested previous 12 month (=1)	0.76	
If invested, financed through savings (=1)	0.97	
Investment past 12 months in Euro	222.5	432.9
Current owner set up the enterprise (=1)	96.8	
For those, most important source of finance (shares)		
Savings	0.86	
Donation	0.11	
Heritage	0	
Family loan	0.02	
Other	0.01	
… second most important source of finance (shares)		
Savings	0.04	
Donation	0.28	
Heritage	0.01	
Family loan	0.03	
Other	0.64	
Help from others, still paying back (=1)	0.11	

Source: Own data, collected in January 2011 and 2012 in Ouagadougou, Burkina Faso.

2.3.2 Measures of pressure for redistribution

To establish causality between pressure for redistribution and our outcomes of interest – investment and transfers – we need to find exogenous measures for redistributive pressure. These measures should not be affected by the tailor's reaction to kinship pressure. Neither observed transfers to the kin nor the number of people seeking (or receiving)

transfers are thus appropriate indicators. Instead, we use the number of living siblings, assuming that the pressure for redistribution increases with their number. We have selected this indicator for three reasons. First, it is relatively easy to report and measurement error should not be a problem. Second, siblings are, as Table 2.1 shows, indeed an important recipient of remittances. Third, parents that have many children may themselves have been born into large families. Thus, the number of siblings should be a good proxy for kinship size in general. Obviously, one may argue that siblings per se rather reduce than increase redistributive pressure as the tailor could share the burden of remittances with them. However, this does not seem to be case. According to the survey respondents, more than half of their siblings are still in the village of origin, most of them do not remit but are in turn one of the most often-cited recipients of remittances.

To test the robustness of our results, we use two additional measures for redistributive pressure – the size of the village of origin (assuming that kinship size increases with village size) and the number of persons visiting the tailor in the past twelve months. We are aware of the potential endogeneity of this latter measure, as the number of visitors might respond to the tailor's business performance.

Table 2.2 presents some descriptive statistics of the indicators used. On average, the sampled tailors have 4.8 siblings who are still alive with a standard deviation of 2.5. 4 per cent have no living siblings, 57 per cent have between four and seven living siblings, and 12 per cent have eight and more siblings. According to the tailors, 1.8 out of the 4.8 siblings also remit to the family. About half of the tailors come from villages or towns with more than 10,000 inhabitants; only 20 per cent come from villages with less than 1,000 inhabitants.[10] Most tailors frequently have visitors from the village of origin with 45 per cent of the tailors receiving five and more such visitors per year.

Table 2.2
Measures of the pressure for redistribution (N=278)

	Mean	SD
Number of living siblings (shares)		
No siblings	0.04	
1 to 3	0.27	
4 to 7	0.57	
8 and more	0.12	
Average number of living siblings	4.77	2.50
Average number of siblings remitting to your family in the village of origin	1.77	2.36
Village size (shares)		
Less than 1,000	0.20	
1,000 to 10,000	0.32	
More than 10,000	0.48	
Number of visitors from the village of origin (past 12 months, shares)		
No visitors	0.17	
1 to 4	0.38	
5 to 9	0.24	
10 to 19	0.13	
20 and more	0.08	

Source: Own data, collected in January 2011 and 2012 in Ouagadougou, Burkina Faso.

2.3.3 Measures of risk aversion

Given the central role of insurance, risk and risk aversion in our theoretical model, we included a module on risk taking behaviour in the survey. Tailors were asked whether they would conduct the following six actions: (i) drink heavily and ride a motorbike; (ii) use a day's income for gambling; (iii) be in disagreement with an authority on a major issue; (iv) execute an order for a client without asking for an advance; (v) quote far too high a price when negotiating with a new client; and (vi) invest all savings in a new enterprise provided that 'you have a good idea'. Possible answers were 'very likely' (1), 'likely' (2), 'unlikely' (3) and 'very unlikely' (4). Based on the answers to these six actions, we ran a factor analysis and retained the principal factor component as an index of risk aversion. Table 2.3 shows the answer pattern given by the tailors. While they appear to be quite risk-averse with respect to the first three actions, they are prepared to take some risk with regard to business-related decisions.

Table 2.3
Descriptive statistics of variables that enter risk aversion index (N=278)

Action	Very likely	Likely	Unlikely	Very unlikely
Drink heavily and ride a motorbike	0.01	0.00	0.04	0.95
Use a day's income for gambling	0.01	0.03	0.11	0.85
Be in disagreement with an authority	0.13	0.17	0.13	0.57
Execute an order without asking for an advance	0.52	0.22	0.12	0.14
Quote far too high a price	0.35	0.15	0.24	0.26
Invest all savings in a new enterprise	0.21	0.15	0.27	0.36

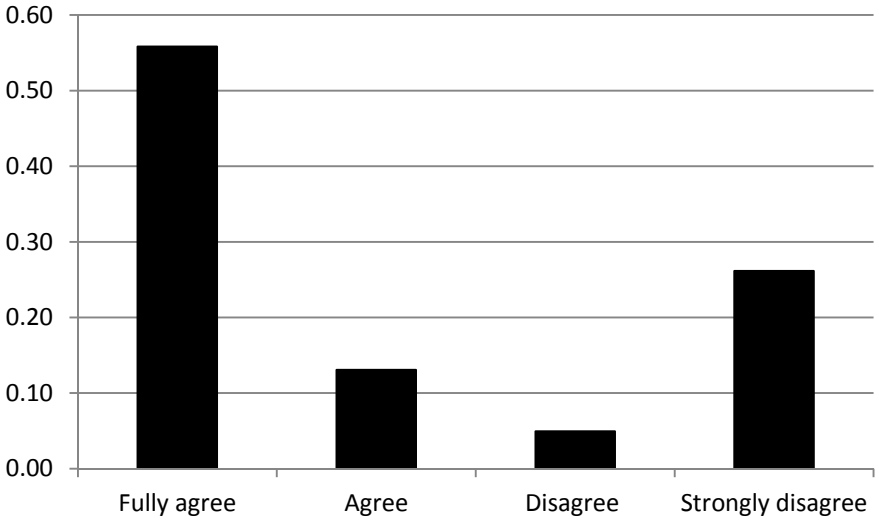
Source: Own data, collected in January 2011 and 2012 in Ouagadougou, Burkina Faso.

2.3.4 Perceptions about pressure for redistribution

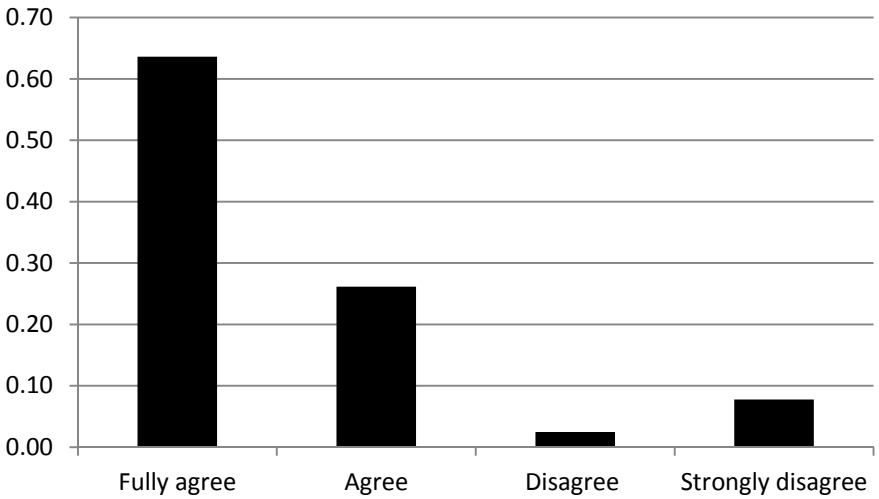
Before we empirically test the major predictions of our theoretical model, we briefly discuss what the tailors think of sharing obligations when they are directly asked about it. Our survey included a module on norms and obligations in which we asked the tailors to indicate to what extent they agree or disagree with a specific statement. The responses given (see Figure 2.1 below) provide supportive evidence on the basic intuition presented in this chapter, whereby the majority of respondents agree that the pressure for redistribution increases with business success. 45 per cent perceive it as a distinct obstacle to business development (Figure 2.1c).

Comparing the characteristics of those 45 per cent of the entrepreneurs that perceive family requests as a constraint to business development to those that do not, we see that entrepreneurs perceiving the constraint have, on average, more siblings alive (5.3 vs. 4.4 for those that disagree with the statement) and are hence potentially exposed to more pressure from their kin. Entrepreneurs that perceive family requests as constraining also exhibit significantly lower investment levels but on the other hand transfer on average about twice as much to their village of origin as compared to entrepreneurs that do not perceive family demands as constraining (97 Euro vs. 53 Euro). The differential characteristics are in line with the basic intuition of the theoretical model which gives us some comfort in the argumentation presented.

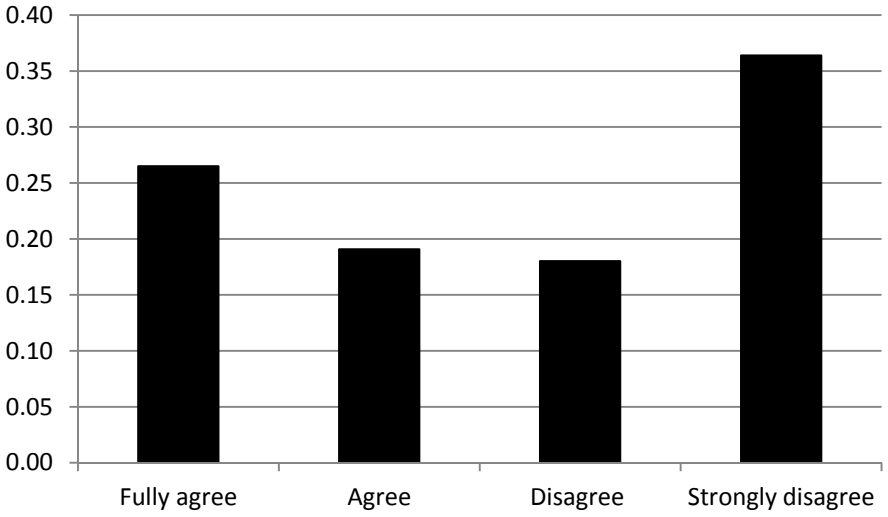
Figure 2.1
Perceptions about pressure for redistribution



2.1a: 'Every time I have money, my spouse or other family members in or outside the household ask for a part of it'



2.1b: 'Someone who succeeds with his/her firm will get additional requests from the family and friends to help financially'



2.1c: 'Requests from the family or friends can be so constraining that it is better not to develop the business'

Source: Author's illustration based on own data collected in January 2011 and 2012 in Ouagadougou, Burkina Faso.

2.4 Empirical specification

To test the five hypotheses described above we first estimate simple functions of enterprise investment and remittances and focus on the role played by redistributive pressure and risk aversion. Following the reasoning of the theoretical model, redistributive pressure should reduce business investment and increase remittances. The same effects are expected from risk aversion, as risk-averse tailors seek insurance. Second, we take our theoretical model literally and investigate the simultaneous decisions of staying in or opting out of the kinship network and of investing.

2.4.1 Investment

The investment equation relates physical business capital investments, I_i, of entrepreneur i to the capital stock in the previous period, $KL1_i$, the pressure for redistribution, N_i, and risk aversion, θ_i. Since we measure the pressure for redistribution but not the actual level of redistribution,

we consider N_i to be exogenous. The equation to be estimated reads as follows:

$$\ln I_i = \beta_{0I} + \beta_{1I} \ln KL1_i + \beta_{2I} N_i + \beta_{3I} \theta_i + \beta_{4I} H_i + X'_{ij} \beta_{5jI} + u_{iI}. \quad (2.14)$$

We include the owner's wealth, H_i, since wealth is an important source of finance for investment in a context of severe capital market constraints. Wealth includes only household assets, such as ownership of a television, a radio, a bicycle and so on, but no business-related capital goods. We do not directly include earnings, as this would raise serious endogeneity problems. The vector X_{ij} stands for a set of j control variables, including the age of the firm, whether the firm is formal, i.e. formally registered, the age, education and the ethnicity of the entrepreneur, and whether the entrepreneur is married and the household head. The vector X_{ij} also includes the number of sisters and brothers outside their household of origin, parental education and the father's (former) occupation. These latter controls will reduce any potential unobservable variable bias, i.e. ensure that the number of siblings only captures redistributive pressure and not other family background effects.

We use different specifications to estimate Equation (2.14): first, a simple linear regression model; second, a Tobit model, since for about a quarter of all tailors investment in the previous period was zero; and, third, a specification that uses the pressure for redistribution variable, N_i, as an instrument for reported transfers made.

2.4.2 Remittances

The transfer equation relates remittances, R_i, measured by the value of money and goods transferred to the tailor's village of origin to pressure for redistribution, N_i, and risk aversion, θ_i, controlling, as in Equation (2.14), for wealth, H_i, and other variables including family background summarized in X_{ij}. Hence, the equation to be estimated reads as follows:

$$\ln R_i = \beta_{0R} + \beta_{1R} N_i + \beta_{2R} \theta_i + \beta_{3R} H_i + \quad (2.15)$$

$$X'_{ij}\,\beta_{4jR} + u_{iR}.$$

We use three different specifications: a simple linear regression model; a Tobit model to account for the fact that about half of the tailors did not remit in the past 12 months; and a specification in which we do not use the value of the resources transferred as a dependent variable but the number of supported persons in the village of origin. Since the dependent variable in the latter specification is a count, we use a negative binomial regression model for estimation.

In order to test whether remittances indeed fulfil an insurance function for the entrepreneur, we estimate an equation that relates a binary variable, T_i, which takes the value 1 if the tailor received transfers from the kin following a shock $(P_i > 0)$ to remittances, R_i. Using a standard Probit model and including a set of controls similar to those in Equation (2.15) we estimate:

$$\Pr(T_i = 1) = \delta\left(\beta_{0T} + \beta_{1T}\ln R_i + \beta_{2T}\,H_i + X'_{ij}\,\beta_{3jT} + u_{iT}\right) \text{ if}(P_i > 0). \quad (2.16)$$

This estimation yields obviously only a correlation, as it is not possible to account for the exact timing of the help received and the remittances paid with the data at hand. Nevertheless, if informal insurance arrangements exist, we expect remittances to be paid permanently and not just in anticipation of or just after a shock.

2.4.3 Compliance with sharing norms and investment

Based on Equations (2.12) and (2.13), we investigate the simultaneous decisions to stay in (insurance regime) or opt out of the kinship network and to invest (growth regime). We interpret this simultaneous decision as a problem of sample selection and heterogeneity. This suggests using an endogenous switching regression model that can jointly estimate the decision about compliance and the decision on how much to invest (Maddala, 1983). We assume that the decision about compliance can be modelled through the following criterion function:

$$Q^* = \gamma_0 + \gamma_1 N_i + \gamma_2 \theta_i + \gamma_3 H_i + X'_{ij} \gamma_{4j} + \varepsilon_i \quad (2.17)$$

where Q^* describes the latent probability of being in the growth regime (note $Q = (1 - q)$), i.e. of not complying with the sharing norms and opting out of the kinship network. This probability is modelled as a function of redistributive pressure, risk aversion and other household and family background characteristics (with the variables defined as described above). The tailor opts for the growth regime

$$Q_i = 1 \text{ if } \gamma_0 + \gamma_1 N_i + \gamma_2 \theta_i + \gamma_3 H_i + X'_{ij} \gamma_{4j} + \varepsilon_i > 0$$

and for the insurance regime

$$Q_i = 0 \text{ if } \gamma_0 + \gamma_1 N_i + \gamma_2 \theta_i + \gamma_3 H_i + X'_{ij} \gamma_{4j} + \varepsilon_i \leq 0.$$

Obviously, working with this model requires us to determine the status $Q_i = 1$. We arbitrarily define this status by a threshold at which tailors transfer less than they invest, i.e. $\frac{R_i}{I_i} < 1$. One may argue that the threshold should be set at $R_i = 0$, but in the given context it is unlikely that entrepreneurs remit nothing at all and hence the chosen operationalization is more in line with the reality on the ground.[11]

Next we define an investment equation for each possible state: compliance (or insurance regime, S) and non-compliance (or growth regime, G).

$$\ln I_i^G = \beta_0^G + \beta_1^G \ln KL1_i + \beta_2^G N_i + \beta_3^G \theta_i + \beta_4^G H_i + X'_{ij} \beta_{5j}^G + u_i^G \text{ if } Q_i = 1 \quad (2.18)$$

$$\ln I_i^S = \beta_0^S + \beta_1^S \ln KL1_i + \beta_2^S N_i + \beta_3^S \theta_i + \beta_4^S H_i + X'_{ij} \beta_{5j}^S + u_i^S \text{ if } Q_i = 0 \quad (2.19)$$

It is assumed that ε_i, u_i^G, u_i^S follow a trivariate normal distribution. The covariance between u_i^G and u_i^S is not defined as I_i^G and $I_i^S$are never observed simultaneously. The model is identified by construction through non-linearities. Following Lokshin and Sajaia (2004), we estimate this endogenous switching regression model using the full information maximum likelihood (FIML) method. The FIML method estimates the selection equation and the investment equation simultaneously yielding consistent standard errors. For $Q_i = 1$ we expect β_2^G to be not significantly different from zero.

2.5 Test of hypotheses and discussion of results

2.5.1 Redistributive pressure, risk aversion and investment

Table 2.4 shows the results for the investment model (Equation (2.14)). We estimate six specifications. The dependent variable is the log of the value of total investment in the 12 months preceding the survey. In the first column we show the simple OLS model. In columns (2) to (5) we show the Tobit model and in column (6) we show the model in which the number of siblings is used as an instrument for transfers made.

In columns (1) and (2) we see that the number of siblings, here introduced via several categorical variables, our preferred measure of redistributive pressure, is significantly and negatively associated with investment. The marginal effects derived from the Tobit model are a bit lower than in the OLS model but qualitatively similar. The categorical siblings variable turns significant for entrepreneurs with four or more living siblings, thus when redistributive pressure increases. While the coefficient is highest for the dummy of eight or more siblings, the effects of the three dummies are not very precisely estimated and thus not significantly different from each other. In column (3) we alternatively use the continuous number of siblings alive and find a coefficient of -0.16, implying that for each additional sibling, investment declines by about 8 per cent. This is coherent with the marginal effects associated with the estimation in column (2). If we use the size of the village and the number of visitors as a proxy for the size of the kin and redistributive pressure we find consistently negative signs, but none of these coefficients is significant. Given that the village size only refers to the year of the survey and not to the year of birth of the entrepreneur, it might be a rather weak measure for

kinship size and pressure – so is the number of visitors, given the potential endogeneity. Hence, these measures are only used to test the robustness of the results but are not our preferred indicators for kinship pressure. In column (5), if we use transfers made directly we also get a negative sign, but the effect is not statistically different from zero. However, actual transfers are obviously endogenous. If we use our measure for redistributive pressure as an instrument for actual transfers made in order to generate variation in the transfers that can be considered exogenous to investment, we also find a significant negative effect. In other words, an exogenous increase in transfers made reduces investment. The associated marginal effect is well above unity, implying that the change in investment is larger than the change in transfers. This would suggest that transfers not only reduce the capacity to invest but also reduce the incentive to invest. With respect to risk aversion, we also find a strong negative effect (columns (1) to (5)). The computed marginal effects imply that an increase in the risk aversion index by one standard deviation (0.75) reduces investment by about 25 per cent. This is also in line with the hypotheses we had derived from out theoretical model.

Quite interestingly, we also find a robust negative effect associated with belonging to the Mossi ethnic group. As mentioned in the introduction, the Mossi are known for their pronounced solidarity with their kin and strong egalitarian norms (Fiske, 1990; Englebert, 1996). According to Fiske (1990), 'in work, transfers and consumption, the Mossi function as a collective "we", not as individuals' (p. 185). On average the Mossi invest about 50 per cent less than other groups.[12]

The effects of all other control variables are also in line with expectations, giving us confidence in the data and formulated model.[13] Investment declines with the size of the existing capital stock and the firm's age and increases with being formalized and the tailor's education level. The asset index is not significant. It might be an imperfect measure of household resources. Earnings in turn are positively significant if included, but we refrained from doing so given the potential endogeneity. Overall the specified model is able to explain quite a lot of the variance in investment, as indicated by an R-squared of about 25 per cent in the OLS specification.

Table 2.4

The effect of redistributive pressure and risk aversion on investment

	(1)	(2)		(3)		(4)		(5)		(6)
	OLS	**Tobit**	**ME**	**Tobit**	**ME**	**Tobit**	**ME**	**Tobit**	**ME**	**IV-Tobit**
Ln capital stock in t-1	-0.384 ***	-0.490 ***	-0.266	-0.485 ***	-0.262	-0.487 ***	-0.263	-0.473 ***	-0.257	-0.358 ***
	(0.049)	(0.063)		(0.062)		(0.062)		(0.062)		(0.137)
Asset index	0.105	-0.002	-0.001	0.001	0.001	-0.013	-0.007	-0.034	-0.019	-0.061
	(0.176)	(0.245)		(0.255)		(0.257)		(0.256)		(0.395)
Age of firm (years)	-0.062 ***	-0.077 ***	-0.042	-0.082 ***	-0.044	-0.079 ***	-0.043	-0.084 ***	-0.046	-0.062
	(0.023)	(0.029)		(0.029)		(0.029)		(0.029)		(0.053)
Firm is formal (=1)	0.595 *	0.715 *	0.388	0.781 **	0.423	0.856 **	0.462	0.666 *	0.361	-0.148
	(0.305)	(0.383)		(0.376)		(0.374)		(0.373)		(0.770)
No siblings alive	Ref.	Ref.								
1 to 3 siblings alive	-0.582	-0.897	-0.487							
	(0.620)	(0.684)								
4 to 7 siblings alive	-1.329 **	-1.805 ***	-0.980							
	(0.606)	(0.662)								
8 and more siblings alive	-1.503 **	-1.951 **	-1.059							
	(0.702)	(0.796)								
Number of siblings alive				-0.155 **	-0.084	-0.151 **	-0.081			
				(0.068)		(0.067)				

Table continues next page.

Table 2.4
(… continued)

	(1)	(2)		(3)		(4)		(5)		(6)
	OLS	Tobit	ME	Tobit	ME	Tobit	ME	Tobit	ME	IV-Tobit
Village size < 1,000				Ref.		Ref.				
1,000 < village size < 10,000						-0.121	-0.065			
						(0.424)				
Village size > 10,000						-0.422	-0.228			
						(0.392)				
20 visitors and more last year						-0.470	-0.254			
						(0.583)				
Ln amount remitted to village								-0.088	-0.048	-1.631 *
								(0.071)		(0.907)
Risk aversion index	-0.492 ***	-0.616 ***	-0.334	-0.648 ***	-0.351	-0.638 ***	-0.345	-0.626 ***	-0.340	0.008
	(0.169)	(0.200)		(0.205)		(0.208)		(0.208)		(0.517)
Age of tailor (years)	-0.045 **	-0.054 **	-0.029	-0.045 **	-0.024	-0.043 *	-0.023	-0.034	-0.018	-0.025
	(0.017)	(0.022)		(0.022)		(0.022)		(0.022)		(0.040)
Tailor is household head (=1)	-0.290	-0.440	-0.239	-0.490	-0.265	-0.543	-0.294	-0.494	-0.268	0.728
	(0.286)	(0.335)		(0.334)		(0.333)		(0.341)		(0.981)

Table continues next page.

Table 2.4
(… continued)

	(1)	(2)		(3)		(4)		(5)		(6)
	OLS	**Tobit**	**ME**	**Tobit**	**ME**	**Tobit**	**ME**	**Tobit**	**ME**	**IV-Tobit**
Primary completed (=1)	0.679 **	0.652 *	0.354	0.641 *	0.347	0.796 **	0.430	0.499	0.271	0.496
	(0.287)	(0.363)		(0.369)		(0.385)		(0.366)		(0.591)
Married (=1)	0.439	0.613 *	0.333	0.555	0.300	0.514	0.278	0.625 *	0.340	0.868
	(0.297)	(0.366)		(0.373)		(0.375)		(0.372)		(0.646)
Mossi (=1)	-0.764 **	-0.992 ***	-0.538	-1.031 ***	-0.558	-1.023 ***	-0.553	-1.043 ***	-0.566	-0.979
	(0.301)	(0.368)		(0.375)		(0.381)		(0.370)		(0.645)
# of brothers outside HH of origin	-0.053	-0.088	-0.048	-0.099	-0.053	-0.076	-0.041	-0.102	-0.055	0.029
	(0.052)	(0.072)		(0.071)		(0.072)		(0.070)		(0.140)
# of sisters outside HH of origin	0.086	0.108	0.059	0.108	0.058	0.116	0.063	0.085	0.046	-0.001
	(0.059)	(0.076)		(0.078)		(0.080)		(0.078)		(0.130)
Father primary completed (=1)	0.753	0.851	0.462	0.909	0.492	0.977	0.528	0.955	0.518	0.133
	(0.585)	(0.704)		(0.733)		(0.720)		(0.733)		(1.271)
Mother primary completed (=1)	-1.201 *	-1.505 **	-0.817	-1.484 *	-0.803	-1.484 *	-0.802	-1.364 *	-0.741	-0.590
	(0.633)	(0.750)		(0.770)		(0.756)		(0.771)		(1.646)
Father is/was farmer (=1)	0.623 *	0.801 *	0.435	0.759 *	0.411	0.787 *	0.426	0.796 *	0.432	1.042
	(0.322)	(0.416)		(0.418)		(0.417)		(0.422)		(0.702)

Table continues next page.

Table 2.4
(… continued)

	(1)	(2)		(3)		(4)		(5)		(6)
	OLS	**Tobit**	**ME**	**Tobit**	**ME**	**Tobit**	**ME**	**Tobit**	**ME**	**IV-Tobit**
Father is/was indep. non-agric. (=1)	0.290	0.419	0.228	0.305	0.165	0.309	0.167	0.354	0.192	0.703
	(0.329)	(0.408)		(0.393)		(0.400)		(0.393)		(0.709)
Constant	7.649 ***	8.707 ***		7.788 ***		7.819 ***		6.885 ***		8.151 ***
	(0.956)	(1.110)		(0.961)		(0.972)		(0.887)		(1.801)
/sigma		2.444 ***		2.474 ***		2.456 ***		2.489 ***		
		(0.122)		(0.123)		(0.123)		(0.123)		
R-squared	0.253									
N	278	278		278		278		278		278
Censored N		67		67		67		67		

Notes: Marginal effects (ME) are computed at sample means of uncensored observations. Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.
Source: Own data, collected in January 2011 and 2012 in Ouagadougou, Burkina Faso.

2.5.2 Redistributive pressure, risk aversion and transfers to the kin

Analogue to the investment model, we now test whether redistributive pressure is associated with higher transfers to the kin, i.e. we have a closer look at the first stage regression underlying the IV estimator employed above. The results for the transfer model are shown in Table 2.5. In columns (1) to (4) the dependent variable is the value of all transfers made (in kind and in cash) to recipients based in the tailor's village of origin. In column (1) we show the results of the OLS model. Columns (2) to (4) show the results of the Tobit model and column (5) shows a count data model, with the number of siblings that actually get a transfer from the tailor as a dependent variable.[14] In columns (1) and (2) the number of siblings comes out with a positive sign, suggesting that redistributive pressure is associated with higher remittances. Four to seven siblings, for instance, increase paid remittances by about 110 to 120 per cent compared to a household without any living siblings. In column (3) where we use the continuous siblings variable. The estimated coefficient is also positive but statistically not significant. In column (4), where we use village size and the number of visitors as proxies for redistributive pressure, we find a positive and significant effect associated with larger villages. Finally, in column (5), where we explain the number of persons that receive remittances from the tailor, we also find a positive effect associated with the number of siblings. A tailor with four to seven siblings compared to a tailor with no siblings sends remittances to twice as many people (based on the incident rate, not reported in Table 2.5).

In line with expectations we find that remittances increase with risk aversion suggesting that risk-averse entrepreneurs transfer higher amounts and to more people, in order to 'buy' insurance (which we test below). It is interesting to note that if income is included (not shown), it does not seem to play a role in any of the specifications; which further supports the idea that other traits, in particular redistributive pressure and risk aversion, determine whether substantial transfers are made in the first place.

Table 2.5
The effect of redistributive pressure and risk aversion on remittances

	(1)	(2)		(3)		(4)		(5)
	OLS	Tobit	ME	Tobit	ME	Tobit	ME	Neg. binomial
No siblings alive	Ref.	Ref.						Ref.
1 to 3 siblings alive	0.788	2.266	0.832					0.790
	(0.636)	(1.687)						(0.527)
4 to 7 siblings alive	1.203 *	2.987 *	1.097					1.061 **
	(0.613)	(1.659)						(0.525)
8 and more siblings alive	1.432 *	3.415 *	1.254					1.237 **
	(0.730)	(1.815)						(0.555)
# of siblings alive				0.142	0.052	0.161	0.059	
				(0.119)		(0.121)		
Village size < 1,000						Ref.		
1,000 < village size < 10,000						1.250 *	0.461	
						(0.748)		
Village size > 10,000						1.402 *	0.516	
						(0.739)		
20 visitors and more last year						0.797	0.294	
						(1.005)		
Risk aversion index	0.388 *	0.831 *	0.305	0.892 *	0.329	0.811 *	0.299	0.251 **
	(0.215)	(0.455)		(0.455)		(0.447)		(0.120)
Age of tailor (years)	0.019	0.043	0.016	0.034	0.013	0.039	0.014	0.018 **
	(0.018)	(0.033)		(0.032)		(0.033)		(0.009)
Tailor is household head (=1)	0.718 **	1.474 **	0.541	1.624 **	0.600	1.574 **	0.580	0.608 ***
	(0.350)	(0.732)		(0.726)		(0.721)		(0.218)
Primary completed (=1)	-0.072	-0.126	-0.046	-0.115	-0.042	-0.447	-0.165	0.026
	(0.324)	(0.608)		(0.615)		(0.638)		(0.163)

Table continues next page.

Table 2.5
(… continued)

	(1)	(2)		(3)		(4)		(5)
	OLS	**Tobit**	**ME**	**Tobit**	**ME**	**Tobit**	**ME**	**Neg. binomial**
Married (=1)	0.240	0.438	0.161	0.457	0.169	0.465	0.171	0.060
	(0.330)	(0.633)		(0.637)		(0.638)		(0.174)
Mossi (=1)	-0.056	0.113	0.042	0.181	0.067	0.082	0.030	-0.000
	(0.343)	(0.640)		(0.644)		(0.639)		(0.175)
# of brothers outside HH of origin	0.076	0.137	0.050	0.145	0.053	0.122	0.045	0.028
	(0.071)	(0.127)		(0.126)		(0.127)		(0.029)
# of sisters outside HH of origin	-0.059	-0.131	-0.048	-0.129	-0.048	-0.143	-0.053	-0.012
	(0.065)	(0.130)		(0.128)		(0.129)		(0.033)
Father primary completed (=1)	-0.409	-1.053	-0.387	-1.092	-0.403	-1.023	-0.377	-0.172
	(0.592)	(1.250)		(1.222)		(1.254)		(0.310)
Mother primary completed (=1)	0.486	0.875	0.321	0.925	0.342	0.944	0.348	0.337
	(0.756)	(1.550)		(1.554)		(1.563)		(0.425)
Father is/was farmer (=1)	0.252	0.407	0.150	0.319	0.118	0.458	0.169	0.022
	(0.362)	(0.666)		(0.660)		(0.663)		(0.172)
Father is/was indep. non-agric. (=1)	0.072	0.025	0.009	0.052	0.019	0.139	0.051	-0.133
	(0.363)	(0.695)		(0.688)		(0.693)		(0.186)
Constant	-0.280	-5.207 **		-2.958 *		-4.096 **		-2.182 ***
	(0.973)	(2.323)		(1.686)		(1.834)		(0.683)
/sigma		4.035 ***		4.033 ***		4.007 ***		
		(0.206)		(0.206)		(0.208)		
R-squared	0.026							
N	278	278		278		278		278
Censored N		137		137		137		137

Notes: Marginal effects (ME) are computed at sample means of uncensored observations. Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.
Source: Own data, collected in January 2011 and 2012 in Ouagadougou, Burkina Faso.

2.5.3 Reciprocity of transfers

Testing whether an insurance function exists, we now consider whether paying remittances indeed increases the probability that the tailor receives help from the kin when experiencing a shock. Table 2.6 shows four different Probit regressions. The dependent variable in each case is 'having received help from family and friends' to cope with a shock. We

use two alternative variables for remittances: the number of recipients in the village of origin and the total number of recipients. In each case we use two specifications: first, a simple Probit model; and, second, a Probit model with sample selection. Selection might be an issue since not all but 'only' 79 per cent of the tailors reported that they experienced a shock in the 12 months preceding the survey.

In all four specifications we find a positive and significant effect of the number of recipients on the probability of having received help from the family or friends in the event of a shock. The marginal effects suggest that remitting to an additional person increases the probability of receiving help in the event of a shock by about 4 to 5 per cent. Moreover, it is interesting to see that almost none of the other covariates are significant which suggests that the actual remittances paid are indeed the main transmission channel.

Table 2.6
The effect of remittances on obtained support in times of shocks

	(1)		(2)	(3)		(4)
	Probit	ME	Heck-Probit	Probit	ME	Heck-Probit
# of persons remitted (village of origin)	0.144 **	0.049	0.107 **			
	(0.067)		(0.052)			
# of persons remitted (all)				0.129 **	0.044	0.106 *
				(0.062)		(0.057)
Ln capital stock in t-1	-0.025	-0.008	-0.024	-0.021	-0.007	-0.023
	(0.039)		(0.031)	(0.039)		(0.034)
Asset index	0.121	0.041	0.081	0.123	0.042	0.104
	(0.119)		(0.097)	(0.120)		(0.113)
Age of firm (years)	-0.017	-0.006	-0.008	-0.018	-0.006	-0.011
	(0.018)		(0.009)	(0.019)		(0.012)
Firm is formal (=1)	-0.193	-0.064	-0.179	-0.171	-0.057	-0.160
	(0.205)		(0.150)	(0.204)		(0.183)
Risk aversion index	-0.061	-0.021		-0.030	-0.010	
	(0.130)			(0.128)		
Age of tailor (years)	0.012	0.004		0.014	0.005	
	(0.014)			(0.015)		

Table continues next page.

Table 2.6
(… continued)

	(1)		(2)	(3)		(4)
	Probit	**ME**	**Heck-Probit**	**Probit**	**ME**	**Heck-Probit**
Tailor is household head (=1)	-0.168	-0.058		-0.176	-0.061	
	(0.227)			(0.233)		
Primary completed (=1)	0.165	0.057		0.116	0.040	
	(0.198)			(0.201)		
Married (=1)	-0.087	-0.030		-0.076	-0.026	
	(0.221)			(0.221)		
Mossi (=1)	0.287	0.093	0.240	0.312	0.101	0.269
	(0.221)		(0.163)	(0.216)		(0.193)
# of brothers outside HH of origin	0.033	0.011	0.017	0.029	0.010	0.023
	(0.041)		(0.035)	(0.041)		(0.037)
# of sisters outside HH of origin	-0.033	-0.011	-0.031	-0.031	-0.010	-0.032
	(0.038)		(0.031)	(0.038)		(0.037)
Father primary completed (=1)	0.363	0.132	0.257	0.328	0.118	0.276
	(0.362)		(0.222)	(0.370)		(0.340)
Mother primary completed (=1)	1.043 **	0.396	0.972 **	1.012 **	0.385	0.939 *
	(0.496)		(0.411)	(0.512)		(0.479)
Father is/was farmer (=1)	0.331	0.116	0.286	0.273	0.095	0.235
	(0.227)		(0.175)	(0.222)		(0.202)
Father is/was indep. non-agric. (=1)	0.416 *	0.146	0.359 **	0.333	0.116	0.311
	(0.222)		(0.176)	(0.218)		(0.210)
Constant	-1.234 **		-0.594 **	-1.405 **		-0.743 **
	(0.605)		(0.277)	(0.627)		(0.378)
athrho			-10.339			-1.059
			(368.939)			(1.146)
N	242		278	242		278

Notes: Marginal effects (ME) are computed at sample means of uncensored observations. Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.
Source: Own data, collected in January 2011 and 2012 in Ouagadougou, Burkina Faso.

2.5.4 Compliance with sharing norms and investment

In the following we present the results of the endogenous switching regression model. Table 2.7 reports two sets of results: first, the results from simultaneously estimating a switching regression model, including a

regime choice equation (column (3)) and an investment equation for each regime (column (1) for the growth and column (2) for the insurance regime); and, second, an investment equation for each regime splitting the sample using the threshold defined above (columns (4) and (5)). In columns (1) and (2) we omitted redistributive pressure and risk aversion from the set of variables. The switching regression shows that redistributive pressure is a significant determinant of the allocation of tailors across the two regimes. Our theoretical model assumes that the effect is ambiguous, as, on the one hand, it increases the share of income that has to be remitted; and on the other hand it increases the disutility associated with the sanction in cases where the tailor cuts the ties with his family network. The data suggests that the latter effect indeed dominates: higher pressure reduces the probability of being in the growth regime. This is also coherent with the results of the IV model above, which suggested that kinship size is on average associated with higher, not lower, transfers made and higher transfers are in turn associated with reduced investment. Risk aversion, in line with our hypothesis, also reduces the probability of being in the growth regime.

In both investment equations, the initial capital turns out to be the main determinant of investment. In line with decreasing marginal returns to capital, accumulation will be faster for firms with lower capital stocks. The likelihood ratio test for joint independence of the three equations reported in the last row of Table 2.7 shows that these three equations are not jointly independent and should hence not be estimated separately. This lends support to the hypothesis that regime choice and investment decisions are indeed taken simultaneously, as postulated by our theoretical model. Figure 2.2 shows the distribution of the probability to choose the growth regime based on the estimated coefficients in column (3). The plot shows that less than half of the observations have a probability of 0.5 and above. Only few observations are in the upper two deciles.

If we estimate the investment equation for the split sample (columns (4) and (5)) and introduce redistributive pressure and risk aversion, we find, again in line with our hypotheses, that the number of siblings reduces investment only for tailors in the insurance regime, but not for those in the growth regime. Even the 'Mossi effect' is only significant for those in the insurance regime.[15] These results again support the idea that tailors in the growth regime have left their sharing network and are no longer subject to redistributive demands. Because they have left, kinship

characteristics no longer affect investment. This result is robust to reasonable variations in the growth-insurance-regime threshold. For tailors in the growth regime, the effects identified also hold when alternative measures for the pressure to redistribute are used, such as village size or the number of visitors in the twelve months preceding the survey.

Table 2.7
Mixture model – Growth vs. insurance regime

	(1) Growth regime	(2) Insurance regime	(3) Switching regression	(4) Growth regime	(5) Insurance regime
Ln capital stock in t-1	-0.140 ***	-0.191 ***	-0.146 ***	-0.226 ***	-0.292 ***
	(0.068)	(0.069)	(0.039)	(0.059)	(0.064)
Asset index	0.133	-0.106	0.114	0.167	0.071
	(0.235)	(0.161)	(0.125)	(0.226)	(0.159)
Age of firm (years)	-0.048*	-0.020	-0.021	-0.032	-0.045 **
	(0.029)	(0.022)	(0.016)	(0.035)	(0.018)
Firm is formal (=1)	0.366	0.130	0.272	0.491	0.254
	(0.333)	(0.310)	(0.194)	(0.357)	(0.322)
No siblings alive			Ref.	Ref.	Ref.
1 to 3 siblings alive			-0.354	0.460	-2.182 ***
			(0.539)	(0.707)	(0.590)
4 to 7 siblings alive			-1.048 **	0.014	-1.961 ***
			(0.502)	(0.733)	(0.546)
8 and more siblings alive			-1.137 **	0.240	-2.598 ***
			(0.556)	(0.800)	(0.619)
Risk aversion index			-0.463 ***	-0.243	-0.017
			(0.137)	(0.163)	(0.243)
Age of tailor (years)			-0.034 **	-0.037	-0.014
			(0.013)	(0.025)	(0.016)
Tailor is household head (=1)			-0.370 *	0.346	-0.634
			(0.227)	(0.328)	(0.487)

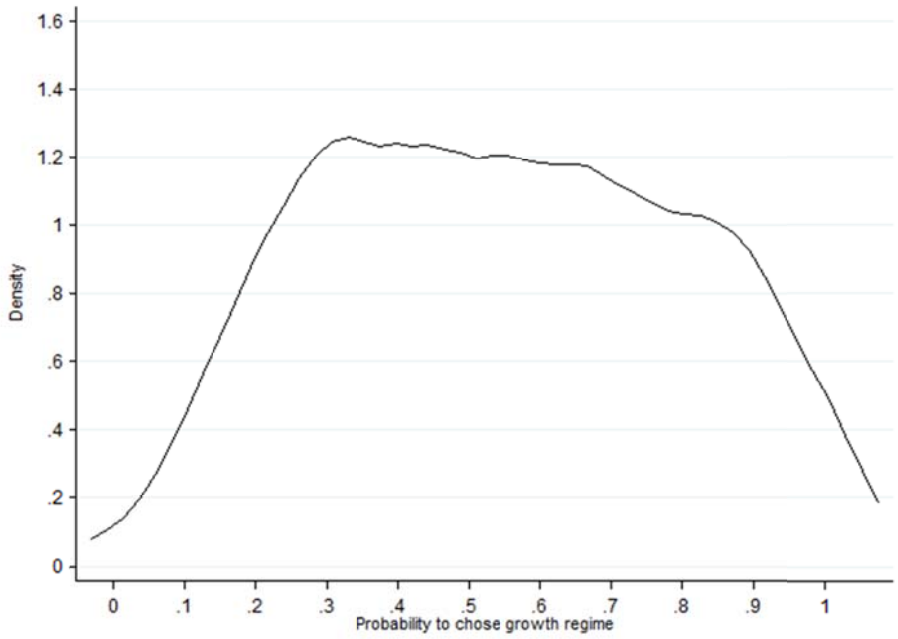
Table continues next page.

Table 2.7
(… continued)

	(1) Growth regime	(2) Insurance regime	(3) Switching regression	(4) Growth regime	(5) Insurance regime
Primary completed (=1)			0.301	0.727 **	0.240
			(0.191)	(0.343)	(0.292)
Married (=1)			0.167	0.326	0.504
			(0.209)	(0.329)	(0.360)
Mossi (=1)				-0.520	-0.765 **
				(0.396)	(0.338)
# of brothers outside HH of origin			-0.010	-0.007	-0.095 **
			(0.037)	(0.061)	(0.042)
# of sisters outside HH of origin			0.054	0.016	0.091
			(0.038)	(0.071)	(0.066)
Father primary completed (=1)			0.311	0.738	0.098
			(0.372)	(0.524)	(0.369)
Mother primary completed (=1)			-0.479	-0.654	-0.592
			(0.524)	(0.658)	(0.475)
Father is/was farmer (=1)			0.147	0.601	0.411
			(0.224)	(0.427)	(0.329)
Father is/was indep. non-agric. (=1)			0.512 **	-0.079	0.148
			(0.213)	(0.384)	(0.389)
Constant	5.410 ***	2.060 ***	2.751	5.938 ***	6.207 ***
	(0.330)	(0.768)	(0.674)	(1.147)	(1.099)
LR test of joint independence of both equations	Chi-squared=155.0				
R-squared				0.185	0.295
N				151	127

Notes: Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.
Source: Own data, collected in January 2011 and 2012 in Ouagadougou, Burkina Faso.

Figure 2.2
Distribution of the probability to choose the growth regime, predictions based on switching regression in Table 2.7 (kernel density estimate)



Source: Author's illustration based on own data collected in January 2011 and 2012 in Ouagadougou, Burkina Faso.

2.5.5 Transfers and investment across the capital distribution

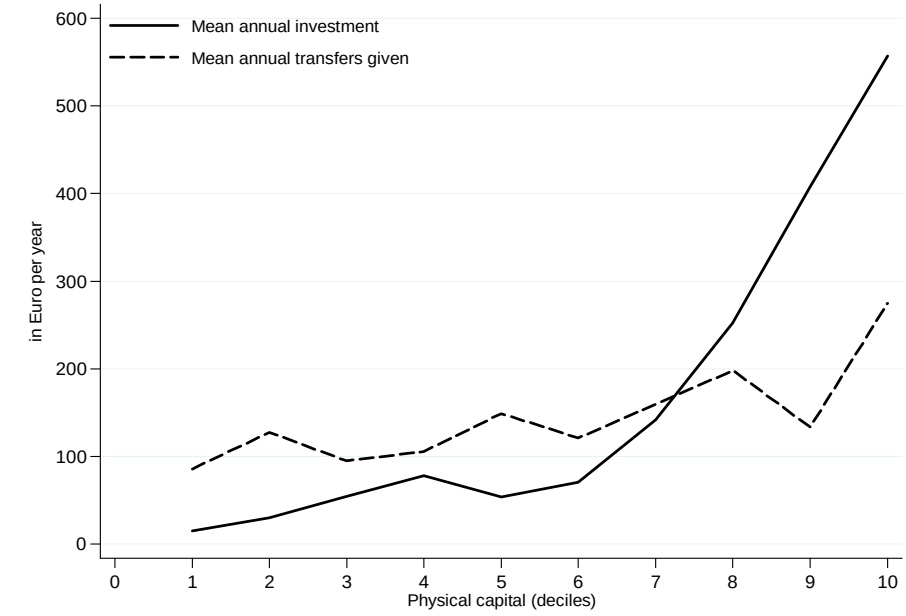
As a descriptive robustness check to the above results, we now examine whether some tailors (in the growth regime) invest and end up with higher capital stocks and relatively low remittances, while others (in the insurance regime) remit, do not invest and stay with low capital stocks. Put differently, we have to exclude the possibility that those in the insurance regime are not just those tailors who have already achieved their optimal capital stock and thus can 'afford' to show solidarity with their kin.

Figure 2.3a shows mean annual investment and transfers made across the capital distribution. We can see that both, absolute investment and transfers, increase with the size of the capital stock. Up to the seventh decile annual transfers exceed annual investment. Above the seventh

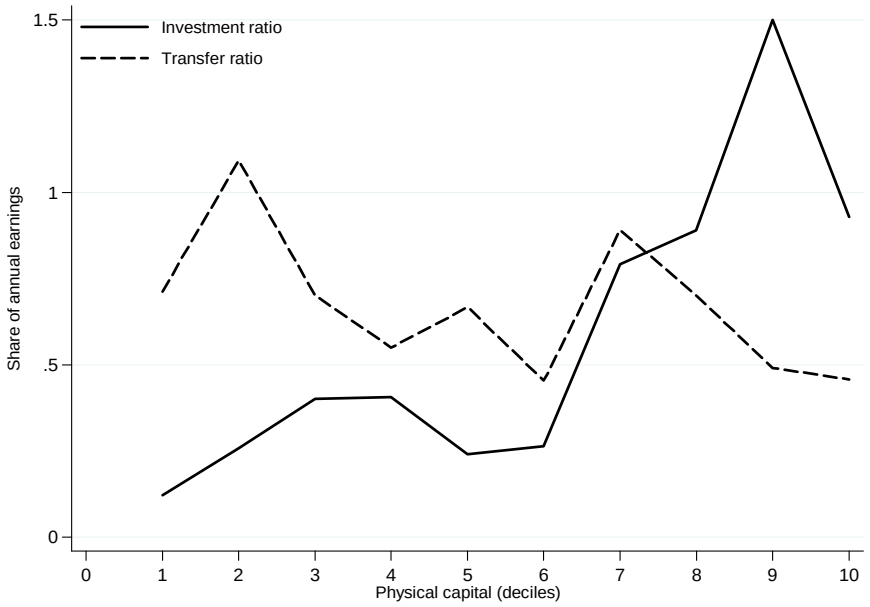
decile however, investment takes off and in the tenth decile is almost twice as large as transfers.

In Figure 2.3b we look at investment and transfers as a share of annual profits. Whereas the transfer ratio declines with increasing capital, although with some fluctuations, the investment ratio goes up. The slope is particularly steep between the fifth and eighth decile. Only in the upper two deciles does the curve flatten out. This happens at a very high level, where virtually all profits are reinvested. At the lower end of the capital distribution we find exactly the opposite. Almost 90 per cent of the total profits are remitted and only a meagre 12 per cent are re-invested. These results further support the hypothesis that there are two distinct behavioural patterns.

Figure 2.3
Investment and remittances across the capital distribution



2.3a: Mean annual investment and remittances



2.3b: Mean investment and transfers given as a share of annual earnings

Source: Author's illustration based on own data collected in January 2011 and 2012 in Ouagadougou, Burkina Faso.

2.6 Conclusion

For a long time, the anthropological literature has suggested that sharing norms may imply adverse incentive effects which hamper investment in productive activities. However, the empirical evidence for such effects is still scarce. Existing studies on the topic have often addressed the issue of forced solidarity in isolation, neglecting the interplay with risk, which may also pose a major constraint to entrepreneurs.

In this chapter, we develop a theoretical model on the interplay between solidarity and investment, where the entrepreneur faces a trade-off between complying with sharing norms and business expansion. Opting for an insurance regime, the entrepreneur makes transfers to his kin, gets insurance, but forgoes future earnings because of lower investment. Following a growth regime, the entrepreneur breaks with the norms, steps out of the kinship network, bears a social sanction and is no longer insured, but does not have to remit and can realize his desired investment

plans. The regime choice, i.e. the decision to comply with the norms or not, is driven be the entrepreneur's degree of risk aversion, the pressure for redistribution and the return on investment.

We test the main predictions of our model with data from a representative sample of tailors in Ouagadougou. The empirical analysis confirms the main predictions of the model and we can identify two distinct groups of tailors who operate under an insurance or a growth regime. Specifically, the joint estimation of the regime choice and the investment decision yields results that are consistent with a world in which some entrepreneurs step out of sharing networks. As predicted by our theoretical model, for tailors in the insurance regime investment declines with the pressure for redistribution. This is not the case for tailors in the growth regime whose investment decision is not affected by kinship pressure.

In this chapter we do not deny the positive aspects of family and kinship ties, often referred to as social capital. On the contrary, we are well aware of their importance in contexts where market mechanisms are non-existent or fail. Our aim is to highlight the possible trade-off faced by tailors due to the coexistence of modern economic activities and traditional norms and institutions. Although we do not explicitly address the issue of efficiency, it is likely that the distortive effects of kinship pressure on investment decisions imply opportunities for pareto-improvements, i.e. both the kinship network and the entrepreneur could be better off if the entrepreneur could realize his investment plans and make lump-sum payments to compensate his social network. Prevailing sharing norms and the associated insurance schemes may not (yet) have adapted to the presence of modern economic activities and the related growth processes that rely on savings and investment. In a context of such norms and institutions, providing insurance to entrepreneurs and their kin might be an effective means of spurring investment in small and micro enterprises. Such a policy would be more effective the more sharing networks are motivated by insurance and not by pure egalitarian norms. Obviously the introduction of insurance, possibly along with credit, does create its own problems in a setting where institutional capacity and trust in formal institutions is weak. However, a number of countries in Sub-Saharan Africa have started to introduce (or at least to experiment with) health insurance schemes. Given that health shocks, as shown, pose an important threat to households, health insurance

schemes may imply a softening of sharing obligations. Before such conclusions can be reached however, such propositions should be carefully tested. While a rigorous evaluation of the contribution of formal health insurance coverage for business development remains subject to further research, a first scoping exercise conducted in Burkina Faso does show promise.

We administered a short questionnaire among 50 randomly selected entrepreneurs in Ouagadougou aiming to elicit their perceptions on the usefulness of a formal health insurance mechanism. Among the 50 entrepreneurs interviewed, 68 per cent have a migratory background of which half reported to regularly remit to their village of origin. The average value of remittances amounts to about 27 Euro per month (similar to the magnitude we saw from the tailors), representing about 28 per cent of their average reported profits. Also, 53 per cent of the migrant entrepreneurs report that they can rely on family support in case of any problems. Hence, also within a more diverse sample, we observe a scenario similar to the situation reported by the tailors outlined above.

Concerning the importance of health related expenditure, the survey, shows that the average health related expenditure in the entrepreneur's household amounts to approximately 30 Euro per year which constitutes a not negligible amount. The importance of health expenditure is further emphasised by the fact that all entrepreneurs interviewed did actually report being interested in taking up health insurance if offered, indicating an average willingness to pay (depending on the package offered) of about half the expense occurred in the past year, namely about 15 Euro. Strikingly, 94.1 per cent of the migrant entrepreneurs interviewed think that they would be requested to transfer less if households in their village of origin were also covered by health insurance, thus providing further assurance on the line of argument made in this chapter. Asking the entrepreneurs on the saving they would expect if the household and the extended family was covered by health insurance, the entrepreneurs reported an average expected saving of about 64 Euro per months which, given the average remittances and health expenses reported, is likely to be overstated. Nevertheless, 61.8 per cent of the interviewed entrepreneurs stated that they would use the freed resources for enterprise investment, giving some comfort to the usefulness of health insurance coverage for enterprise development also.

Generally speaking, existing policies targeted at entrepreneurs often have a mono-causal foundation. This is, for instance, the case for micro-credit programmes that address credit market imperfections but ignore other bottlenecks that may constrain entrepreneurial activities. Our analysis, however, clearly indicates that the issues of savings and credit constraints, risk and social norms and preferences are closely interrelated. Future work on micro and small enterprise performance and policy interventions towards these firms should not neglect these interdependencies.

Notes

[1] However, this is not the focus of the article and the results are not further discussed.

[2] We think in particular of idiosyncratic shocks, such as catastrophic health expenditures, and ignore covariate shocks within the kin, which is plausible if the kinship network is geographically dispersed.

[3] Constant Relative Risk Aversion.

[4] For instance, an entrepreneur might be forced to employ (less productive) members of the kin.

[5] Indeed, among the tailors interviewed in 2012 only 2.6 per cent used microfinance or formal bank credit.

[6] The attrition rate is 13 per cent. A systematic pattern for sample attrition was not detected.

[7] 1 Euro = 656 CFAF.

[8] This is in line with De Mel et al.'s (2009) conclusion that simply asking entrepreneurs to report their profits is probably a more accurate measure of firm profits than detailed questions on revenues and expenses.

[9] The fact that the average reported values of remittances and investments are of similar magnitude as reported profits further suggests that the profit figures are underreported. Given the labour market context in Burkina Faso, it is not uncommon to have several businesses or jobs, thus some of the investment and remittances could also be financed out of the tailor's other income. While tailoring is their primary activity, we have not collected information on other sources of income. Therefore, the latter explanation is still speculative.

[10] Village size refers to the survey year, not the birth year of the tailor.

[11] The robustness to alternative thresholds is examined below.

[12] However, we did not find significant interaction effects between being Mossi and our measures of redistributive pressure.

[13] Note that we do not control for gender as almost all tailors are male and also the head of their household, which is included in the set of covariates.

[14] We use a negative binominal model instead of a Poisson model, because based on tests presented in Cameron and Triverdi (2005), we have to reject the hypothesis of equidisperzion.

[15] In principle the Mossi variable belongs to the regime choice equation, however the maximization problem did not converge in this case, hence we had to remove the 'Mossi' and just put it in the investment equation.

3 Mutual Health Insurance and the Contribution to Improvements in Childhood Health in Rwanda

A number of countries in Sub-Saharan Africa have started to introduce (or at least experiment with) health insurance schemes. In this chapter we review the experience in Rwanda. We go beyond the access and financial protection functions of health insurance and consider the extent to which health insurance improves health outcomes. We concentrate on children between zero and five years. The results suggest that the mutual health insurance in Rwanda leads to weak improvements in children's health, benefiting in particular young children below the age of two and children from poorer backgrounds.

3.1 Introduction

Research on the effects of health shocks shows that prolonged periods of illness or malnutrition in early childhood have lasting consequences for height and educational attainments (see e.g. Behrman and Rosenzweig, 2004; Case et al., 2005; Alderman et al., 2006; Heckman, 2006; Oreoupolous et al., 2008; Currie, 2009; Maluccio et al., 2009; Alderman, 2010; Almond and Currie, 2010; Schultz, 2010).[1] Some studies even link ill health as a child to lower earnings in adulthood (see e.g. Hoddinot et al., 2008).

In recent years there has been a global push to expand health insurance in low income countries to mitigate the negative consequences of health shocks (see e.g. World Health Organization, 2005). Thus far, the large majority of studies on the impact of health insurance in these contexts concentrates on assessing two aspects – the effect on utilization of health care and the extent to which insurance protects policy holders from excessive health spending (see e.g. Jütting, 2004; Ekman, 2004,

2007; Dror et al., 2005, 2007; Wagstaff et al., 2009; Galárraga et al., 2010; Thornton et al., 2010; Wagstaff, 2010b; Sparrow et al., 2012). Secondary effects, like a potential amelioration of the income (see e.g. Aggarwal, 2010), assets (see e.g. Parmar et al., 2012), or the health status of policy holders (see e.g. Quimbo et al., 2011), remain less studied. Nevertheless, it is still widely believed that an increased use of health care services leads to better health. If this is true, young children should particularly benefit from improved health care access, given the potential long-term link between childhood health and adult outcomes.

To date, there is little empirical back-up for this hypothesis. While research from richer countries generally supports the idea of a positive link between health insurance and child health outcomes, most studies fail to establish a causal link (for systematic reviews see e.g. Hadley, 2003; Levy and Meltzer, 2008).[2] The evidence from health insurance programmes in poorer countries is less conclusive. Giedion and Diaz (2011), for example, reviewed 49 studies on health insurance schemes in low and middle income countries. About half of these studies provide robust evidence that health insurance safeguards financial resources and improves access to health care (Giedion and Diaz, 2011). However, beyond that there is little evidence of improvements in the health status of the insured. Generally, the linkages between health insurance, health care behaviour and health outcomes in these contexts are still poorly understood (Giedion and Diaz, 2011).

Taking a look at the existing empirical evidence on the insurance-childhood-health-nexus in developing countries, Dow and Schmeer (2003) and Dow et al. (2003), for example, find only a very small effect of the national health insurance expansion in Costa Rica in the 1970s on child mortality where only about 4 per cent of the observed reduction in mortality could be explained by insurance. The authors explain the low effect on mortality with the low quality of the health care system (Dow and Schmeer, 2003). Wagstaff and Pradhan (2005) evaluate the impact of health insurance on childhood health in Vietnam and find positive effects of the national health insurance programme for children under the age of five but no improvement for older children. For the younger cohort the authors estimate the average annualized improvement in height to amount to about 0.47 cm and the gain in weight to 0.15 kg, which is quite significant. The authors attribute the improvements in young children's health to three factors: the move away from traditional to modern

health care; a reduction in medical expenses safeguarding consumption, i.e. Vietnam Health Insurance (VHI) enrolment actually leading to an increase in non-medical consumption (incl. food); and the quality of care in diagnosing and treating common childhood illnesses (Wagstaff and Pradhan, 2005). Ansah et al. (2009) conducted a randomized control trial (RCT) in southern Ghana where they provided free primary care and drugs to children under five. Despite children in the treatment group using health services more frequently, they did not show any measureable differences in health outcomes (mean haemoglobin concentration, anaemia, parasitaemia, prevalence of wasting, mortality) after one year of treatment (Ansah et al., 2009). In contrast, in another randomized experiment – the Quality Improvement Demonstration Study (QIDS) in the Philippines – Quimbo et al. (2011), find positive effects of insurance coverage on health outcomes. They show that for poor children below the age of five the social health insurance programme, PhilHealth, leads to a 9-12 percentage point reduction in the likelihood of wasting and a 4-9 percentage point decrease in the likelihood of having an infection (as measured by a C-reactive protein biomarker) (Quimbo et al., 2011). The effects are measured for children hospitalized with pneumonia and diarrhoea only. Directly after discharge from the hospital children covered by PhilHealth do not differ from their uninsured counterparts. However, 4-10 weeks after discharge effects are measurable. The authors argue that the delayed effect is due to the financial protection function of the insurance whereby insured children are set on a better trajectory for full recovery than their uninsured counterparts as they are better protected from a fall in consumption – particularly food consumption (Quimbo et al., 2011).

The studies investigating the insurance-childhood-health-nexus use very different outcome indicators, measured on different occasions, which makes the reconciliation of results rather difficult. Nevertheless, the existing research leads us to suggest that effects are context-specific and dependent on the design and coverage of the insurance scheme. Moreover, an increase in health care utilization may not result in an improved health status, which means that increased utilization might not be a major pathway to better health. At the same time, changes in the health status seem to only become measurable over time. The above-mentioned studies all indicate that the quality of the health care system is an important factor linking insurance and health outcomes. Furthermore, the

results from Vietnam and the Philippines lead us to suggest that the role of insurance in safeguarding consumption might have a larger effect on better health then increased health care utilization.

In light of these observations and the limited empirical evidence, this chapter aims to contribute to the existing literature by investigating the role of health insurance for improving child health in the case of Rwanda. Rwanda provides an interesting case to study for two reasons: first, Rwanda is one of the few countries in Sub-Saharan Africa and the developing world reaching almost universal health insurance coverage; second, the country made considerable progress in improving child health between 2005 and 2010, whereby the observed progress also coincides with the year when the *Mutuelles de Santé* (hereafter also referred to as *Mutuelles*) – the social health insurance scheme – was standardized.[3] Over the five-year period, from 2005 to 2010, infant mortality dropped from 86 per 1,000 live births to 50; under-five mortality was halved (from 152 per 1,000 live births to 76); wasting fell from 5 to 3 per cent and stunting declined from 51 to 44 per cent (National Institute of Statistics Rwanda, 2012). The prevalence rates for diarrhoea, acute respiratory infections and fever also decreased slightly, while access to treatment expanded. For example, in 2005 only 14 per cent of the children with diarrhoea symptoms were treated at a health facility, in 2010 this expanded to 37 per cent (National Institute of Statistics Rwanda, 2012). Against this background, the question that arises is how much of the observed improvements can actually be attributed to insurance.

A rigorous evaluation of the health effects of the *Mutuelles* is challenging in many ways but the key issue is the identification of these effects because the decision to join the health insurance scheme might be determined by unobserved factors which simultaneously also affect health care behaviour and consequently the health outcomes. Hence, any estimates of the effect of insurance on health outcomes might be subject to selection or omitted variable bias. The influence of such a bias could be limited in randomized assessments. But, a randomized trial for the assessment of health insurance is neither always feasible nor desirable, particularly when it concerns large scale, nationwide interventions like the *Mutuelles*, where it would be politically and ethically challenging to systematically exclude a part of the population over a longer period of time necessary to measure health effects. Randomized trials have also been criticized for focusing too strongly on 'what works' without understand-

ing the (theoretical) mechanisms (see e.g. Deaton, 2010). In this chapter we are not developing a mathematical model which links insurance coverage to health outcomes because such a model would become too complex if all potential channels are to be taken into account. Instead, our analysis concentrates on two potential channels – the role of insurance for improving access to health care and the influence of insurance on preventative health measures at the household level. With the majority of the studies in the health insurance literature focusing on the access and financial protection function of insurance, this latter channel has received little attention so far. Thus, despite the absence of a formal presentation of the insurance-child-health-nexus, the chapter still aims to contribute to a better understanding of the mechanisms at play.

In this chapter we apply a propensity score matching approach to nationally representative data from the 2010 Rwandan Demographic and Health Survey (RDHS). We also test the robustness of the results with a sector fixed effects model whereby we expand the data and also include the 2005 RDHS. The results obtained show weak improvements in child health, particularly for children below the age of two and for children from poorer backgrounds. However, the estimates are insufficient to explain the improvements in child health observed at the national level. Concerning the underlying mechanisms, we find positive evidence on the two channels under consideration. In line with results of earlier studies, we also find that the *Mutuelles* improves access to facility based treatment when the child is sick. Children that are insured are approximately 30 per cent more likely to be treated in a health facility that their uninsured counterparts. In addition, we also find a positive effect of insurance on preventative measures at the household level with insured children being more likely to sleep under a bed net and benefiting from treated, purified water for drinking.

The remainder of this chapter is organized as follows. In Section 3.2 we provide background information on the *Mutuelles de Santé* and the health care system in Rwanda. In Section 3.3 we present the data and key variables. In Section 3.4 we outline the empirical strategy. In Section 3.5 we discuss the results and in Section 3.6 we conclude.

3.2 Background

3.2.1 Implementation and organization of the *Mutuelles*

The development of the *Mutuelles* followed a structured process. In 1997 the Government of Rwanda decided to pilot test community-based health insurance schemes (*Mutuelles de Santé*) in three districts.[4] This pilot was carefully evaluated (see Schneider and Diop (2001) for the assessment and results) and following the positive results in 2000 the Government decided to scale up the community-based schemes to the national level.

The *Mutuelles*, as known in its current form, was formally launched in 2005 after the approval of the *Mutuelles* Health Insurance Policy (Lu et al., 2012). The policy standardized the main parameters of the existing community-based schemes, such as the benefits package, enrolment fees, organization structure, management, and subsidization mechanisms which up to this point had varied across districts.[5] The policy was legally enforced in 2007 when the Government enacted the 'law establishing and determining the organization, functioning and management of the mutual health insurance scheme (No. 62/2007 of 31/12/2007)'.

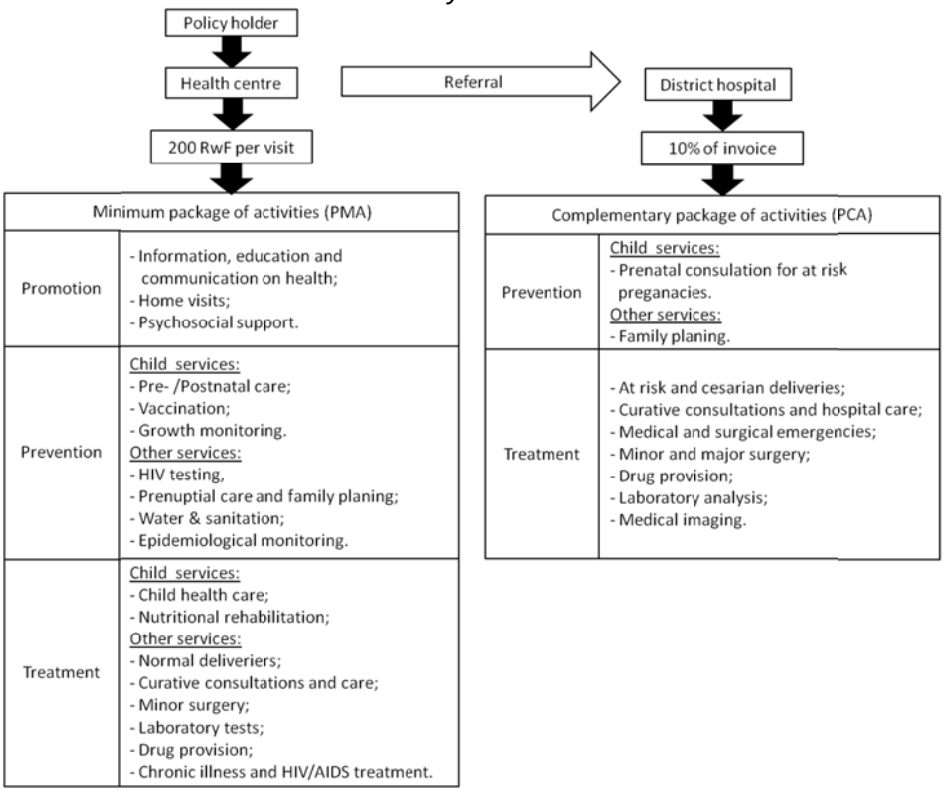
Based on the legal framework, the organization of the *Mutuelles* follows the decentralized administrative structures of the country. The scheme is coordinated and managed at the district level with each of the 30 districts of the country holding a mutual health insurance fund ('*Fonds Mutuelles de Santé*'). Within each district, each health centre at the sector level has a *Mutuelles* section which serves as first point of contact for the population and is in charge of enrolment. The *Mutuelles* section directly reimburses the health centres for services rendered to the insured, district hospitals are reimbursed by the district office, and services rendered at the national reference hospitals are covered by the National Risk Pool – a fund administered at the national level. In terms of funding, so far about 50 per cent of the *Mutuelles* funding is obtained through membership contributions. The remainder comes from cross-subsidization of other national insurance funds (RAMA, MMI), and transfers from NGOs, development partners and the Government (Antunes et al., 2009).

The *Mutuelles* applies a household subscription policy, i.e. instead of individual membership all household members have to be enrolled.[6] The insurance premium is payable on a per capita basis. Until July 2011, the

membership contribution was flat, amounting to 1,000 RwF (approximately 1.25 Euro) per person and year.[7] Upon enrolment a 30 days waiting-period applies before the insurance enters into effect. However, newborn children are covered free of charge for the first three months after birth.

The *Mutuelles* covers a minimum package of activities (PMA) at the health centre and a complementary package of activities (PCA) at the district hospitals (see Figure 3.1). The PMA includes all primary child health care services. However, for each visit to the health centre a co-payment of 200 RwF (approximately 0.25 Euro) is required. After referral, the insured need to pay 10 per cent of the invoiced amount directly for all services rendered at the district and national reference hospitals.

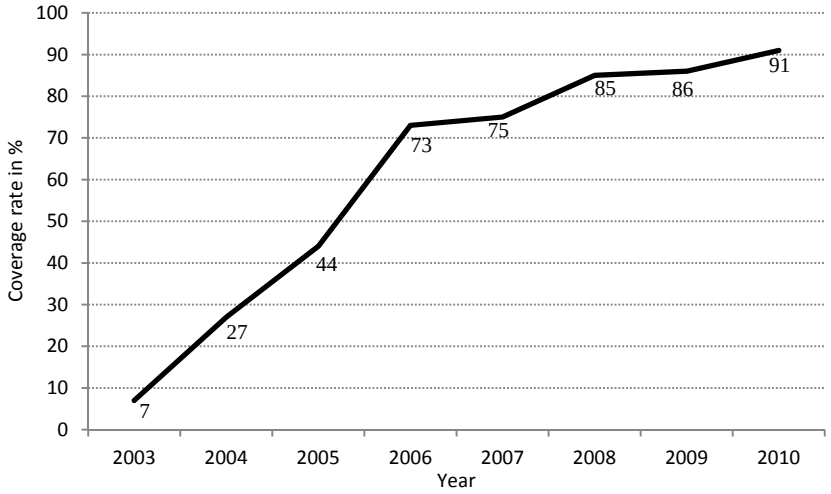
Figure 3.1
Services covered by the Mutuelles de Santé



Source: Author's illustration based on Lu et al. (2012).

In addition to regulating the organizational set-up of the *Mutuelles,* the 2007 health insurance law also stipulates that every resident is obliged to have health insurance (Art. 33). Thus, the *Mutuelles* reportedly covers over 90 per cent of the population (see Figure 3.2), although the actual coverage rates could be substantially smaller based on other national surveys (see e.g. the 2010 RDHS).[8]

Figure 3.2
Coverage rates of the Mutuelles de Santé (2003-2010)



Source: Author's illustration based on Ministry of Health of Rwanda (2011).

In July 2011, the Government replaced the flat premium schedule by a stratified one based on the households' *Ubudehe* or wealth level.[9] The amendment aims to safeguard the financial sustainability of the scheme but also to address concerns on inequality in health care access (see e.g. Schmidt et al., 2006). For households in the poorest two categories, the annual contributions increased to 2,000 RwF (approximately 2.50 Euro) per person; households in category 3 and 4 pay 3,000 RwF (approximately 3.75 Euro) per member; and households in the richest two categories 7,000 RwF per person (approximately 8.75 Euro). The 2011 policy reform also established patient roaming of the health centres and district hospitals to further enhance the access to health care services. Since the data used for analysis only covers the period until March 2011 (see Sec-

tion 3.3.1), the impact of the 2011 policy reform is not subject to this chapter and will be investigated in future work.

Despite the hike in the premium schedule, *Mutuelles* enrolment rates were kept up in the financial year 2011-2012, with the Government covering the fees for about 25 per cent of the population categorized as very poor (Ministry of Health of Rwanda, 2012). Despite the government subsidy for the very poor, the change of the insurance premium improved the financial sustainability with the population contributions now accounting for 60 per cent of the *Mutuelles* funding (Ministry of Health of Rwanda, 2012).

3.2.2 Previous assessments of the *Mutuelles*

Previous assessments of the *Mutuelles* document that the scheme is successful in improving access to health care services and in reducing out-of-pocket health spending (see e.g. Schneider and Hanson, 2006; Shimeles, 2010; Saksena et al., 2011; Dhillon et al., 2012; Lu et al., 2012). Saksena et al. (2011) and Lu et al. (2012), for example, show that the insured use facility based care almost twice as often as their uninsured counterparts. However, these results do not apply uniformly and there is still substantial debate whether the *Mutuelles* actually increases or reduces the utilization gap between the rich and the poor (see. e.g. Saksena et al. (2011) and Sekabaraga et al. (2011) vs. Shimeles (2010) and Lu et al. (2012)). Also the financial risk protection capacity of the *Mutuelles* shows limitations with Shimeles (2010) and Lu et al. (2012) showing higher rates of catastrophic health spending among the poor.

3.2.3 The role of the quality of care for health outcomes

Almost simultaneous to the standardization of the *Mutuelles*, in 2005 the Government of Rwanda also decided to introduce a pay-for-performance (P4P) scheme for maternal and child health care services, supplementing the input-based budgets of the local health centres. Under the P4P scheme, the facilities receive additional payments depending on their performance on 14 maternal and child health care output indicators (for a detailed description of the scheme see Basinga et al., 2011; Gertler and Vermeersch, 2012). The P4P scheme started in 2006 and,

following a randomized evaluation, was rolled-out nationwide before 2010. The evaluations conducted by Basinga et al. (2011) and Gertler and Vermeersch (2012) show that the P4P improves the quality of pre- and postnatal care, increases the number of institutional deliveries and preventive care visits but does not lead women to complete the recommended four prenatal care visits or to reach full immunization of children. Gertler and Vermeersch (2012) also show that the improvements in the quality of care are directly translated into improvements in child health outcomes leading to a 0.53 standard deviations increase in the weight-for-age z-scores of children aged between zero and 11 months, i.e. children that benefited from the entire pre- and postnatal treatment under the P4P, and a 0.25 standard deviations increase in the height-for-age z-scores of children between 24 and 49 months.[10]

3.2.4 Study hypothesis

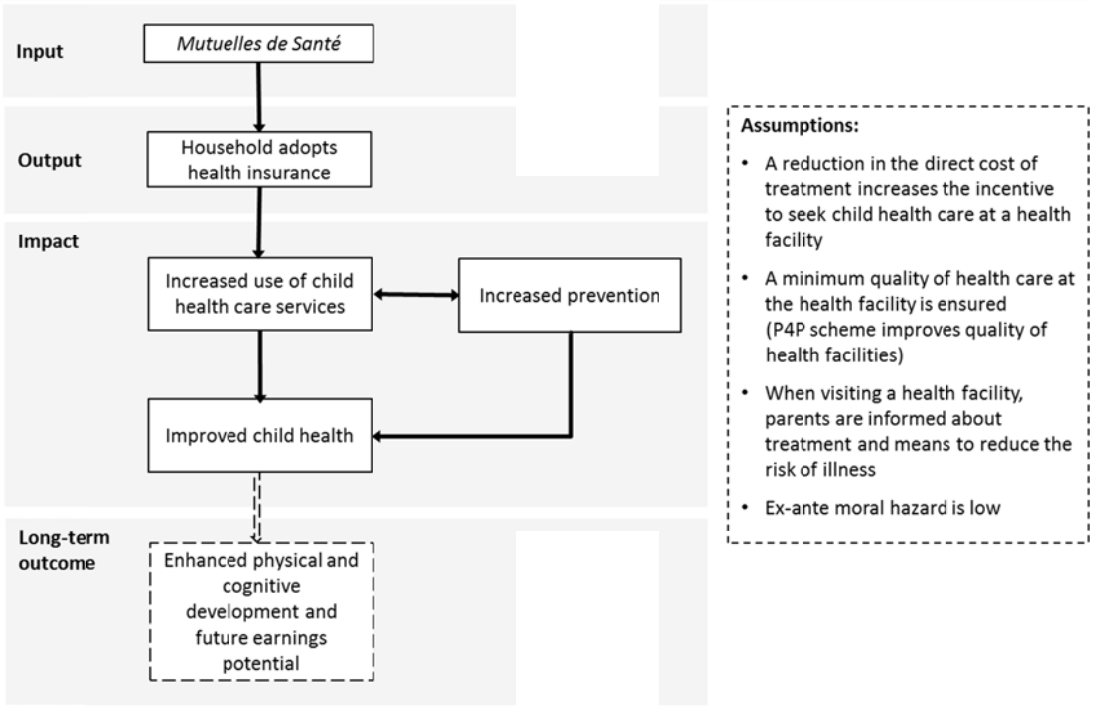
The central hypothesis that is tested in this study is that children that are covered by the *Mutuelles* benefit from more (and/or better) health care and will in consequence have better health than their uninsured counterparts. This is based on the assumption that health insurance promotes the use of health care (and here we mean both facility and home based care) and thus leads to better health. A variety of pathways are possible but in this study we explore only two potential channels (see Figure 3.3). The reason for this is data restrictions which do not, for example, allow us to test the importance of insurance on consumption smoothing and how this affects outcomes.

The first channel considered is the access channel, i.e. the *Mutuelles* provides children with access to modern health centre services (both for treatment and prevention). In consequence, insured children are more likely to use these services and thus have better health outcomes. We already know from other studies (see Section 3.2.2) that with enrolment the chances of using facility based health care increases. Here, we revisit this issue by limiting the units of observation to children between zero and five years. Improving the access to formal health care services does not mean that recovery is automatically assured. Recovery also depends on the quality of care received. As outlined in Section 2.3, the P4P scheme introduced seems to have promoted the quality of facility based care. Beyond that however, the mutual health insurance coverage might

also contribute to a better quality of care by increasing the likelihood of completing treatment e.g. through access to standard medication covered in the PMA and PCA.

The second channel considered is prevention. Due to an increased use of health care services, parents or care givers of insured children are more exposed to information on treatment and prevention of common childhood illnesses. Hence, insured families would be expected to expand prevention, reducing the risk of illness and thus ensure better health outcomes. This second channel however could also work in the opposite direction if parents reduce prevention due to easier access to facility based care when the child falls sick. This is typically referred to as a case of (ex-ante) moral hazard. However, unlike for other types of insurance, moral hazard is not considered a serious issue when it comes to health insurance as people are not expected to gamble with their health or the health of their minors, at least not to the extent to which they would with material assets, as a loss in health bears serious and even fatal consequences (Cutler & Zeckhauser, 2000). Nevertheless, there are studies documenting (ex-ante) moral hazard, e.g. in Ghana (see Yilma et al., 2012). We will therefore analyse to what extent this also applies in the case of Rwanda, given that the PMA explicitly includes communication and education on health issues.

Figure 3.3
Causal chain linking insurance coverage and health outcomes



Source: Author's illustration.

3.3 Data

3.3.1 General description of the data

We use cross-section data from the Rwandan Demographic and Health Surveys (RDHSs) for the years 2005 and 2010.[11] The RDHS is a standardized and nationally representative survey. The survey collects detailed level information on household characteristics, housing, gender aspects, family planning, health related behaviours, HIV/AIDS, malaria, and maternal- and child health. The RDHS uses a two-stage sampling design analogue to the Integrated Living Conditions Survey (EICV), the only other nationally representative survey conducted in Rwanda. The 2005 RDHS was carried out in the period between February and July 2005 and gathered information from 10,272 households; for the 2010 RDHS

12,540 households were interviewed over seven months from September 2010 to March 2011.

Our analysis concentrates on children aged between zero and five years. Moreover, we only consider children who are covered by the *Mutuelles* and children that have no formal health insurance. Children insured by alternative schemes such as RAMA, MMI or other private health insurance providers are systematically excluded from the analysis.[12] Our total sample covers 16,594 observations – 8,210 from 2005 and 8,384 from 2010.

Tables A3.1 and A3.2 in the Appendix show the characteristics of the children by survey year and insurance status. In 2005, about 43 per cent of the children in our sample are covered by the *Mutuelles*. The insured children do not differ from the uninsured in their basic characteristics (gender, age, breastfeeding period). However, they differ in socio-economic characteristics with the insured more frequently coming from richer backgrounds, mostly male headed households, and with mothers that are better educated and have a higher body mass index (BMI).

In 2010, insurance coverage expanded and about 72 per cent of the children in our sample were covered by the *Mutuelles*.[13] In comparison to 2005, the sample characteristics changed quite significantly and the difference between the insured and the uninsured children became more pronounced with insured children differing from uninsured children in almost all characteristics except the gender, household composition and place of residence. The average age of the children in the sample increased between 2005 and 2010 (by about five months) but children that are covered under the *Mutuelles* in 2010 are on average two months younger than their uninsured counterparts at the time, which is partly due to the new-born which are automatically covered by the *Mutuelles* in the first three months. The difference in average age translates to the breastfeeding period. On their socio-economic characteristics, insured children are still more likely to come from richer backgrounds, from male headed households and with better educated mothers (of the insured 82 per cent have at least primary education, while of the uninsured it is only 76 per cent). Despite the expansion in insurance enrolment in 2010, comparing the distribution of the wealth quintiles over time would suggest that the poor still remain excluded from the insurance with over 50 per cent of the uninsured in 2010 found in the poorest two quintiles.

3.3.2 Outcome variables

In the introduction we mentioned already that studies assessing the impact of health insurance on child health outcomes use a variety of indicators making a comparison of results rather difficult. Anthropometric indicators (z-scores or prevalence of stunting and wasting) are among the most frequently used proxies for children's health status though. Gideon and Diaz (2011), for example, criticize the use of weight-for-age and height-for-age z-scores as outcome measures, since they are only marginally dependent on better access to health care and also strongly influenced by other variables. They advocate using outcome variables closely related to the precise services covered. But, if insurance promotes prevention and thus reduces the likelihood of sickness and frailty, this should indeed be reflected in the weight and or height attainments of children. In addition, if insurance improves recovery and safeguards consumption, at least acute malnutrition (measured by weight-for-height z-scores) should be directly affected. Therefore, despite the criticisms levied against the anthropometric indicators, we will still use them as measures for children's health status in this study, also to compare our findings to existing studies.

We measure child health status using weight-for-height and height-for-age z-scores. The z-scores have been calculated using the 2007 WHO reference (World Health Organization and United Nations Children's Fund, 2009). In addition, to address the criticism by Gideon and Diaz (2011), we also use infant mortality as an outcome measure. The health services covered under the *Mutuelles* (including pre-and postnatal care as well as direct treatment and vaccination) should prevent infant death. Hence infant mortality should be directly influenced by insurance coverage.[14]

To test if insurance improved access to modern health services for young children, we use health centre visits if the child has suffered from illness in the four weeks prior to the survey. The variable is coded one in case the child has received treatment from a modern health facility and zero otherwise. To test if insurance affected home-based prevention we consider the use of bed nets and treatment of drinking water. Bed nets use is coded one if the child slept under a bed net in the night prior to the survey conditional on the household actually having at least one net

and zero if the child did not sleep under a net. The water purification variable is coded one if the household uses any form of treatment in order to ensure safe drinking water and zero if the household does not treat water prior to drinking. The basis statistics of the main outcome indicators used in this study are presented in Table 3.1.

The descriptive statistics give first hints at the validity of the proposed hypothesis. It is indeed the case that insured children show better anthropometric indicators than their uninsured counterparts. However, there is no noticeable difference in the prevalence of infant mortality between the two groups. Concerning the potential transmission mechanisms, we see that the share of insured children receiving treatment is higher than the uninsured. Moreover, the insured children are also exposed to more home-based prevention. The degree of treatment and prevention improved over time. While in 2005 55 per cent of the insured children were taken for medical treatment when sick, in 2010 this figure was 65 per cent. An even larger improvement is observed on the use of bed nets. While in 2005 only 20 per cent of the insured children slept under a net, in 2010 74 per cent of the insured children slept under a net.[15] For the uninsured we observe a similar development but starting from lower magnitudes.

Table 3.1
Descriptive statistics of the outcome variables

	2005						2010					
	Insured		Uninsured				Insured		Uninsured			
Variable	**Mean**	**SD**	**Mean**	**SD**	**P-value**		**Mean**	**SD**	**Mean**	**SD**	**P-value**	
Child health outcomes												
Weight-for-height z-score (SD)	-0.03	1.05	-0.04	1.14	0.964		0.09	1.05	0.01	1.07	0.009	***
Height-for-age z-score (SD)	-1.70	1.47	-1.79	1.56	0.076	*	-1.54	1.28	-1.75	1.33	0.000	***
Infant died (=1)	0.09		0.08		0.594		0.05		0.05		0.419	
Health care behaviour												
Medical treatment (=1)	0.55		0.34		0.000	***	0.65		0.42		0.000	***
Slept under bed net (=1)	0.20		0.14		0.000	***	0.74		0.65		0.000	***
Water purified (=1)	___		___		___		0.52		0.39		0.000	***

Notes: Information on water purification was not collected in the RDHS 2005. The p-values represent the result of the t-test on the equality of means between the insured and the uninsured. * p<0.10, ** p<0.05, *** p<0.01.
Source: RDHS 2005 and 2010.

3.4 Econometric approach

3.4.1 Empirical strategy and estimation

The 2005 RHDS was mainly collected prior to the standardization of the *Mutuelles* but we do not have precise information on when each district and sector amended their procedures. Our empirical strategy therefore relies on the 2010 RDHS, we use the 2005 data to test the robustness of our results.

With these data limitations at hand, the main empirical challenge lies in isolating the effect of health insurance on health outcomes after controlling for other factors that influence insurance uptake and outcomes, bearing in mind that some factors cannot be observed. To identify the effects of insurance on health outcomes we work within the potential outcomes framework and use a propensity score matching (PSM) approach.

Within this framework each child, i, has two potential outcomes, $Y_i(1)$ and $Y_i(0)$. $Y_i(1)$ represents the outcome of interest, Y, for a child which is covered by the *Mutuelles* at a specific point in time, in our case in 2010. $Y_i(0)$ is the outcome if the child is not covered by the *Mutuelles* in 2010. I, is the programme indicator and specifies whether the child is covered by the *Mutuelles* $(I = 1)$ or not $(I = 0)$. The effect of interest, the average treatment effect on the treated, is thus defined as:

$$ATT = \mathbb{E}(Y_i(1) - Y_i(0)|I = 1) \tag{3.1}$$

Since the child cannot present both states, $Y_i(1)$ and $Y_i(0)$ at the same time, we cannot estimate Equation (3.1). Rosenstein and Rubin (1983, 1985) show that if we assume unconfoundedness i.e. that there are no unobserved characteristics of the child which are correlated with the treatment or the outcome or, in other words, that conditional on a set of covariates X_i the counterfactual outcomes are independent of the treatment,

$$I_i \perp (Y_i(0), (Y_i(1))| X_i, \tag{3.2}$$

the ATT can be identified by solely conditioning on a propensity score. The propensity score allows us to match treated and untreated children, based on their probability $\pi(X_i) \equiv Pr(I = 1|X_i)$ of being enrolled in the *Mutuelles*, with $\pi(X_i) < 1$ and $Pr(I = 1) > 0$. Hence, the ATT may be written as

$$ATT = \frac{1}{N}\sum_{i=1}^{N}(Y_i^1 - \sum_{j=1}^{C} v_{ij} Y_j^0) \quad (3.3)$$

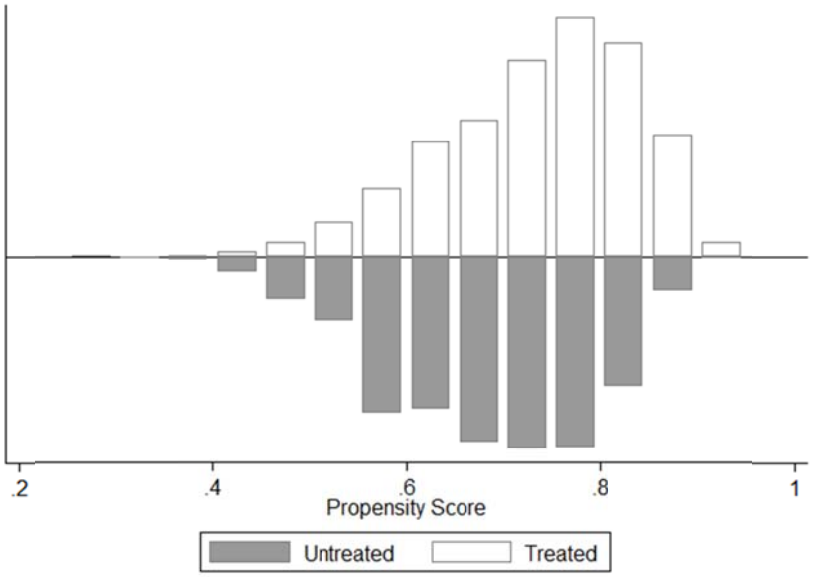
with Y_i indicating the outcome for each of the two groups (insured=1, uninsured=0) and v_{ij} the weight placed on the comparison observation j for each insured child to calculate the counterfactual outcome. Provided that the assumption of unconfoundedness holds, the ATT provides an unbiased estimate of the effect of insurance on health outcomes.

The propensity score is estimated for the whole sample using a Probit model of the child's health insurance status controlling for child-, mother-, and household characteristics (see Table A3.3).[16]

Figure 3.4 provides a graphic representation of the overlap of the estimated propensity scores between the insured and uninsured group. The area of common support for the propensity score is limited to the area where the score of the treated households is not higher than the maximum of the untreated households. Limiting the observations to the area of common support and re-weighting households based on their propensity score improves the balancing of the sample (see Table A3.4).

We estimate the ATT using a nearest-neighbour (with replacement) and local linear matching (using a tri-cube kernel function with a bandwidth of 0.1) algorithm with the estimates restricted to the region of common support. While the nearest neighbour estimate uses only few, but high quality, observations likely to be less biased, the local linear matching produces a non-parametric matching estimator using weighted averages of all individuals in the control group in order to calculate counterfactual outcomes and hence has a lower variance (Caliendo and Kopeinig, 2008). The standard errors are estimated through bootstrapping with 100 repetitions. To test for heterogeneity of effects we disaggregate the analysis by poverty status and child age.

Figure 3.4
Distribution of the propensity score of insured and uninsured children



Source: Author's illustration based on data from the RDHS 2010.

The unconfoundedness assumption upon which the matching approach is based rules out that self-selection on unobservables is taking place. In the present case this is quite a strong assumption and unlikely to hold, which means that the estimates obtained from the matching could be biased. However, the programme design does provide scope to rule out some of the unobservable confounders: first, the 30 day waiting period after subscription eliminates selection based on immediate needs; second, since the *Mutuelles* is a household level programme, by controlling for the health status of other family members we can reduce the influence of the health status of the family as a time invariant latent confounding factor. In our case we use the mother's body mass index (BMI) as control. This still leaves us with the unobserved health status of the child as a source of bias. The child's health status should, however, be closely related to the overall family health status and therefore the influence should be lowered. The bias resulting from the child's health status could go in both directions; if healthier children are more likely to be insured then the estimates obtained would be overestimated. If it is frail-

er children that are insured then the estimates of insurance on health outcomes would be systematically underestimated. The characteristics of the insured children (see A3.2) show that insured children are more likely to come from wealthier backgrounds. If more wealth also means better health (see e.g. Case, Lubotsky, and Paxson, 2002; Deaton, 2003) then in our case the estimates are likely to be upward biased.

In order to test for the influence of selection bias we follow the bounding approach proposed by Rosenbaum (2002). The Rosenbaum bounds do not test the unconfoundedness assumption itself but determine how strongly the influence of unobserved variables must be in order to undermine the validity of the matching analysis. It thus tests the sensitivity of the estimates. Depending on the outcome variable under consideration (binary or continuous), the Rosenbaum bounds are calculated following the procedure by Becker and Caliendo (2007) or DiPrete and Gangl, (2004) respectively.

3.4.2 Alternative approach and robustness test

To test the robustness of the matching results, we alternatively also use a difference-in-difference approach. For this we pool the matched observations from the 2010 RDHS with matched observations from the 2005 RDHS. We applied the matching procedure described in Section 3.4.1 to the 2005 data. While the matching was set at the individual level, we use the pooled data to run a sector level fixed effects regression in the following form:

$$Y_i = \delta_0 + \delta_1 Z_i + X'_{im} \delta_{2m} + \delta_3 T_i + S'_{in} \delta_{4n} + \mu_i \qquad (3.4)$$

Y_i again represents the outcome of interest for each child, i. Given that not all outcome variables were compiled in the 2005 data, the estimations are limited to the outcomes which were compiled in both periods, 2005 and 2010. Due to missing information, we cannot estimate any effect of the insurance on water purification. Z_i represents the average *Mutuelles* enrolment rates in each sector calculated from the 2005 and 2010 RDHS. The vector X'_{im} stands for a set of m control variables including the age, sex, and breastfeeding history of the child, and the age,

education, nutrition and marital status of the mother. The vector X'_{im} also includes household controls such as the sex of the household head, household composition, and the wealth status of the household. The covariate T_i represents the survey year. The vector S'_{in} controls for sector effects. With T_i absorbing changes in the outcome over time and S'_{in} accounting for regional differences, the coefficient on Z_i , δ_1, in essence provides a difference-in-difference estimate of insurance enrolment at the sector level. Hence, assuming that the parallel trend assumption holds, the coefficient, δ_1, provides an unbiased estimate of the ATT at the sector level. We do not have sufficient pre-intervention records on enrolment rates of the *Mutuelles* at the sector level prior to the standardization in 2005 and therefore cannot test if the parallel trend assumption holds; however enrolment figures (see Figure 2) up until 2005 were generally low and thus the parallel trend should apply.

In contrast to the matching approach, the sector level analysis circumvents selection at the household level. The sector level fixed effects may also account for potential spill-over effects, e.g. congestion and an increased burden on public health facilities. Furthermore, the fixed effects control for the quality of health care at the sector level to the extent that this is constant across time. In order to control for a potential influence of the P4P scheme mentioned, we also included a set of dummy variables on health centre participation and performance. However, these turn out to be insignificant in the fixed-effects regression giving us some comfort that we are not picking up effects from the P4P scheme in our treatment estimate.

In addition to the sector level fixed effects estimation, we tried to use an instrumental variable (IV) approach applied to the 2010 cross-section. We used two alternative instruments: first, the average *Mutuelles* enrolment rates at the sector level based on administrative records from the Ministry of Health of Rwanda; second, the average *Mutuelles* enrolment rates per sector derived from the 2010 RDHS. The IV approach does not allow us to identify the ATT but, assuming monotonicity of treatment, independence between the instrument and the potential outcomes (i.e. that the instrument is exogenous), that the instrument does not have a direct effect on the outcomes (exclusion restriction), and that the effect of the instrument on health insurance enrolment is statistically significant, the IV approach allows us to estimate a local average treatment effect (LATE).

While average *Mutuelles* enrolment rates based on the administrative records of the Ministry might satisfy the exclusion restriction, they proved to have very low explanatory power for individual insurance enrolment. Also, the first-stage F-values obtained indicate that the instrument is weak (see Stock and Yogo, 2005). The *Mutuelles* enrolment rates derived from the 2010 RDHS show a higher explanatory power, explaining about 12.6 per cent of the variation in insurance enrolment, but also here the first-stage F-values do not give sufficient confidence in the instrument. Furthermore, since the average enrolment rates are derived from the 2010 RDHS, the exclusion restriction is unlikely to hold. Due to the weakness of the instruments, we refrained from using this approach as an alternative approach and to test the robustness of our results.

3.5 Results

3.5.1 The *Mutuelles* and childhood health

Table 3.2 shows the results of the ATT (Equation (3)) using the local linear matching algorithm. Column (1) shows the estimate across the entire sample of children, columns (2) to (4) show disaggregated estimates by wealth status and columns (5) and (6) results by age, i.e. differentiating between children below the age of two – the age category considered crucial for development – and older children up to five years.[17]

With respect to the weight-for-height z-scores (WHZ), the results obtained show that the effect of the *Mutuelles* is positive yet not statistically significant. This can partly be explained by the already low prevalence of stunting in Rwanda mentioned in the introduction.

The results for the height-for-age z-scores (HAZ) as a more long-term measure of child health status also show that, measured across the entire sample, the *Mutuelles* has a positive yet not significant effect. However, unlike the estimates of the WHZ the estimated HAZ-effect is subject to a considerable degree of heterogeneity. Disaggregating the results by wealth status, the results obtained indicate that the *Mutuelles* has a positive and significant effect on the HAZ of children coming from the poorest household quintile, while there is no significant improvement for children from higher wealth quintiles. The estimated improvement in HAZ of 0.223 due to health insurance in the poorest quintile represents

an average gain in the height of these children of approximately 0.2 cm. The estimated effects also indicate that the *Mutuelles* has a positive and significant influence on the height of children between six and 24 months. For older children no significant improvements are identified. The estimated improvement in HAZ of 0.222 represents an average gain in height for the cohort of approximately 0.2 cm.

The estimates of insurance enrolment on infant mortality suggest that the *Mutuelles* safeguards child survival, reducing the likelihood that an infant dies by 12.1 per cent. However, this effect also does not apply uniformly across all wealth categories. Unlike the pro-poor effect found with the HAZ, these results are actually driven by the beneficial impact of insurance on survival of children from richer backgrounds which are 18 per cent less likely to die during infancy.

While we find rather heterogeneous effects of *Mutuelles* enrolment on child health outcomes, we find consistent positive effects on the underlying channels. For example, the estimates provide further evidence that the *Mutuelles* indeed fulfils its access function. Children covered by the *Mutuelles* are almost 30 per cent more likely to be treated at a modern health facility when falling sick than their uninsured counterparts. Disaggregated, the effects are also similar across the wealth distribution; even so, the magnitude is somewhat higher for children from the second wealth quintile. The estimates do not point to a discrimination in access by the poor. However, the constant magnitude of the effect also suggests that any pre-existing gap in health care access between the rich and the poor is not reduced with the *Mutuelles*.

As second pathway, we also explore the influence of insurance on home based prevention. The estimated effects suggest that health insurance enrolment in Rwanda has a positive behavioural effect, with preventative measures at the household level expanding. Children that are covered by the *Mutuelles* are 5 per cent more likely to sleep under a bed net and 10 per cent more likely to benefit from treated drinking water. The positive influence on prevention could also be an indication that the information provided as part of the insurance package is actually working.

We have tested the robustness of the estimates to the influence of hidden bias using the approach proposed by Rosenbaum (2002). The values for Γ reported in Table 2 indicate how big the influence of an unobserved variable would need to be in order to render the estimated ef-

fects insignificant. Thus, the bigger the value for Γ the less likely the unobserved factor invalidates the estimated effects. In our case, for the majority of the estimated effects that are found to be statistically significant, Γ is beyond 1.5 or 2 even which provides some comfort that the estimates are not very sensitive to the influence of unobserved factors. However it does not mean that unobserved heterogeneity does not exist; it only tests the sensitivity of results but not the validity of the confoundedness assumption itself. Some more caution has to be exercised with the effects estimated with respect to the HAZ as the Γ is only 1.2, meaning that the findings become sensitive to bias if the odds of insurance enrolment increase by 1.2.

Alternatively to the local linear matching algorithm we have also estimated the ATT using nearest neighbour matching (with replacement). The estimates obtained are very similar in magnitude and significance to the ones presented in Table 2 and therefore not reported.

Table 3.2
Impact of Mutuelles coverage on child health outcomes and health behaviour (local linear matching with tri-cube kernel, bandwidth 0.1)

	(1) Total	(2) Bottom 20%	(3) 40%	(4) Top 60%	(5) 6-24 months	(6) >24 months
Child health outcomes						
Weight-for-height z-score (SD)	0.034 ***	0.069	0.106	0.034	0.045	0.004
	(0.043)	(0.076)	(0.099)	(0.059)	(0.096)	(0.056)
N	3,895	870	873	2,152	1,210	2,362
Γ (Rosenbaum bounds)	1	1	1	1	1	1
Height-for-age z-score (SD)	0.079	0.223 ***	-0.040	0.048	0.222 ***	-0.032
	(0.061)	(0.113)	(0.099)	(0.066)	(0.108)	(0.056)
N	3,895	870	873	2,152	1,210	2,362
Γ (Rosenbaum bounds)	1	1.2	1	1	1.2	1
Infant died (=1)	-0.121 ***	0.077	-0.016	-0.182 ***		
	(0.036)	(0.074)	(0.078)	(0.057)		
N	1,060	256	250	554		
Γ (Rosenbaum bounds)	1.7	1	1	2.3		
Health care behaviour						
Medical treatment (=1)	0.291 ***	0.299 ***	0.388 ***	0.237 ***		
	(0.041)	(0.100)	(0.082)	(0.062)		
N	795	183	178	434		
Γ (Rosenbaum bounds)	4.1	2.2	2.8	2.2		
Slept under bed net (=1)	0.048 ***	0.008	0.024	0.067 ***		
	(0.018)	(0.037)	(0.037)	(0.025)		
N	3,724	801	827	2,096		
Γ (Rosenbaum bounds)	1.4	1	1.1	1.6		
Water purified (=1)	0.095 ***	0.081 **	0.076	0.109 ***		
	(0.023)	(0.041)	(0.051)	(0.030)		
N	2,923	652	654	1,617		
Γ (Rosenbaum bounds)	2	1.2	1.4	1.5		

Notes: The ATT is estimated on the common support. The standard errors in parenthesis are obtained from bootstrapping with 100 repetitions. * p<0.10, ** p<0.05, *** p<0.01.
Source: RDHS 2010.

3.5.2 Results of the sector level estimations

Table 3.3 present the results of the sector fixed effects regressions as a means of testing the robustness of the results obtained from the matching approach (the results of standard OLS estimations are presented in Table A3.5 in the Appendix.). Comparing the results, a few observations stand out. Even though there is some divergence in terms of the size of the effects obtained (particularly in the event of medical treatment, where the estimates of the fixed effects approach are consistently larger), the results obtained from the fixed effects regression overlap with the matching results. Hence, also the fixed effects estimations lead us to conclude that the *Mutuelles* contributes to improving child health as measured by HAZ, particularly for insured children from the poorest backgrounds and the very young, i.e. children aged below the age of two. Furthermore, the results also indicate that a reduction in infant mortality comes mainly from households in the richest 60 per cent. Thus overall, the sector fixed effects estimates provide some comfort in the direction of the effects obtained.

3.5.3 Confounding factors

Even though the estimated effects are generally robust to alternative estimation approaches, our analysis is not without shortcomings. One concern is that we might not be able to sufficiently control for the effect of the P4P scheme which was introduced almost simultaneously with the standardization of the mutual health insurance. We have tried to control for health centre quality with a set of dummy variables which have, however, turned out insignificant in various specifications hence giving us some comfort that we are not actually picking up much of this effect.

An additional shortcoming is that the data at hand does not provide any information on the length of time the children have been enrolled in the *Mutuelles*. This could have a significant effect on health behaviour and outcomes which we cannot sufficiently explore and account for.

Furthermore, given the limitations of the data, we are not able to follow through a potential causal chain fully. For example, we cannot test to what extent the insurance induced reduction in health spending contributes to a better trajectory for recovery in the case of Rwanda as sug-

gested by the studies in Vietnam and the Philippines (Wagstaff and Pradhan, 2005; Quimbo et al., 2011).

Table 3.3
Impact of Mutuelles coverage on child health outcomes and health behaviour (sector fixed effects)

	(1) Total	(2) Bottom 20%	(3) 40%	(4) Top 60%	(5) 6-24 months	(6) >24 months
Child health outcomes						
Weight-for-height z-score (SD)	0.175	0.205	-0.207	-0.435	-0.385	-0.066
	(0.194)	(0.458)	(0.434)	(0.262)	(0.372)	(0.192)
N	6,889	1,482	1,492	3,915	2,229	4,013
Height-for-age z-score (SD)	-0.218	0.314 ***	-0.504	-0.267	0.109 ***	-0.216
	(0.218)	(0.160)	(0.431)	(0.294)	(0.031)	(0.275)
N	6,756	1,443	1,474	3,839	2,189	3,925
Infant died (=1) [+)]	-0.045	-0.015	-0.024	-0.345 *		
	(0.032)	(0.077)	(0.060)	(0.198)		
N	2,168	472	481	1,251		
Health care behaviour						
Medical treatment (=1) [+)]	0.381 ***	0.660 ***	0.501 ***	0.270		
	(0.072)	(0.157)	(0.155)	(0.087)		
N	1,431	307	307	817		
Slept under bed net (=1) [+)]	0.076 *	0.067 *	0.077 *	0.066 *		
	(0.046)	(0.041)	(0.046)	(0.040)		
N	4,216	792	887	2,537		

Notes: Information on water purification was not collected in the RDHS 2005 and could thus not be assessed using the fixed effects model. For the outcomes marked [+)] the marginal effects are reported. Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.
Source: RDHS 2005 and 2010.

3.6 Conclusion

Previous research shows that negative health shocks in childhood can have lasting consequences through to adulthood. In this chapter we explore to what extent health insurance could limit these effects and actual-

ly contribute to improving childhood health. We explore this in the context of Rwanda, which is one of the few countries in Sub-Saharan Africa that operates a national social health insurance scheme – the *Mutuelles de Santé*.

The *Mutuelles de Santé* started from a set of community-based health insurance schemes that were decentrally managed at the district level and was gradually transformed into a social health insurance scheme. Crucial factors for the implementation are the fact that it was a government-driven process, which included pilot testing of the schemes and organization, and the establishment of a legal framework unifying the schemes. In low income countries, the uptake and adherence to insurance is often low. In the case of the *Mutuelles*, the relatively well developed health infrastructure, the decentralized management structure with promotion and enrolment taking place at the *Mutuelles* section at the sector level, the flat, low premium schedule in the beginning, and the legal obligation to obtain health insurance are four factors that contributed to ensure adherence in the early stages.

Our study complements an increasing body of research on the effects of health insurance in developing countries and provides first estimates on the impact of health insurance on childhood health in Rwanda. We find heterogeneous effects of health insurance on childhood health. The estimates suggest that particularly young children below the age of two and children from poorer backgrounds benefit from the insurance. For both groups we estimate that the *Mutuelles* contributes to an average improvement in height of approximately 0.2 cm respectively. These estimates are more modest than estimates obtained in other contexts (see e.g. Wagstaff and Pradhan, 2005). Nevertheless, if enrolled, it would indeed suggest that the *Mutuelles* does have a pro-poor effect. However, there also seem to be clear limitations. When looking at infant mortality, the estimates suggest that the *Mutuelles* might not provide sufficient protection to limit the death of infants in poor households. Thus, while the *Mutuelles* lowers the financial barriers to health care, risk factors for poor households seem to remain which need to be identified. If they are primarily of a financial nature, there is a risk of a reversal of the pro-poor effect of the *Mutuelles* in light of the amended premium schedule: in 2011, to ensure the financial sustainability of the health insurance scheme, the annual membership fees were increased. For the poorest the annual per capita fee increased by 100 per cent. Even though the gov-

ernment is currently subsidizing the fees for about 25 per cent of the poorest (Ministry of Health of Rwanda, 2012), the increase bears the risk of causing drop-out or non-enrolment and a reversal of the positive effects seen. This will have to be closely monitored and the effects of the policy change at the household level will have to be analysed in a more systematic way in further research.

Notes

[1] There is still some debate on the critical ages, i.e. the periods when health shocks are most harmful, but most works consider the period from gestation up to two years of age as crucial (see e.g. Currie and Vogl, 2012).

[2] Exceptions are the studies from the Rand Health Insurance Experiment in the US, one of the few randomized control trials (RCTs) conducted on the subject (see. e.g. Brook et al., 1983).

[3] Comparing the child health statistics over time shows that it took the country about 10 years to recover from the 1994 Genocide to get back to the pre-Genocide rates of 1992 (see RDHS of the years 1992, 2000 and 2005).

[4] The pilot schemes were introduced in the three districts of Kabutare (in the former Butare prefecture), Byumba (formerly Byumba prefecture) and Kabagayi (in the former Gitarama prefecture). In 2005, Rwanda went through a reorganization and the administrative structures were changed from prefectures and sectors to provinces, districts and sectors. Currently the country is divided into 416 sectors in 30 districts and 4 provinces as well as the capital city of Kigali.

[5] Despite the approval of the policy at end of 2004, there was still some variation in the scheme design across districts until 2006 when it was fully unified (Lu et al., 2012).

[6] Following expert interviews, conducted with programme staff and community health workers in the period from the 1st to the 11th March 2012, non-compliance with the family enrolment is negligible due to close social ties at the sector level and below.

[7] Prior to the standardization, the annual premium for a household with up to seven members varied considerably by region ranging from 2,500 to 11,500 RwF (ca. 3.10 to 14.40 Euro) (Lu et al., 2012).

[8] The government subsidizes the *Mutuelles* enrolment for poor and vulnerable groups e.g. victims of the Genocide. Anecdotal evidence indicates that some of the beneficiaries are not aware of their entitlement, meaning that the enrolment rate from other national surveys might also be somewhat underreported.

[9] *Ubudehe* categories are poverty or wealth categories used in the country for household classification. The identification of which household belongs to which category is based on a community participatory approach. The current classification comprises of six categories running from those in abject poverty (*umutindi nyakujya*), the very poor (*umutindi*), to the poor (*umukene*), the resourceful poor (*umukene wifashije*), the food rich (*umukungu*) and finally the money rich (*umukire*).

[10] Based on the study results as presented it cannot be deduced how much of an average gain in weight and height that actually implies, which makes a comparison difficult.

[11] We have to resort to cross-section data as panel data including health outcomes is not available.

[12] This represents 2.6 per cent of all children in the sample.

[13] Note the difference to the official coverage rates reported by the Ministry of Health of Rwanda (see Figure 3.2). The divergence comes from a different definition of the target population used by the Ministry of Health of Rwanda but likely also from underreporting in the RDHS as households which receive government subsidies are often not aware of their entitlement.

[14] With the size of our sample, we are only able to detect effects when more than 19,000 deaths occur.

[15] The increase in use comes after a nationwide campaign in 2006, in which the Ministry of Health distributed 1.96 million long-lasting insecticide-treated bed nets (LLIN) to children under five (see Otten et al., 2009).

[16] The covariates include the sex, age and breastfeeding history of the child; the age, marital status, education and BMI of the mother; the location of the household (rural/urban) the sex of the household head, the household composition, the wealth quintile and whether the household owns a radio as a source of information.

[17] We cannot disaggregate the results further by age within each wealth quintile as the sample sizes become too small.

4 Public Works as Means to Push for Poverty Reduction? Short-term Welfare Effects of Rwanda's Vision 2020 *Umurenge* Programme

In this chapter we use a two-round household panel together with qualitative information to explore the short-term welfare effects of the public works component of Rwanda's Vision 2020 *Umurenge* Programme (VUP). Double-difference estimates show that households significantly increase food consumption and livestock investment in the short-run. Qualitative evidence, however, suggests that these improvements are short-lived as households fear falling back to their initial state after leaving the programme. While the VUP is targeted at the poorest households, the public works component seems to attract relatively better-off households. Removing the barriers for participation could enhance the poverty-reducing effect of the programme.

4.1 Introduction

Public works programmes have a long-standing tradition as policy interventions going back to the 19th century and beyond (Subbarao, 1997). The increasing frequency of economic shocks, crises and disasters and persistent poverty have revived the interest of policy makers in public works programmes. The opportunity to provide employment and construct physical infrastructure that can enhance growth and economic transformation makes them an attractive option for poverty reduction and social security in low income countries (Deininger and Liu, 2013). At the same time, the implementation of such programmes on a national scale is demanding and requires considerable administrative capacities. This is also one of the reasons why there are still only few national programmes implemented in Sub-Saharan Africa.

The Vision 2020 *Umurenge* Programme (VUP) in Rwanda is one of the recent nationwide public works interventions launched in Sub-Saharan Africa. It is also the flagship anti-poverty and social protection programme currently run in Rwanda. While the empirical literature on public works programmes and employment guarantee schemes, particularly on the case of the NREGS[1] in India, is expanding rapidly (see e.g. Dev, 2011; Azam, 2012; Afridi et al., 2012; Klonner and Oldiges, 2012; Lagrange and Ravallion, 2012; Papp and Imbert 2012; Zimmerman, 2012; Deininger and Liu, 2013), to our knowledge there is no empirical analysis of the VUP, yet.

The VUP offers limited term employment to poor households. Through the income transfer the programme aims to safeguard consumption and promote asset accumulation and investment. While it is widely believed that providing poor households with an income opportunity in the form of public works leads to increased consumption and investment, there is little empirical evidence for this hypothesis (see e.g. Devereux and Coll–Black, 2007; McCord and Slater, 2009; DFID, 2011; Independent Evaluation Group, 2011a; Hagen-Zanker et al., 2011 for reviews). There are also concerns that public works programmes may have adverse effects and actually work counter-intuitively to the poverty-reduction rationale. For example, labour used in public works may lead to crowding out of other activities such as on-farm production and investment and thus cause a net loss in income and thus lower consumption and investment (see e.g. Datt and Ravallion, 1994). Also, the presence of a public works or any other transfer-based safety net programme may reduce income uncertainty and induce households to lower their demand for assets and investment. Deaton (1989, 1991), and Rosenzweig and Binswanger (1993) and others (see e.g. Elbers et al, 2007; Christiaensen and Dercon, 2011), for example, develop theoretical models and show that in the absence of functioning credit markets, risk-averse households tend to save to smooth future consumption even at high discount rates. Their models predict that a reduction in the uncertainty in future income, e.g. due to the presence of a public works programme, leads to increased consumption by these households at the expense of investment.

Empirically there are some studies which show that public works-based safety net measures can indeed have these disincentive effects. In Ethiopia, for example, Barrett et al. (2004) find a strong negative associa-

tion between food-for-work participation and investment in agricultural intensification, i.e. improved seeds, fertilizer and irrigation. Gilligan and Hoddinott (2006) find significantly slower growth in livestock holdings of food-for-work participants, consistent with the argumentation of reduced demand for precautionary savings due to greater confidence in the reliability of transfers. Maxwell et al. (1994), on the other hand, do not find evidence for disincentive effects, neither for labour supply nor for agricultural intensification when assessing the impact of a food-for-work programme in Damot Woyde, Ethiopia. The authors argue that this is a result of careful targeting and complementary encouragement of intensification through an extension programme.

More recent studies from the Productive Safety Net Programme (PSNP) in Ethiopia – which is in many aspects similar to the VUP in Rwanda – also suggest that intended positive effects of public works on consumption and investment may not materialize immediately. Gilligan et al. (2009), for example, find no evidence for increased consumption, use of agricultural technologies or livestock due to the programme in the short-run. The authors attribute these findings to the lower than expected transfers received. However, they also show that participants who have access to public works and agricultural support are more likely to use improved agricultural technologies but still do not show faster asset growth. Anderson et al. (2011) also do not find a significant impact of the PSNP on livestock holding in the Amhara region of Ethiopia. It seems that the intended positive effects of the PSNP on consumption and investment can only be established in the longer run. Berhane et al. (2011) show that if households receive public works transfers from the PSNP for a period of five years, their food consumption and security improves sustainably. With respect to investment in productive assets, i.e. tools, the authors cannot identify a significant long-term effect. However, they do find an overall positive effect on livestock holdings. Households that receive the public works transfer for five years expand their livestock holding by 0.38 tropical livestock units (TLU) on average relative to households which only receive a one year transfer. In the case of the NREGS, Deininger and Lui (2013) also find that asset accumulation only becomes visible in the medium term. But they do identify positive short-run effects of the scheme on consumption and nutritional intake (Deininger and Lui, 2013).

The existing evidence on public works interventions in low income settings leads us to suggest a number of things: first, unintended effects, particularly in the short-run, are likely; second, positive effects on the accumulation of assets may only become observable over time; third, targeting and the size of the public works transfer matter; and forth, complementary interventions seem to promote productive effects already in the shorter term.

Against this background and in light of the programme objectives we explore the impact of the VUP on key consumption and investment indicators using data from a two-round household panel. Since public works programmes are often implemented as short-term countercyclical interventions where it is not feasible to collect baseline information (see Ravallion, 2003; 2013), or in contexts where baseline information is lacking (as in the case of the PSNP, see McCord and Slater, 2009), we propose a matching procedure which accounts for potential selection effects to assess programmes when only cross-section data is available. Thus, we aim to contribute to the literature in two ways: we provide further evidence on the welfare effects of public works programmes in the short-run, and methodologically, we propose an additional approach for short-term monitoring to inform the policy discourse when only limited data is available.

We find that in the setting studied, the public works programme attracts relatively better-off households. The estimated effects point to programme-induced improvements in consumption and livestock investment already in the short-run. Qualitative evidence suggests that regular training and information activities have a positive influence on investment behaviour. Nevertheless, the qualitative information suggests that the material improvements are short-lived as households fear falling back to their initial state after leaving the programme.

The remainder of this chapter is organized as follows. In Section 4.2 we describe the key features of the VUP and the public works component. In Section 4.3 we present the data, key variables and descriptive statistics. In Section 4.4 we outline the empirical strategy. In Section 4.5 we present the estimates on the short-term programme impact complemented by a qualitative discussion and in Section 4.6 we conclude and draw out implications for policy and further research.

4.2 Programme nature and context

4.2.1 Programme design and objectives

The VUP was launched in 2008 in order to accelerate the rate of poverty reduction in Rwanda, since in 2006 still over 56 per cent of the population lived below the national poverty line. While the VUP is intended to be a national programme it was rolled out in phases. In 2008 the programme was operated in 30 pilot sectors (cohort 1).[2] This is one sector from each district of the country. The programme area was expanded by 30 sectors each year (for a map of the sectors covered in this study see Appendix A4.1). The programme implementation is not random. Sectors are selected based on infrastructure and food security characteristics.[3] Implementation started in the poorest sector of each district, expanding to the second poorest in the following year, and so on. Currently the VUP is operated in 180 sectors, i.e. in about one third of the country covering over half a million people.[4] By 2016 it is planned that the VUP will be operated nationwide.

The VUP has three components: public works, direct support and financial services. The public works component was the first VUP component launched in July 2008. It is the largest programme component and aims to provide poor households which have at least one adult member able to work with limited term employment opportunities. The income earned from this activity is intended to serve as a basis for saving and investment, to promote asset accumulation and to stop households from selling productive assets to survive (Ministry of Local Government of Rwanda, 2009). The direct support component was launched in January 2009 and works as a social protection floor providing a direct monthly cash transfer to poor households without 'able-bodied' labourers. The size of the transfer is dependent on the household size, ranging from 7,500 RwF for one person to 21,000 RwF (approximately 10-28 Euro) for households with five or more members. Households benefiting from the direct cash and wage transfers also receive training and sensitization on financial management and the productive use of transfers, savings and credit, as well as information on health, education and cross-cutting issues such as gender equity to complement the intervention.

The eligibility for either the public works or the direct support components of the VUP is determined at the community level in a yearly community meeting with sector staff present. Two criteria determine

eligibility for the programme, the *Ubudehe* category of the household and the available labour force, i.e. households with adult labourers qualify for public works, labour-scare households for direct support. The *Ubudehe* category reflects the poverty or wealth level and is used in Rwanda for social protection targeting. *Ubudehe* category 1 households are households in abject poverty (*umutindi nyakujya*), i.e. households without land, livestock and shelter which have to beg to survive. In category 2 are the very poor (*umutindi*). The main difference with category 1 is that they are typically physically more able to work. The poor (*umukene*, category 3) generally have some land and shelter, and can survive from their labour income and own production on a day to day basis. Categories 4 to 6 comprise the resourceful poor (*umukene wifashije*), the food rich (*umukungu*) and the money rich (*umukire*). Only households ranked in *Ubudehe* categories 1 and 2 are eligible for VUP public works or direct support. The community-based targeting exercise is repeated on a yearly basis. Thus, the initial programme eligibility is limited to 12 months. Even though broad descriptions are given out on which households should be classified in which category, there is no uniform approach or directive to be followed thus the decision-making process varies by community and cannot be observed.

The financial services component, the *Ubudehe* Credit Scheme, was launched in selected communities in February 2010. It complements the public works and the direct support components by offering credit to the poor and aims to further spur productive investment, entrepreneurship and off-farm employment. In principle all households in the community, irrespective of their VUP programme status, can apply for credit under the *Ubudehe* Credit Scheme.[5] Applicants submit a proposal for a profitable income-generating activity to the community leadership committee for approval. Households have to demonstrate the ability to manage the loan and the income-generating activity; they have to have a bank account and upon acceptance have to sign a performance contract with the community. The interest rate on the loan is 2 per cent p.a. The repayment schedule can be chosen by the applicant but the maximum repayment period for the loan should not exceed 12 months.

4.2.2 Public works implementation

Labour markets in rural Rwanda are thin and jobs are not readily available. Over 80 per cent of the population are engaged in agriculture. About three million Rwandans work on their own farm as a main occupation (NISR, 2012). However, due to the high pressure on land, new labour force entrants in rural areas are largely pushed into waged farm employment. Over the past decade the share of waged farm employment has expanded by 300 per cent. It is now the main occupation for about half a million working age adults in rural areas (National Institute of Statistics Rwanda, 2012). But agricultural labourers are also the poorest group in the workforce with 38.2 per cent living below subsistence levels (National Institute of Statistics Rwanda, 2012).

The public works component of the VUP creates a local labour market for unskilled labour by involving them in labour intensive community-based infrastructure and rehabilitation projects. The VUP public work projects are selected and implemented by the sector administration according to local needs and in line with sector level development plans. Due to the high pressure on land in the county, the majority of the public works projects implemented are land rehabilitation works (see Table 4.1 for the infrastructure generated through public works).

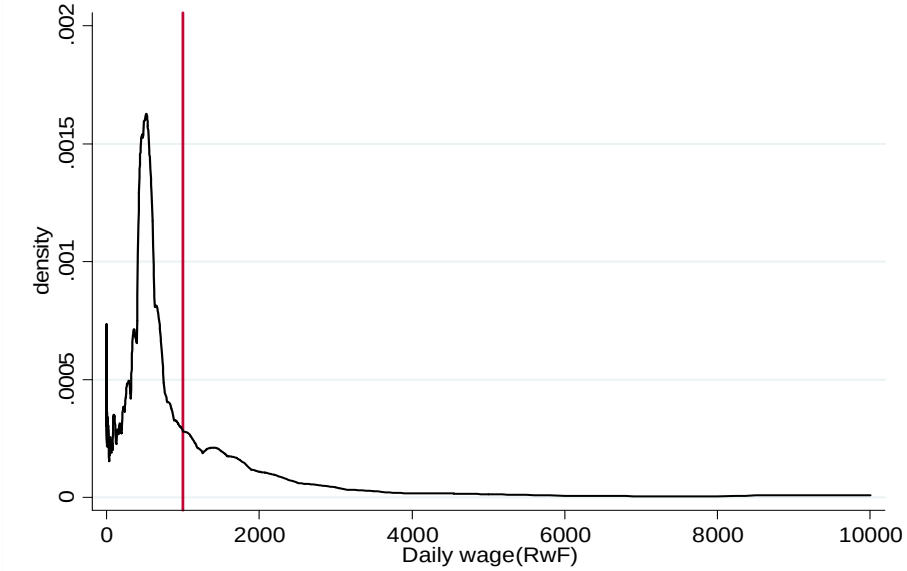
While the direct support component of the VUP is an entitlement-based programme, the public works component is not: Participation is dependent on the budget and the amount of work available in the sector. If the eligible households exceed the number of jobs available, jobs are either rationed or workers are rotated so that all eligible households are covered but work a smaller number of days. If the number of jobs exceeds the number of eligible households, participation is also offered to households in higher *Ubudehe* categories. Thus, the number of days a household can work on public works is not fixed and varies according to the eligible population, project type and financial resources available. In the first years, the public works component provided just over 40 days of work per household per year (see Table 4.2) which means that the VUP falls short of the target of providing beneficiaries with all-year-round employment.

The daily wage rate paid for public works is set at the sector level at a rate no higher than local market wages for unskilled labourers working eight hours a day.[6] Through the local wage setting, the programme aims

to promote self-selection of poor beneficiaries without distorting local labour markets. To reduce leakages and promote access to financial services, one of the innovative features of the VUP is that all beneficiaries have to have a bank account and wages are paid directly to beneficiary bank accounts on a two-weekly basis.

Figure 4.1 shows the distribution of the average daily wages in rural Rwanda based on nationally representative data from the Integrated Household Living Conditions Survey (EICV) conducted in Rwanda in 2010/11. The red line indicates the average daily wage paid for public works in the same period (approximately 1,000 RwF, equivalent to 1.30 Euro). The figure shows that about 74 per cent of the rural population earn on average less than the daily public works wage. In light of the low average income, the lower than market wage paid for public works might actually not work as a selection mechanism targeting the neediest.

Figure 4.1
Distribution of average daily wage in rural Rwanda (2010/11)



Source: Author's illustration based on data from the EICV 2010/11.

Table 4.2 below shows the number of eligible and actual public works beneficiary households and the average earnings for the first four years of programme implementation. The figures indicate that the actual num-

ber of beneficiaries is lower than the number eligible which could suggest one of two things; either the public works positions offered do not suffice for the eligible population or there is not enough take-up. Project level data shows that in the majority of sectors rationing is taking place. For example, during the financial year 2011/12 the number of positions offered was lower than the number of eligible households in about two third of the sectors (Rural Local Development Support Fund, 2012).

Despite rationing at the sector level, in-depth interviews with programme managers, public works participants and non-participants suggest that there are still substantial barriers or refusal to participate in public works.[7] Generally, people perceive the public works wage as too low and the work as too physically demanding which means that weaker workers are not able to perform the tasks. Closely related to the wage, the payment mechanism also poses a significant barrier to participation. Households cannot afford to pay the fees to open the bank account (approximately 4,000 RwF) and pre-finance two weeks expenses (or more) prior to receiving their wage. Another obstacle to participation is the accessibility of the public works sites. Interviewees also indicated that household structure and responsibilities restrict participation, e.g. women have to look after their children or household members have to guard their property.

'The take-up rates are definitely lower than 100 per cent. Some people deliberately decide not to do public works even if they are offered. The main reasons are that the public works projects are all located close to the sector office so people living in Kibaga or Kinjana, for example, do not come. For them it is just too far to get here. They would need to leave home at four in the morning in order to be here by seven. Second, for public works you only get 800 RwF a day so some people prefer to go to Kigali or Gitarama to work where they earn more. Also, for most one-person households, the person prefers to stay around their house and not leave.'

'Before, I could not work for VUP because they worked far away and I was pregnant but now they are closer and I started making terraces. The work is hard and I have trouble with my back and I cannot sleep. I can only work a few days in a row. Then, I have to rest and find another job to be able to eat.'

'I cannot work for VUP because they pay late and I need to earn at least 500 RwF every day to eat and feed my child.'

The indicative evidence on rationing and the barriers to programme participation point to inefficiencies in the programme design that need to be addressed. We return to this aspect in Sections 4.3 and 4.4, when looking at programme participation more systematically.

Table 4.1
Infrastructure generated through VUP public works (2008-2012)

	Financial Year (FY) 2008 (Jul 08–Dec 08) 30 sectors	FY 2009 (Jan 09-Jun 09) 30 sectors	FY 2009/10 (Jul 09-Jun 10) 60 sectors	FY 2010/11 (Jul 10–Jun 11) 90 sectors	FY 2011/12 (Jul 11-Jun 12) 120 sectors
# of projects	38	35	123	187	229
Anti-erosive ditches (ha)	2,376	2,702	17,782	23,247	6,322
Radical terraces (ha)	318	280	5,446	3,875	4,450
Valley dams (#)	40	—	70	485	8
Ponds (#)	—	—	—	116	38
Marsh land rehabilitation (ha)	—	—	—	22	3
Coffee plant ditches (#)	—	147	—	—	—
Crop cultivation (ha)	—	—	—	489	540
Roads (km)	166	72	131	485	749
Bridges (#)	—	—	88	6	1
Water infrastructure (km)	—	—	32	82	106
Electricity (km)	—	—	—	3	1,112
School classrooms & admin. (#)	—	—	43	78	154
School latrines (#)	—	—	—	24	54
Health centres (#)	—	—	2	4	10
Markets (#)	—	—	4	1	2
Community halls (#)	—	—	—	1	1
Football fields (#)	—	—	—	1	—
Improved furnaces (#)	—	—	1	4	1

Notes: As of the 1st July 2009 the Government financial year in Rwanda changed from the 1st January to 31st December to 1st July to 30th June.
Source: RLDSF administrative records and RLDSF (2012).

Table 4.2
Public works (PW) participation and income (2008-2012)

	Financial Year (FY) 2008 (Jul 08-Dec 08) 30 sectors	FY 2009 (Jan 09-Jun 09) 30 sectors	FY 2009/10 (Jul 09-Jun 10) 60 sectors	FY 2010/11 (Jul 10-Jun 11) 90 sectors	FY 2011/12 (Jul 11-Jun 12) 120 sectors
# of eligible households (according to targeting list)	___	___	64,554	124,581	143,291
# of beneficiary households	18,304	17,886	61,335	103,557	94,427
% of female headed households	___	___	49	46	46
Av. days worked per household	43	47	69	45	42
Av. wage earned per household (RwF)	38,305	42,311	63,423	45,168	45,242
Av. daily wage paid (RwF)	890	900	919	1,003	1,077
% of total PW cost spent on labour	88	86	88	45	47

Notes: As of the 1st July 2009 the Government financial year in Rwanda changed from the 1st January to 31st December to 1st July to 30th June.
Source: RLDSF administrative records and RLDSF (2012).

4.3 Data and descriptive statistics

4.3.1 Quantitative data

The quantitative data used in this chapter comes from the VUP household survey. The survey is conducted under the responsibility of the Rwanda Local Development Support Fund (RLDSF) at the Ministry of Local Government of Rwanda (MINALOC), the agency charged with the implementation of the VUP. The VUP household survey was supposed to be conducted on a yearly basis as part of the regular monitoring and evaluation activities of the VUP. So far, however, only two survey rounds have been collected.

The first survey was conducted from October to December 2009 – 15 months after the launch of the programme. The survey covers 90 sectors, i.e. three sectors per district. The 90 sectors comprise the 30 VUP pilot sectors where the VUP was introduced in July 2008 (cohort 1), the 30 sectors where the VUP started in July 2009 (cohort 2) and 30 sectors where the VUP had not yet been rolled out at the time of the survey but where the VUP has operated since July 2010 (cohort 3) (see Figure 4.2). The survey used a stratified design, sampling six households per each cell in the sector, comprizing of three households from *Ubudehe* categories 1

and 2 (the potential VUP beneficiary categories); two households from *Ubudehe* category 3 and one household from *Ubudehe* category 4 or above. The survey had a response rate of 99.3 per cent, collecting information on a total of 2,771 households. Information on 14 households could not be used due to missing or incorrect recording of information, resulting in a final sample size of 2,757 households.

For the survey a six-page questionnaire was used organized around 11 modules covering the basic demographic characteristics of the household, the education level of the household head, the available labour force, aggregate income, food consumption, expenditure and investment, agricultural production, accommodation, equipment and assets, access to infrastructure and services, and social participation. In 2009 information on the available infrastructure in each cell was also collected.

The follow-up survey was conducted two years later from August to December 2011 with an increased sample of 4,449 households. This included 2,567 households which were already interviewed in 2009. The sample attrition is 8 per cent. We tested for the influence of attrition but no significant pattern or influence could be identified. The remaining sample was comprised of a set of households in the new and prospective VUP sectors. The 2011 survey thus also included households from the 30 sectors where programme implementation started in July 2011 (cohort 4) and households from 30 sectors where the VUP was planned to be rolled out in 2012 (cohort 5). For the new sectors included in the sample the same stratified sampling was applied.

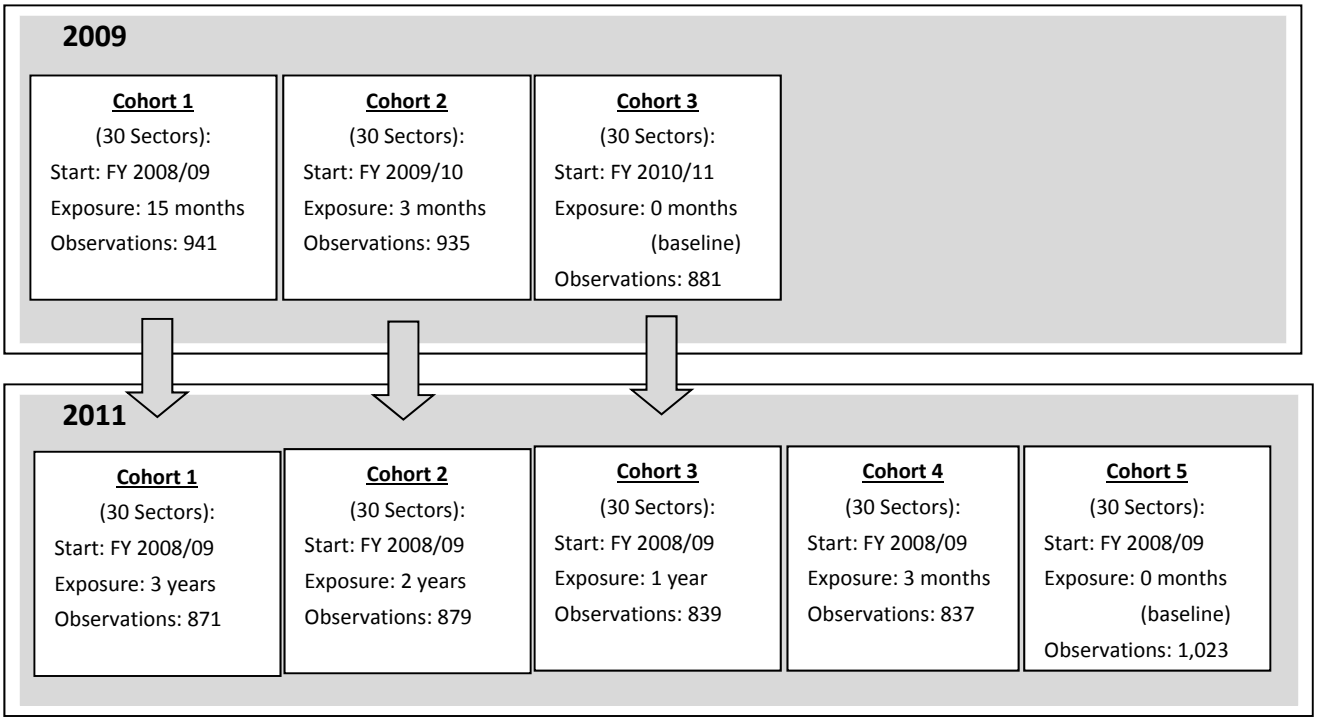
The questionnaire used in the follow-up survey was amended and the modules on income, agricultural production and assets were dropped. Figure 4.2 summarizes the composition of the quantitative data collected.

4.3.2 Qualitative data

In addition to the quantitative data, we conducted 26 in-depth interviews and one focus group discussion with public works participants, non-participants and recent graduates in three VUP sectors (see Tables A4.2 and A4.3 in the Appendix for a description of the interview sample and basic characteristics). The qualitative data was collected in December 2011. The sectors where the in-depth interviews and focus group discus-

sion were conducted vary in their length of programme exposure. One sector was part of the VUP pilot scheme, in the second and third sector the programme had been operating for just over one year (launch in July 2009). For the in-depths interviews, interviewers followed a structured protocol with open ended questions. All interviews were conducted in the local language (Kinyarwanda), taped and transcribed into English. The topics covered in the interview include perceptions of the programme, the choice to participate, consumption and investment, the welfare impact, behaviour change, attitudes, experience and expectations.

Figure 4.2
Composition of the household survey



Source: Author's illustration.

4.3.3 Descriptive statistics of the sample households by area

Table A4.4 in the Appendix provides descriptive statistics of the households in the VUP and non-VUP sectors in 2009. Since programme implementation in the cohort 2 sectors started late and no public works income had been reported at the time of the survey, we count those 30 sectors as non-VUP sectors. The households in the VUP and non-VUP sectors are similar in most characteristics. Exceptions are housing characteristics where households in the VUP sectors appear slightly poorer with a higher prevalence of dirt floors (90 per cent) and less electricity access (2 per cent). Households in VUP sectors are on average also a bit further away from public transport links and attend fewer meetings with the administration. However, we do not know how many meetings were scheduled. The *Ubudehe* categorization is not representative of the true poverty profile in the sectors but is a result of the stratification. The cell characteristics highlight the difference between the VUP and non-VUP sectors. The higher prevalence of markets and electricity connections in the cells in the non-VUP sectors is indicative of regional differences with VUP sectors having fewer endowments.

4.3.4 Descriptive statistics of beneficiary households

Table A4.5 in the Appendix shows the characteristics of the actual public works participants in the VUP sectors and the public works eligible households in non-VUP sectors in 2009. The public works eligible households in the non-VUP sectors are those that meet the targeting criteria, i.e. which are classified in *Ubudehe* categories 1 or 2 with at least one able-bodied labourer. Direct comparison shows that actual public works participants are different from actual eligible households in a number of characteristics. 67 per cent of the households participating in public works are male headed. Among the eligible households this is more gender balanced (52 per cent). Only 34 per cent of the heads of public works households are handicapped compared to 47 per cent of the eligible households. Public works households have approximately 0.5 more members on average, they have more rooms in their house and about 90 per cent own the house they live in compared to 84 per cent of the eligible households. Also public works eligible households have lower land holdings than actual public works participants with 68 per cent of the

eligible households owning less than 0.25 ha of farm land compared to 50 per cent of the public works households. The difference in landholding could already be a result of the VUP if public works households invested in land acquisition. Public works households still have to travel further to access basic infrastructures and institutions like markets or banks. Regional differences are also apparent when considering the cell characteristics. About 72 per cent of the public works households participated in the social mapping and targeting meeting conducted by the administration and they also attended one to two more meetings at the sector and district level compared to the eligible households in the non-VUP sectors. The poverty categorization shows that public works households are mainly classified in categories 2 and 3 but 10 per cent also reportedly belong to the non-poor (category 4 or above), whereas the eligible are per definition limited to *Ubuedehe* categories 1 and 2 households. The direct comparison of the public workers and the eligible suggests that the actual public works households are a bit richer than the eligible given their housing characteristics, land ownership and poverty categorization. Especially when looking at the *Ubudehe* categories, the information would suggest that the programme mistargets.

The 2009 household survey provides baseline information on households in the third VUP cohort. In Table 4.3 we show the actual baseline characteristics of the public works participants in 2010/11 and compare them to the characteristics of households that were eligible for public works during this period but did not participate.

Table 4.3
Baseline characteristics of public works participants (N=137) and public works eligible non-participants (N=237) in cohort 3 sectors

	Public works participants		Eligible non-participants			
	Mean	**SD**	**Mean**	**SD**	**P-value**	
Characteristics of the household head						
Male (=1)	0.61		0.43		0.001	***
Age	43.52	13.60	46.94	16.45	0.040	**
Handicapped (=1)	0.41		0.46		0.338	
Literate (=1)	0.46		0.39		0.176	
Household characteristics						
# of household members	4.64	2.19	4.34	2.11	0.191	
# household members able to work	1.54	1.01	1.95	1.14	0.001	***
# elderly (65+)	0.07	0.28	0.19	0.43	0.003	***
# children (0-5 yrs.)	0.88	0.90	0.76	0.92	0.191	
# of rooms in house	2.73	1.38	2.61	1.23	0.402	
Household owns house (=1)	0.91		0.87		0.300	
Household is rent-exempted (=1)	0.03		0.07		0.113	
Grass hatched roof (=1)	0.24		0.16		0.056	
Earth floor (=1)	0.92		0.94		0.535	

Table continues next page.

Table 4.3
(…continued)

	Public works participants		Eligible non-participants			
	Mean	**SD**	**Mean**	**SD**	**P-value**	
Household characteristics (cont.)						
Household has electricity access (=1)	0.02		0.03		0.515	
Landholding <0.25 ha (=1)	0.64		0.70		0.166	
Distance to nearest road (min.)	68.77	166.03	78.13	189.55	0.631	
Distance to market (min.)	112.76	213.61	96.39	182.31	0.433	
Distance to school (min.)	60.58	307.08	52.14	195.22	0.745	
Distance to health centre (min.)	115.85	395.01	92.10	237.66	0.468	
Distance to bank (min.)	129.89	230.01	115.72	173.50	0.501	
Distance to nearest transport (min.)	105.20	104.86	83.78	103.53	0.056	
Distance to administration (min.)	69.01	307.35	76.54	347.85	0.834	*
Participation in social mapping (=1)	0.61		0.57		0.546	
# of village meetings attended	10.80	10.19	8.91	7.91	0.047	**
# of sector meetings attended	7.59	9.21	6.67	7.27	0.286	
# of district meetings attended	3.09	3.35	2.43	2.80	0.043	**
Ubudehe category (shares)						
1	0.18	0.39	0.21	0.41	0.509	
2	0.45	0.50	0.79	0.41	0.000	***
3	0.27	0.45	0.00	0.00	0.000	***
4	0.07	0.26	0.00	0.00	0.000	***
5	0.02	0.15	0.00	0.00	0.022	**
6	0.00	0.00	0.00	0.00	---	
Cell characteristics						
# of households in the cell	907.38	393.14	886.69	324.93	0.584	
# of markets in the cell	0.35	0.51	0.34	0.50	0.917	
Electricity in cell (=1)	0.16		0.16		0.978	
Phone network in cell (=1)	0.21		0.29		0.119	
Internet in cell (=1)	0.02		0.02		0.968	

Notes: The p-values represent the result of the t-test on the equality of means between the public works participants and the public works eligible non-participants in cohort 3. * p<0.10 ** p<0.05 *** p<0.01.
Source: 2009 VUP household survey.

Comparing the baseline characteristics indicates that female headed households are less likely to participate in public works with over half of the non-participating households being headed by a female. The average head of a public works household is 43.5 years old. In non-participating households the head is on average 3.5 years older. Both public works households and non-participants have on average just over four household members. Public works households have about 1.5 persons able to work, whereas in non-participating households it is almost two. In turn, non-participating households are more likely to have an elder member. The actual public workers do not differ much from non-participants in their housing characteristics. Also, both have similar access to infrastructure; however public works participants live closer to the administration. This observation ties in with the qualitative evidence which suggests that public works sites are located closer to the sector administration, posing a barrier to households living further away. Public works households are more likely to have participated in the social mapping exercise but the difference is not statistically significant. Nevertheless, public works households attended on average two village meetings more. This could be an indication that public works households have more information about the programme which could influence their choice to participate in the VUP. 45 per cent of the public works participants are classified as very poor (*Ubudehe* 2). Only 18 per cent of the participants are from category 1, i.e. those in abject poverty which are also those less likely to be able to work. The *Ubudehe* classification indeed shows that there is a considerable degree of mistargeting, with over one third of the participating households coming from *Ubudehe* category 3 or higher and thus initially not being eligible to benefit from public works. Thus it seems that is rather the 'better-off' poor that participate in public works, implying that public works actually fail to reach the poorest. A qualitative study by Berglund (2012) also supports this view.

'Even the rich ones want to work for VUP now. Even families with many cows and big land send someone in the family to work for VUP; it gives them a good extra income. [...] And I know people who have good skills for building houses, who used to go to the city to work, that now stay here and work for VUP. So this has become like a program for rich people.' (Berglund, 2012:18).

'We have heard that this program is supposed to be for poor people, but poor people cannot work for VUP. Instead the poor ones are having more trouble now, and the

ones who are a bit rich they get even more money. Is it a program for the poor or not?!' (Berglund, 2012:19).

Potential reasons for the lack of participation among the poorest have been mentioned in Section 4.2.2.

4.3.5 Outcome variables

The household data from the survey allows us to use changes in food consumption, non-financial household assets and livestock to measure the short-term welfare effects of the programme. The fact that the survey also includes information on spending on crop inputs (seeds, fertilizer) allows us to explore the extent to which the VUP helps to increase agricultural investment as a potential pathway for medium-term programme effects.

We measure daily food consumption based on the average value of food consumed from a three-day recall period. Food consumption is adjusted to per capita terms based on adult equivalent measures.[8] We measure food consumption both in levels and in logs.[9] The survey also includes information on whether households have been eating protein in the past two weeks. We use these figures as indicators for improvements in food quality since consumption data does not allow us to assess the protein or caloric content of the foods consumed. We measure non-financial assets using an asset index because the survey does not include information on asset values. Unfortunately, a full listing of non-financial household assets was only included in the 2009 survey wave. Hence, we do not have panel data on the non-financial household assets. We construct two asset index measures, one, including household durables and equipment[10] and one including only productive household assets i.e. tools (machete, axe, hoe), bikes, motorcycles and sewing machines. The indices have been constructed using principal component analysis. To measure livestock investment, we convert household livestock holding into tropical livestock units (TLU) (see Food and Agriculture Organization, 2003). Finally, investment in crop input is measured as a binary indicator conditional on the household owning farming land, indicating whether the household has undertaken any crop related investments in the past 12 months (=1) or not (=0). In addition, we consider the change in the

total amount spent on crop inputs in the past 12 months. We measure spending on crop inputs both in levels and logs.

Table A4.6 in the Appendix summarizes the welfare indicators comparing actual public works participants and eligible households from cohort 3 in 2009 and 2011 respectively. With the exception of protein consumption and the logarithm of crop inputs, public works participants and the eligible are similar in all outcomes in 2009. The difference in protein intake and crop input remains in 2011. In addition, public works households show higher livestock holdings in 2011, providing first indications of potential programme effects.

4.4 Empirical strategy

Establishing a control group to more rigorously assess the impact of the public works component is made difficult by the absence of baseline data for cohorts 1 and 2 and the fact that the implementation of the VUP is not random but instead gives preference to poorer sectors. Working within the data limitations, we use propensity score matching (PSM) and difference-in-difference (DID) methods to estimate the effect of the programme on beneficiary households. We define public works beneficiaries as those households that worked under the VUP in the past 12 months irrespective of their eligibility status.[11]

4.4.1 Propensity score matching

The 2009 survey wave collected detailed information on household assets. To exploit this information we use propensity score matching on the cross-section. To illustrate the propensity score matching approach let $T_i = 1$ if household i has participated in public works and $T_i = 0$ not. If Y_i^T is the outcome of the household when participating and Y_i^C the outcome when not participating, then the gain from participating would be the average treatment effect on the treated (ATT) defined as

$$ATT = \mathbb{E}(Y_i^T - Y_i^C \mid T_i = 1), \tag{4.1}$$

i.e. the expected difference between the actual outcome and the counterfactual outcome for participating households. Since the counterfactual outcome, Y_i^C, cannot be observed for beneficiary households, the ATT as presented in Equation (4.1) cannot be estimated. Therefore, the evaluation problem is typically reformulated to the population level. Rosenbaum and Rubin (1983; 1985) show that under the assumption of unconfoundendness, i.e.

$$T \perp (Y^T,\ Y^C) | X, \tag{4.2}$$

with X representing a set of observable characteristics, the ATT can be identified comparing beneficiary households to non-beneficiary households conditioning on X. To reduce the dimensionality problem on X, a propensity score is used. The propensity score can be defined as the probability of participating in public works, i.e. $\pi(X) \equiv Pr(T = 1|X)$ with $\pi(X) < 1$ and $Pr(T = 1) > 0$. The counterfactual outcomes of participants $\mathbb{E}\left(Y^C \middle| T = 1, \pi(X)\right)$ is thus approximated by the outcome of non-participants $\mathbb{E}\left(Y^C \middle| T = 0, \pi(X)\right)$. The ATT then becomes

$$ATT = \mathbb{E}\left(Y^T \middle| T = 1, \pi(X)\right) - \mathbb{E}\left(Y^C \middle| T = 0, \pi(X)\right). \tag{4.3}$$

Provided that the assumption of unconfoundedness holds, the ATT gives an unbiased estimate of the programme effects. However, since households self-select into public works, it is unlikely that the unconfoundedness assumption holds. Hence, the estimated ATT is likely to be biased with the selection bias being defined as

$$B\left(\pi(X)\right) = \mathbb{E}\left(Y^C \middle| T = 1, \pi(X)\right) - \mathbb{E}\left(Y^C \middle| T = 0, \pi(X)\right) \neq 0. \tag{4.4}$$

The data allows us to identify two potential counterfactual groups: the non-participant households within the VUP programme area (cohort 1), or households outside the programme area (cohorts 2 and 3 in 2009). Instead of households from the VUP sectors, we use households from

the non-VUP sectors as counterfactuals. This arguably reduces the influence of selection bias, as households in the non-VUP area do not have the opportunity to select into treatment in the first place (see Bensch et al. (2011)). Furthermore, it also reduces the influence of intra-sector spill-over effects. Even though the spill-over effects might be small after only one year, spill-over effects resulting from the programme-induced monetization within the sectors are likely to lead to underestimating the programme impact.

We estimate the probability to participate in public works, i.e.

$$\Pr(T_i = 1) = \vartheta(\beta_0 + C'_i \beta_1 + u_i) \tag{4.5}$$

using a Probit model. T_i represents a binary variable indicating whether household i in the VUP area participated in public works. C'_i is a vector of household characteristics. To respect the assumption of conditional independence, the covariates under consideration are such that they are not influenced by the public works status but do influence the decision to participate (Rosenbaum, 1984). The covariates included are the sex, age, handicap and literacy status of the household head, the number of household members and household composition, housing size, -ownership and land holding, infrastructure access, social participation including participation in the social mapping exercise, the *Ubudehe* status as well as cell characteristics. The household composition, location and *Ubudehe* status reflect the targeting and barriers to participation discussed in Sections 4.2 and 4.3.

The estimation of the probability to participate in public works is restricted to the VUP area (cohort 1) only. The results are presented in Table 4.4. The pseudo R-squared of 0.18 indicates a relatively good fit of the model estimated. The obtained coefficients are largely in line with expectations. Analogue to the qualitative evidence, households including the elderly and children requiring care are less likely to participate in public works. Also, the distance to the sector administration reduces the likelihood of participation. Households that participated in the targeting exercise are 9 per cent more likely to take up public works than households not attending. The Probit results also show that households from *Ubudehe* category 3 are almost equally likely to participate in public works

as the very poorest, providing further support to the concern that public works is capturing the relatively better-off households.

Table 4.4
Probit regression of public works participation on decision-to-participate determinants

	Probit	ME
Male (=1)	0.244	0.045
	(0.171)	
Age	0.007	0.001
	(0.006)	
Handicapped (=1)	-0.201	-0.037
	(0.156)	
Literate (=1)	-0.360 ***	-0.067
	(0.138)	
# HH members	0.005	0.001
	(0.041)	
# HH members able to work	-0.027	-0.005
	(0.070)	
# elderly	-0.575 **	-0.107
	(0.228)	
# children	-0.041	-0.008
	(0.091)	
# of rooms	0.007	0.001
	(0.051)	
House rented or other (=1)	Ref.	
House owned (=1)	0.270	0.050
	(0.331)	
House free (=1)	-0.250	-0.047
	(0.518)	
Landholding <0.25 ha (=1)	0.010	0.002
	(0.151)	
Distance to nearest road (min.)	0.001	0.000
	(0.001)	
Distance to market (min.)	0.000	0.000
	(0.000)	
Distance to school (min.)	0.000	0.000
	(0.000)	
Distance to health centre (min.)	0.000	0.000
	(0.001)	
Distance to bank (min)	-0.001	0.000
	(0.001)	
Distance to nearest transport (min.)	0.001 **	0.000
	(0.001)	

Table continues next page.

Table 4.4
(… continued)

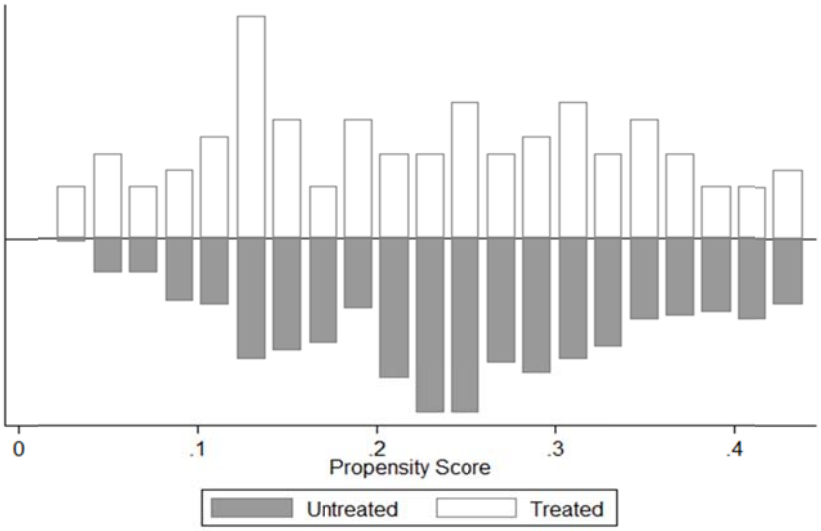
	Probit	ME
Distance to administration (min.)	-0.005 **	-0.001
	(0.003)	
Participation in social mapping (=1)	0.478 ***	0.089
	(0.150)	
# of cell meetings attended	-0.010	-0.002
	(0.009)	
# of sector meetings attended	0.013	0.002
	(0.010)	
# of district meetings attended	0.020 **	0.004
	(0.008)	
Ubudehe category 1 (=1)	0.942 **	0.175
	(0.454)	
Ubudehe category 2 (=1)	1.246 ***	0.232
	(0.436)	
Ubudehe category 3 (=1)	0.760 *	0.142
	(0.430)	
Ubudehe category 4 (=1)	0.270	0.050
	(0.435)	
Ubudehe category 5 or 6 (=1)	Ref.	
# of households in the cell	0.000 **	0.000
	(0.000)	
# of markets in the cell	0.018	0.003
	(0.219)	
Electricity in cell (=1)	0.000	0.000
	(0.266)	
Phone network in cell (=1)	-0.317 *	-0.059
	(0.170)	
Internet in cell (=1)	0.464	0.086
	(0.508)	
Constant	-2.024 ***	
	(0.614)	
Pseudo R-squared	0.177	
N	793	

Notes: Robust, clustered standard errors in parentheses.
*p<0.10, ** p<0.05, *** p<0.01.
Source: 2009 VUP household survey.

We use the obtained coefficients as presented in Table 4.4 to predict the participation probabilities (propensity score) for all households in the VUP and non-VUP areas. On the basis of the obtained propensity score we identify the counterfactual households from the non-VUP areas, i.e. those households in the non-VUP sectors that are equally likely to participate in public works once the programme is rolled out given their underlying characteristics. We refer to these households as 'hypothetical' public works households hereafter. The identified hypothetical public works households represent a 'synthetic' control group that could not self-select into treatment, with selection only based on observable characteristics similar to the public works participants. Hence, the assumption of unconfoundedness is more likely to hold. Thus, matching on the propensity score should reduce the selection bias.

Figure 4.3 provides a graphic representation of the overlap in propensity scores between the actual public works households and the hypothetic public works households. We restrict the households under consideration to the area of common support. Restricting the observations to common support also improves the balancing of the sample (see Table A.7).

Figure 4.3
Distribution of the propensity score of actual and hypothetical public works households



Source: Author's illustration based on data from 2009 VUP household survey.

We estimate the ATT using a tri-cube kernel function with a band width of 0.1. We prefer kernel over nearest neighbour matching as it allows us to obtain valid standard errors through bootstrapping (see Abadie and Imbens, 2006, 2008). We use bootstrapping with 500 repetitions to obtain the standard errors. In light of the small number of observations, the kernel approach also makes use of all observations using weighted averages (Caliendo and Kopeinig, 2005). Nevertheless, we apply nearest neighbour matching (with replacement) to test the sensitivity of the results.

By comparing the outcomes of the actual and hypothetical public works, we aimed to reduce the influence of a potential self-selection bias on the ATT. While the propensity score accounts for cell-level characteristics, it is still likely that the estimates are influenced by unobserved differences at the sector level (e.g. management capacities etc.) due to the non-random programme placement of the VUP. If there were regional differences, it is assumed that they would affect matched (hypothetical) participant and matched (hypothetical) non-participant households alike,

i.e. that the difference between the actual and hypothetical publics works participants and the non-participants in the VUP and non-VUP sectors is the same, the regional bias $B(r)$ being

$$B(r) = \left[\mathbb{E}\left(Y^{T,\ VUP} \middle| T = 1\right) - \mathbb{E}\left(Y^{T,\ NON-VUP} \middle| T = 0\right)\right] = \left[\mathbb{E}\left(Y^{C,\ VUP} \middle| T = 0\right) - \mathbb{E}\left(Y^{C,\ NON-VUP} \middle| T = 0\right)\right] \quad (4.6)$$

If this assumption holds we can account for regional differences using a difference-in-difference specification which estimates the ATT as within estimator using the following model

$$Y_{ij} = \theta^m \cdot 1(s = VUP\ area) + \gamma^m \cdot treated + \mu^m \cdot \text{treated} \times 1(s = \text{VUP area}) + C'_i\,\delta^m + \varepsilon_i^m \quad (4.7)$$

with Y_{ij} being the outcome of interest of household i in sector j. s is a binary variable indicating whether the sector is a VUP-sector (=1) or not. Treated indicates the participation status i.e. whether the household is an actual or hypothetical participant (=1) or not. The vector C'_i controls for household characteristics. With $\hat{\theta}^m$ accounting for regional differences and $\hat{\gamma}^m$ for selection, $\hat{\mu}^m$ gives an estimate of the ATT.

4.4.2 Difference-in-difference estimation

In light of the potential short-comings of the matching approach, we also use a before and after difference-in-difference (DID) approach to estimate the short-term impact of the VUP. We implement the DID approach using panel data from cohort 3 only, because it is the only cohort for which actual baseline data was collected in 2009 prior to the implementation of the VUP. To illustrate the DID approach, $t = 0, 1$ indicates the survey year 2009 and 2011 respectively. Analogue the matching $T_{it} = 1$ if household i has participated in public works and $T_{it} = 0$ otherwise. Y_{it}^T is the outcome under participation and Y_{it}^C the counterfactual outcome. The ATT thus becomes

$$\mathrm{ATT} = \mathbb{E}(\,\mathrm{Y}_1^{\mathrm{T}} - \,\mathrm{Y}_1^{\mathrm{C}}\,|\mathrm{T}_1 = 1). \tag{4.8}$$

But here also the ATT cannot be estimated directly as the counterfactual outcome cannot be observed.

Under the assumption of parallel trends, i.e.

$$\mathbb{E}\big(\,\mathrm{Y}_1^{\mathrm{C}} - \,\mathrm{Y}_0\ \big|\mathrm{T}_1 = 1\big) = \mathbb{E}\big(\,\mathrm{Y}_1\ - \,\mathrm{Y}_0\ \big|\mathrm{T}_1 = 0\big) \tag{4.9}$$

the DID estimate

$$\mathbb{E}\big(\,\mathrm{Y}_1\ - \,\mathrm{Y}_0\ \big|\mathrm{T}_1 = 1\big) - \mathbb{E}\big(\,\mathrm{Y}_1\ - \,\mathrm{Y}_0\ \big|\mathrm{T}_1 = 0\big) \tag{4.10}$$

provides an unbiased estimate of the ATT. Due to a lack of pre-intervention data, we are unable to test whether the parallel trend assumption holds. Hence, we face the risk of bias arising from differences in initial conditions which could lead to subsequent changes in the outcomes. To reduce the potential influence of bias, we combine DID with PSM to account for bias arising from observable and time-invariant unobservable characteristics. However, we cannot rule out any bias arising from time-variant unobservable factors. To match participants and non-participants on pre-programme characteristics (i.e. 2009 characteristics), we again use a kernel function with a 0.1 bandwidth. We estimate the ATT as within estimator based on the following model

$$\begin{aligned}\mathrm{Y}_{\mathrm{it}} = \alpha_{\mathrm{i}}\ + \theta^{\mathrm{D}} \cdot 1(\mathrm{t} = 2011) + \\ \mu^{\mathrm{D}} \cdot \mathrm{treated}\ \times 1(\mathrm{t} = 2011) + \mathrm{C'}_{\mathrm{it}}\,\delta^{\mathrm{D}} + \ \varepsilon_{\mathrm{it}}{}^{\mathrm{D}}.\end{aligned} \tag{4.11}$$

α_{i} are household fixed effects, $\mathrm{C'}_{\mathrm{it}}$ is a vector of household characteristics in 2009 and 2011 accounting for the change in observable characteristics over time. $\hat{\mu}^{\mathrm{D}}$ gives an estimate of the ATT.

4.5 Empirical results

The empirical results point towards a programme-induced increase in food consumption and asset accumulation. The effects are particularly strong for livestock investment. The estimates for crop investment are positive and, together with the investments in productive assets, point towards positive programme effects in the medium term through improved agricultural productivity if the investment effects materialize.

4.5.1 Estimates of the programme impact

The results of the PSM approach applied to the 2009 cross-section are presented in columns (1) and (2) of Table 4.5. Columns (3) and (4) show the DID estimates with and without matching using household panel data from cohort 3.

Except for the logarithm of per capita food consumption and protein intake, the estimated programme effects are of similar magnitude and consistently point to a positive programme effect. However, the effects differ in statistical significance, which is also influenced by the small number of observations and beneficiary households.

The results of the PSM approach (column (1)), point to a positive significant effect of public works participation on asset accumulation, both in terms of non-financial household assets and productive assets, already in the short-run. Furthermore, the estimates also show that public works households expand their livestock holding in the short-run by almost 0.2 TLU, which is roughly equivalent to an average increase in livestock holding of one goat. The estimated effects from the matching are also robust when taking potential regional differences into account (see estimates column (2)). The estimates suggest that the public works component of the VUP already meets its objective of promoting asset accumulation in the short-term. This is contrary to findings from other studies in Ethiopia and India (see Berhane et al., 2011; Deininger and Lui, 2013), which find positive effects on asset accumulation and livestock only in the medium-term.

In addition to the positive effects on asset accumulation, the PSM estimates (column (1) also point to a significant programme-induced increase in crop investment. Public works households are 14 per cent more likely to invest in seeds and fertilizer than non-participants, increasing

the yearly spending by just over 1,000 RwF (approximately 1.25 Euro). The log spending, which would suggest a spending increase by 18 per cent, however is not statistically significant. The crop expenditure estimates appear sensitive to outliers and are likely also influenced by the small sample size given the large standard errors. Accounting for potential regional effects, the coefficients remain similar, but we lose statistical significance (column (2)).

While the PSM estimates (columns (1) and (2)) indicate an increase in food consumption of public works households, the estimated effects are not significant at the conventional confidence levels. The estimates of the DID approach (column (3) and (4)) using before and after data from cohort 3 also point to a programme-induced improvement in food consumption at magnitudes similar to the effect estimated by PSM. The DID estimates are, however, significant at 5 respectively 1 per cent. The estimates suggest that public works households increase daily per capita food consumption by approximately 150 RwF (0.2 Euro) or 22 per cent. This effect is substantial. Given that the average public works household has approximately four members, this would imply that approximately 60 per cent of the daily wage income from public works is spent on food. With the data at hand we cannot compute the calorie intake of the foods consumed. In order to obtain an indication of the quality of foods consumed we consider whether the household consumed proteins in the past two weeks. The obtained estimates do not, however, point to a significant expansion in protein consumption: this suggests an expansion in the quantity of food, less so the quality of food, consumed, but that remains speculative.

Similar to the PSM estimates, the DID estimates also point to a programme-induced significant increase in livestock holding. The coefficient is somewhat higher using the DID approach. It is estimated that public works households increase their livestock by, on average, 0.3 TLU.

In addition to the increase in livestock, the DID estimates also provide indicative evidence of a programme-induced increase in crop investment. We estimate that public works households are approximately 9 per cent more likely to invest in seeds and fertilizer. While we obtain positive estimates on crop investment in levels and logs, the coefficients are not statistically significant, as is the case with the PSM estimates. Thus we only have indicative evidence of potential positive medium-

term effects of the programme through programme-induced improvements in agricultural productivity.

Methodologically, comparing the estimates of the PSM and DID approaches, two observations can be made. Comparing the PSM estimates and the difference-in-difference estimates aimed at accounting for regional differences (columns (1) and (2)), the PSM estimates are likely to overestimate potential programme effects, and regional differences also have to be taken into account. Comparing the PSM (columns (1) and (2)) to the DID results (columns (3) and (4)) leads us to suggest that the PSM approach does, generally, returns more conservative estimates.

We tested the sensitivity of the estimates to the matching approach by also using nearest neighbour matching with replacement. The obtained coefficients are not substantially different to the estimates reported in Table 4.5.

Table 4.5
Estimates of programme impact from public works participation

	(1) PSM (2009 cross-section)	(2) DID (2009 cross-section)	(3) DID without matching (cohort 3 panel)	(4) Matched DID (cohort 3 panel)
Per capita food consumption (RwF/day)	176.769	161.157	141.937 **	154.926 **
	(106.713)	(125.658)	(69.953)	(70.497)
Per capita food consumption (ln)	0.118	0.014	0.211 ***	0.221 ***
	(0.078)	(0.086)	(0.070)	(0.072)
Protein consumed (=1) [++)]	0.004	0.033	-0.002	0.008
	(0.043)	(0.044)	(0.037)	(0.038)
Non-financial asset index	0.139 **	0.167 **	___	___
	(0.069)	(0.067)		
Productive asset index	0.161 **	0.128 *	___	___
	(0.072)	(0.077)		
Livestock holding (TLU)	0.196 *	0.186 *	0.278 ***	0.296 ***
	(0.102)	(0.110)	(0.104)	(0.105)
Crop investment (=1) [++)]	0.145 ***	0.080	0.100 **	0.090 **
	(0.052)	(0.058)	(0.040)	(0.041)
Crop input (RwF/year)	1,086.216 ***	1,171.020	1,656.302 *	1,375.611
	(475.140)	(967.628)	(924.179)	(944.890)
Crop input (ln)	0.181	0.179	0.245	0.295
	(0.162)	(0.211)	(0.232)	(0.252)
Controls		Yes	Yes	Yes
N	141+507=658	2,349	1,451	1,294

Notes: For the outcomes marked [++)] the marginal effects are reported. Bootstrapped respectively, robust and clustered standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.
Source: 2009 and 2011 VUP household survey.

4.5.2 Confounding factors

Even though the estimated programme effects are generally robust to different approaches, our analysis is not without short-comings. An obvious concern is the small sample size i.e. the small number of actual beneficiary households in the sample, which leads to large standard errors in the estimates and makes the estimates also very sensitive to outliers. Furthermore, given the small number of actual public works households in our sample, we are unable to conduct more detailed analysis to account for potential heterogeneity in programme effects, i.e. by gender, age or region.

In light of the data constraints and in the absence of further pre-intervention data, we cannot test the parallel trends assumption. This implies that the DID estimates could be subject to bias arising from un-observed pre-programme differences.

Our sample only contained few observations on direct support and financial services beneficiaries as these programme components were only implemented later. We have removed direct support and financial services beneficiaries from the sample used for estimation to reduce the influence of inappropriate counterfactual households and also to reduce the influence of spill-over effects in the estimates. Still, while spill-over effects should be small after only one year of programme operation, we cannot fully rule out their influence on the estimates, particularly on the DID estimates.

4.5.3 Qualitative evidence and further discussion

To complement the estimates of the programme effects and to obtain a more in-depth understanding of the mechanisms, we conducted in-depth interviews and a focus group discussion with programme participants, non-participants, programme graduates and staff. The qualitative information confirms that households use a considerable share of their public works income on food consumption. Food expenses are typically the first expenses incurred after the transfer of funds, while other expenditures and investments are incurred later.

'Because I was so hungry, I bought beans and sweet potatoes for food and for farming. Later I also bought a goat.'

'The first thing I bought were beans to eat.'

'First I bought food and clothes because I needed them and I was hungry.'

'I started by buying food. Then with the second instalment I wanted something which can provide some income so I bought two goats.'

Almost all beneficiary households interviewed report that they have used their public works income to acquire livestock. While more male participants have reported investing in bulls, female participants seem to invest in goats and pigs, i.e. smaller farm animals pointing towards dif-

ferent investment behaviours between men and women. Despite the high savings rates amongst beneficiaries (see Devereux, 2010b; 2011), almost half the interviewees mentioned that they were unable to realize their investment plans, which mainly meant acquiring a bull/cow with the transfer received. Aiming to understand what has motivated the beneficiaries' investment decision, it becomes evident that the training and sensitization that they receive as part of the programme seems to play a considerable role in directing the cash transfers towards productive use.

'At first, we decided to buy a young bull. After three months, I sold it and got more money. Then I bought a cow which I still have. We have a small area of farm land but it produces more because of the manure.'

'I chose goats and rabbits because they produce fast. I would have liked to have bought a cow but the money was not enough.'

'Because of the mobilization from VUP about what we can buy, I bought a goat which reproduced and now I have five goats to get manure. I would like to buy a cow but the money was not enough.'

'After the training, on my way from getting the money, I bought a goat. Later on I bought a pig which I sold for 9000 RwF and I bought another goat which produced three more goats that I still have now.'

'At first I bought a pig but it died from a disease. I got the idea to buy the pig from VUP mobilization.'

The interviewed beneficiaries uniformly acknowledge that public works improved their material welfare. However, female interviewees in particular, raised concerns about their status once leaving the programme. The interviews with programme graduates suggest that programme benefits are short lived. Graduate households reported, for example, that they had to resell previously acquired livestock.

'I have two parents and eight brothers. Even though we have a small area of farm land, we are a big family and food was a big problem. I worked for 400 RwF/day and it was not enough to buy enough food. Now I can feed my family. I am renovating the house and building my own house too.'

'We are very poor but we have hands, we can work. Before I worked for VUP I used to work for farmers and get 250 RwF/day, which was not enough to care for my fam-

ily. Now I am earning 1,000 RwF/day and it is almost enough but I don't know what will happen when I cannot work on public works anymore.'

'Before VUP, my family's life situation was not good. We were facing poverty and hunger. Even though that is still the case, something has changed for the better. I used to work for 600 RwF/day and sometimes beg. Now life is better because I earn 1,000 RwF/day from VUP and we have food but without VUP we might just end up where we were.'

'My husband is handicapped. I am the only one who feeds the family and we have six kids. Before VUP, my family suffered from hunger. I used to beg or work for others and get 400 RwF/day. It was not enough to buy food and deal wiyh other problems like health services or the school material for my kids. With the money from VUP I bought food, the school material for the kids, and I saved and bought a sewing machine but I need training to start a business otherwise I will soon just have to go back and work for others.'

'My family's living conditions improved. Before VUP we used to beg and work for others in order to get food. I mean I was not paid but I shared the harvest with the farmer. After we graduated from VUP, so early, I started to work like before, for others and share with the farmers. Of course, I am not as poor as the first time but I need help again.'

'After graduating from VUP I had to sell the rabbits I bought before to survive again.'

'When I used to work in terracing for VUP, my living conditions were improving. Before VUP I could not find nutritive food for my kids. With VUP I could buy meat or fish once a month. Since I am not benefiting from VUP anymore, there is nothing left at home from what I got with VUP.'

4.6 Conclusions and implications

Our study is one of the first assessments of the welfare effects of the VUP and complements an increasing literature exploring the effects of public works programmes in low income countries. We use two-round household panel data to explore the short-term welfare effects of the programme. Substantively we contribute to the literature in two ways: empirically we contribute to the literature by presenting evidence from a programme that has not been explored much yet; methodologically we

propose a matching strategy to estimate programme effects for policy monitoring when only limited, cross-sectional data is available.

The estimated effects suggest that public works households significantly increase food consumption and livestock investment in the short-run. The estimated increase in food consumption is around 20 per cent, whereas the estimated increase in livestock amounts to approximately 0.3 TLU. In rural households livestock often fulfils a dual function, i.e. it serves as a buffer for consumption smoothing and as an income generator. Thus the programme could be considered to have a positive effect on precautionary savings and productive investment alike. In addition to the positive effect on livestock investment, we also find indications of a programme-induced expansion in crop investment. Together with the expansion in livestock, this could point to positive medium-term effects due to increased agricultural productivity. However, despite the positive short-term effects and medium-term outlook, qualitative evidence points towards limitations in the sustainability of the programme effects. Furthermore, our analysis also suggests that the public works component in its current design is targeting relatively better off households.

The findings suggest a number of potential avenues for policy and further research. On the policy side, the findings suggest the importance of reviewing the targeting approach of the programme, particularly to consider removing obstacles to participation by the poorer households, for example by improving geographical accessibility to public works sites, shortening the payment period and removing the costs for opening the required bank accounts. Improving the targeting efficiency of the public works component could, in consequence, also expand the poverty-reducing effect of the programme. The qualitative evidence also suggests reviewing the graduation procedure, ensuring that graduate households do not fall back to previous poverty levels. For this, however, further research is needed to critically assess the sustainability of the programme effects. This also relates to the creation of off-farm employment opportunities as a stated programme objective. Likewise, the role of the training and information in directing participant behaviours should be investigated in more detail. Further research should also investigate potential heterogeneity in the programme effects, particularly by exploring differences between male and female participants.

Notes

[1] NREGS stands for the National Rural Employment Guarantee Scheme. In 2009 the programme was renamed the Mahatma Ghandi National Rural Employment Guarantee Scheme. In this chapter we use NREGS throughout.

[2] A sector is an administrative sub-district. Rwanda is made up of 416 sectors spread across 30 districts and four provinces.

[3] The criteria considered are the level of food security, distance to the nearest water source, health centre, school and the settlement pattern, i.e. the level of dispersion of the village settlement and the dominant dwelling type.

[4] Compared to other programmes, the VUP is still a comparatively small programme with a yearly budget of ca. 30.6 million Euro (ca. 3 per cent of the government budget).

[5] Households in *Ubudehe* category 1 to 3 can apply for individual, group or cooperative loans. Households in category 4 to 6 can apply for group or cooperative loans provided they also have one member from *Ubudehe* category 1 to 3.

[6] See Andrews *et al.* (2013) for details on the wage setting.

[7] In-depth interviews were conducted in December 2011. See Section 3.2 for details.

[8] We use the same equivalence scale as applied in the national poverty assessment in Rwanda (see McKay and Greenwell, 2007).

[9] The log transformation provides an estimate of the percentage change of food consumption and is less sensitive to outliers.

[10] The assets considered include the amount of farm land owned, electricity, the number of mattresses, beds, mosquito nets, bed sheets, blankets, pans, plates, spoons, tables, chairs, sofas, as well as the possession of a cooking stove, fridge, radio, TV, and mobile phone and productive assets i.e. axes, machetes and hoes, motorcycles, bicycles, and sewing machines.

[11] Since we do not know the *Ubudehe* status of households before 2009 we cannot identify eligible households in cohort 1. Furthermore, since public works positions are also offered to households in higher *Ubudehe* categories if more positions are available, it is challenging to strictly apply the eligibility criteria without information on which households were offered it.

5 Conclusion

5.1 Summary

This thesis examines the effects of different risk protection mechanisms at the micro level. In this thesis we consider two situations: One, a situation of informal risk sharing whereby the actors rely on their family and kinship network and two, a situation where a formal protection or safety net mechanism is present. The formal insurance or safety net mechanisms under scrutiny in this thesis are health insurance and public works. Specifically, this thesis aims to address the following three research questions:

1. To what extent do informal sharing obligations within the family hamper investment in small and micro enterprises?

2. To what extent does health insurance contribute to improvements in childhood health?

3. To what extent does a non-contributory safety net – here in the form of public works – contribute to improvements in household welfare in the short-term?

The three research questions are not investigated within a single country context. Instead, the empirical analysis conducted for this thesis is based on micro data from two countries, Burkina Faso and Rwanda. More specifically, in this thesis we use three different micro datasets. We use data from tailors in Ouagadougou collected in 2011 and 2012; data on children from the Rwandan Demographic and Health Surveys collected in

2005 and 2010/11, and household data collected in Rwanda in 2009 and 2011.

Methodologically, we use a number of different approaches in this thesis. We combine theoretical modelling with regression analysis; we apply and expand quantitative impact evaluation instruments; and we complement the quantitative analysis with qualitative information obtained in structured and semi-structured interviews and focus group discussions.

This thesis contributes to a number of different strands in the economic literature. It expands the literature on social capital and provides additional empirical evidence on the role of family ties on insurance and investment. Without denying the positive aspects of family and kinship ties, we argue in this thesis that sharing norms, which persist within family networks in many societies, may also have adverse effects which can pose a constraint to micro and small entrepreneurs within such a network, reducing their capacity to invest in their enterprise.

Based on data from tailors in Ouagadougou, the capital of Burkina Faso, we indeed find support for this line of argument. Our empirical results show that investment decreases with increasing pressure for redistribution by kin. Furthermore we find that risk-averse tailors are less likely to invest, i.e. that tailors with a higher degree of risk aversion, measured by a risk aversion index, invest less. On the other hand, we find that redistributive pressure is positively associated with remittances. At the same time we find that remittances increase with risk aversion, which suggests that risk-averse entrepreneurs transfer more in order to 'buy' insurance from their kin but will do so, given the redistributive element inherent in the system, at a price which deviates from a price that is actuarially fair. Furthermore, when we consider the decision to share or to invest simultaneously, we can identify two distinct groups of entrepreneurs. On the one hand there are those that opt for insurance; they make transfers to their kin, get insurance, but forego future earnings because of lower investment. On the other hand, there are those that opt for growth and break with the sharing norm. We find that those tailors are less risk-averse, and that their investment decisions are no longer affected by kinship pressure. Hence, overall the thesis provides empirical support that sharing obligations within the family can hamper investment in small and micro enterprises. Depending on the entrepreneur's degree of

risk aversion and the redistributive pressure exercised by the kin, the financial constraint can be substantial.

The thesis also contributes to the growing literature on the effectiveness of social protection policies in developing countries. It provides additional evidence on the effects of health insurance, beyond the immediate impacts on access to health care and financial risk protection, by exploring the relation between insurance, household-level prevention and child health outcomes. The empirical analysis based on micro data from children in Rwanda suggests that health insurance coverage has a positive effect on household health care and prevention practises. For example, insured households are more likely to use bed nets and purify water prior to drinking, both of which are important measures limiting the risk of common childhood illnesses such as malaria, diarrhoea and other waterborne diseases. The thesis further shows that the effect of insurance on childhood health can be quite heterogeneous. Our empirical analysis leads to the suggestion that it is primarily children below the age of two that benefit from health insurance. However, for children older than two years, we do not find any improvement in their health status due to insurance. Similarly, we also find that health insurance coverage has a positive effect on the health status of children from the poorest wealth quintile; at higher quintiles, however, we do not observe any significant improvement in health outcomes. In light of these findings, we argue that health insurance does indeed have a positive pro-poor effect. However, there also seem to be clear limitations. When looking at infant mortality, our results suggest that health insurance might not provide sufficient protection to limit the death of infants in poor households. Thus obstacles for poor households to fully benefit from insurance seem to remain: these obstacles need to be identified.

Finally, this thesis also expands the knowledge base on the functioning and effectiveness of public works programmes in a low income setting. Based on household data from Rwanda, we find a positive effect of public works on household welfare in the short-term. More specifically, the results of our analysis suggest that public works help households to increase food consumption. Furthermore, we also find evidence of a positive effect on livestock accumulation. Nevertheless, our analysis also reveals some of the shortcomings of this type of safety net intervention. We find, for example, drawbacks in programme targeting. While the programme under scrutiny is intended to target the poorest households,

our analysis reveals that it is relatively better off households that participate in the intervention, pointing to inefficiencies in programme design and targeting which need to be addressed.

5.2 Lessons for policy

The empirical analysis and findings from this thesis lead to a number of suggestions for policy making.

1. A formal insurance mechanism might be an effective mean of spurring investment in small and micro enterprises:

The potential distortive effects of kinship pressure on investment imply that there are opportunities for pareto-improvements. These improvements could be realized by providing formal insurance to the entrepreneur and the kin. The presence of formal insurance could induce the entrepreneur to realize his optimal investment plan and thus promote capital accumulation and enterprise growth.

Our research shows that health shocks in developing countries are frequent. Field et al. (2013) also show that they pose a major obstacle to investment. This suggests that the provisioning of health insurance, as a formal insurance mechanism, could have positive effects on investment. If health insurance proves to have a double dividend, i.e. to not only have direct effects on health and health care, but also indirect effects on investment and job creation, the cost-benefit analyses for such initiatives should be modified. Higher returns would also allow for the mobilization of more resources and thus further promote the roll-out of public health insurance schemes in developing countries.

Burkina Faso, the country in which this research is set, is currently considering the implementation of a national health insurance scheme. Given that private sector development, and support to small enterprises in particular, is one of the key pillars of Burkina Faso's Strategy for Accelerated Growth and Sustainable Development (2011-2015) (see International Monetary Fund, 2012), our results provide fertile ground for further exploration of this issue.

2. Health insurance could be an effective means to promote early childhood health but additional efforts targeted at the poor are required:

The empirical analysis in this thesis provides evidence of a positive, yet still weak effect of insurance on early childhood health. The results of the empirical analysis suggest that the poorest in particular seem to benefit from insurance. However, the analysis has also shown that the insurance is insufficient to reduce the number of infant deaths. The positive effects on childhood health could therefore also be a result of selection within the poorest households. Thus, while there is positive evidence that health insurance in Rwanda lowers the financial barriers to health care, there still seem to be limitations for poor households which need to be identified so that these households can equally benefit from the insurance. This issue is particularly relevant in Rwanda at the moment. If the obstacles for poor households are primarily of a financial nature, there is a risk that even the positive effects on the health of surviving children might be reversed. In order to ensure the financial sustainability of the health insurance scheme, the per capita membership fees increased in 2011. For the poorest the fees have increased by 100 per cent. Even though the government is currently subsidizing the fees for about 25 per cent of the poorest (Ministry of Health of Rwanda, 2012), the fee increase brings with it the risk of non-enrolment or a reversal of the positive effects seen and thus has to be closely monitored.

Going one step further, Ferreira and Robalino (2010) argue that countries have to move away from providing safety nets towards providing 'opportunity ropes'. This includes an expansion of early childhood interventions necessary to break the intergenerational cycle of poverty in the long-term. While health insurance is undoubtedly an important aspect, in light of the overall weak health effects identified, further targeted interventions still seem to be required. In Rwanda, the importance of early childhood development has been recognized and has been manifested in the country's new Economic Development and Poverty Reduction Strategy (2013-2018) (Ministry of Finance of Rwanda, 2013). With the importance recognized, the challenge will be to align the early childhood interventions into a coherent package and system.

3. Public works could be an effective means to improve household welfare and reduce poverty if the poor can be drawn to the programme:

The empirical analysis in this thesis shows that public works participation can lift the budget constraints of poor households and promote consumption and investment in the short-term. However the analysis also discloses a number of potential inefficiencies in the design and targeting of public works interventions. In the case of the public works intervention under scrutiny in Rwanda, we find, for example, that poor households are less likely to participate in the intervention due to demographic, financial and geographic obstacles. Overcoming these limitations would require a revision of the programme design. Potential measures could be to alternate the selection of public works locations in order to provide easier access for the poor, to remove or subsidize the fees to open a household bank account which is a prerequisite for programme participation, to revise the interval between wage payments from a bi-monthly to a weekly schedule and to revise the targeting criteria in order to not only consider the household poverty category but also the household dependency ratio. Households with a high dependency ratio should then be eligible for direct support.

The research in this thesis provides the first quantitative assessment of the public works component in Rwanda and discussions on potential changes in the programme design are underway.

5.3 Further discussion: Institutions and the financing of safety nets

This thesis has concentrated on the effects of safety net mechanisms at the micro level. A crucial factor determining the effectiveness, efficiency and sustainability of formal safety net mechanisms that has only been marginally considered in this thesis is the institutional set-up and fiscal space for financing safety nets. There is a consensus that safety nets need institutional ownership, strong coordinating bodies and monitoring and evaluation systems as well as sound financial planning. However, there is still little systematic research and guidance on how this can be estab-

lished, particularly in low income countries facing severe resource constraints and where institutional capacity is often still weak.[1]

Low income countries do not, in general, have the fiscal space to finance at scale safety net mechanisms (World Bank, 2013b). Therefore safety net programmes in these countries remain heavily donor funded. External financing not only undermines ownership but also raises questions on the long-term financial sustainability of these programmes. In order to ensure their sustainability, non-contributory safety net programmes will need to be increasingly financed from domestic resources in the medium to long-term. However, in many low income countries, tax systems are weak and the tax base is still narrow. Thus, while pushing for an expansion of social protection schemes in developing countries, additional efforts should also be devoted to improving the efficiency of revenue collection. Expanding the tax base in low income countries is more challenging as this requires changing the structural characteristics of these economies, e.g. by bringing more people into the formal economy. One aspect that has to be taken into account when moving towards tax financed safety nets however is that the higher levels of taxation required for safety net financing could also lead to distortions at the economic and social level (particularly when the tax base is still narrow). Thus potential distortions have to be closely monitored (Barrientos, 2012; see also Levy, 2007).

In addition to domestic resource mobilization, the World Bank (2013b) proposes a reallocation of resources for safety net financing by reducing energy subsidies. Energy subsidies, which are often regressive in nature, are substantial in many low income countries. In Benin, for example, the amount spent on energy subsidies is about 10 times more than the total spending on safety nets in the country (World Bank, 2013b). The World Bank (2013b) estimates that by redirecting about half of the energy subsidies to targeted safety nets about 27 million people could be lifted above the poverty line of 1.25 USD/day. Resource reallocation could be a suitable strategy for short-term safety net financing. In light of the regressive nature of energy subsidies, however, such a reallocation might be difficult to enforce when it means challenging powerful political interests.

The importance of institutions and financing not only applies to non-contributory social protection mechanisms but also to contributory programmes such as health insurance. While the social health insurance

scheme in Rwanda is still dependent on external financing, the step-by-step approach chosen by the government has proven to be quite efficient in reaching almost universal health insurance coverage and could thus be considered as a best-practise approach for other countries to follow. The Rwandan scheme gradually evolved from a set of community-based health insurance schemes into a social health insurance scheme. A common legal framework has helped to stipulate the responsibilities across the different administrative levels and also ensured adherence to the insurance programme. The country is currently working towards ensuring the financial viability of the health insurance scheme. For this the yearly membership fees were amended and increased in 2011 which improved the financial viability of the scheme. Previously, the annual membership fees covered about 50 per cent of the insurance funding (Antunes et al., 2009). Currently, 70 per cent of the insurance costs are covered by beneficiary contributions directly. The remaining 30 per cent are financed by the government and donors (Ministry of Health of Rwanda, 2012).

The Government of Burkina Faso is currently pursuing an approach similar to the one used in Rwanda by promoting the establishment of community-based health insurance schemes as an intermediary mechanism towards a national health insurance plan. This development also offers a path for more systematic research on the institutional aspects in the future.

5.4 Avenues for further research

Following on from the still limited knowledge on the role of institutions for the effectiveness and efficiency of social protection schemes, the analyses in this thesis also point to a number of other issues to be explored in further research.

In this thesis we propose that the provisioning of formal insurance, for example, in the form of health insurance to the entrepreneur and his kin, has a positive effect on enterprise investment. This proposition, however, is still subject to empirical scrutiny. We have already designed a research project to investigate this issue. Again set within the context of Burkina Faso, we provide health insurance to rural households and urban entrepreneurs linked to the rural households. We then apply a randomized encouragement design for identification of the effects. To our

knowledge this will be one the first attempts to provide causal evidence on the link between formal insurance and investment in micro and small enterprises.

The policy developments in Rwanda also provide ground for further research. First, the change in the premium schedule in 2011 provides a 'natural' experiment to explore the sensitivity of households to amendments in the fee schedule and to review the effects of health insurance on health outcomes again. In light of the identified heterogeneity of the effects of health insurance on health outcome, further research is needed to better understand the driving forces behind this differential impact. Another aspect that needs to be explored but which this thesis could not address due to data restrictions, is how the role of insurance on childhood health outcomes changes over time, i.e. to identify which periods are the most critical in terms of effects. Given the increasing attention to early childhood development, this could provide a fruitful area for further research.

Concerning public works interventions, there is still limited evidence on the medium-term effects of such interventions, both at the household but even more so at the meso, i.e. the community level (see e.g. Barrientos, 2012). Public works programmes are particularly attractive to policy makers since they help expand local infrastructures. However, the sustainability of the infrastructure generated by public works and the effects on welfare and growth are still underexplored. Both aspects, the medium-term and the meso level effects of public works programmes, will be explored more systematically in the future. The data collection necessary to assess the medium-term effects at the household level is currently underway.

Finally, the empirical analyses in this thesis also highlight the challenges of evaluating large scale national policies in the absence of experimental or longitudinal data. In recent years the situation has improved and the design of monitoring and evaluation approaches is increasingly integrated in the policy and programme design at an early stage. However, budget constraints and short-term interventions will still render imperfect situations for policy analysis. Even though the use of shoestring evaluations is seen with scepticism (see e.g. Ravallion (2013), there is nevertheless a need to enhance the methods and approaches for policy evaluation under resource and data constraints to inform the policy dis-

course (see Bamberger et al., 2003; Centre for Development Impact, 2013).

Notes

[1] An evaluation of World Bank support to social safety nets highlights that the support to institutions and systems-building needs to be accelerated in the future (Independent Evaluation Group, 2011). At an ODI event on 'Rethinking Public Works and Social Protection for the 21st Century', Stefan Dercon (currently Chief Economist at the UK Department for International Development (DFID) also emphasized the need to review institutions and systems (see: http://www.odi.org.uk/events/3126-social-protection-public-works-sub-saharan-africa).

Appendices

Table A3.1
Descriptive statistics by Mutuelles insurance status in 2005

	All (N=8,210)		Insured (N=3,587)		Uninsured (N=4,623)			
Variable	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**P-value**	
Child characteristics								
Male (=1)	0.51		0.51		0.51		0.893	
Age (months)	25.39	17.51	25.45	17.60	25.18	17.39	0.496	
Months breastfed	15.62	11.49	15.70	11.53	15.53	11.46	0.500	
Maternal characteristics								
Mother's age (years)	31.13	6.87	31.61	6.82	30.69	6.90	0.000	***
Married (=1)	0.51	0.50	0.63	0.48	0.42	0.49	0.000	***
Education obtained (shares)								
No education	0.28		0.26		0.30		0.000	***
Primary	0.63		0.64		0.64		0.860	
Secondary or higher	0.09		0.10		0.06		0.000	***
BMI	22.33	2.77	22.40	2.76	22.19	2.68	0.016	**
Household characteristics								
Rural (=1)	0.81		0.84		0.79		0.000	***
HH head is male (=1)	0.83		0.86		0.80		0.000	***
# of HH members	5.69	2.02	5.84	2.00	5.54	2.01	0.000	***
#r of children under 5	1.88	0.80	1.90	0.80	1.86	0.80	0.030	**
Wealth quintile (shares)								
Poorest	0.21		0.18		0.24		0.000	***
Poorer	0.20		0.21		0.20		0.357	
Middle	0.19		0.20		0.20		0.787	
Richer	0.21		0.22		0.20		0.115	
Richest	0.20		0.20		0.17		0.000	***
HH owns a radio (=1)	0.50		0.58		0.43		0.000	***

Notes: The p-values represent the result of the t-test on the equality of means between the insured and the uninsured. * p<0.10, ** p<0.05, *** p<0.01.
Source: RDHS 2005.

Table A3.2
Descriptive statistics by Mutuelles insurance status in 2010

	All (N=8,384)		Insured (N=6,077)		Uninsured (N=2,307)			
Variable	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**P-value**	
Child characteristics								
Male (=1)	0.51		0.51		0.52		0.259	
Age (months)	28.76	17.68	28.19	17.92	30.13	17.01	0.000	***
Months breastfed	8.54	12.24	8.11	11.96	9.96	13.06	0.000	***
Maternal characteristics								
Mother's age (years)	30.76	6.63	30.62	6.59	30.97	6.90	0.033	**
Married (=1)	0.60		0.64		0.45		0.000	***
Education obtained (shares)								
No education	0.19		0.18		0.24		0.000	***
Primary	0.72		0.74		0.70		0.000	***
Secondary or higher	0.09		0.08		0.06		0.001	***
BMI	22.70	3.05	22.71	3.03	22.42	2.85	0.005	***
Household characteristics								
Rural (=1)	0.87		0.88		0.87		0.573	
HH head is male (=1)	0.81		0.83		0.76		0.000	***
# of HH members	5.46	1.94	5.46	1.95	5.38	1.89	0.084	*
# of children under 5	1.73	0.73	1.73	0.72	1.76	0.75	0.137	
Wealth quintile (shares)								
Poorest	0.23		0.21		0.32		0.000	***
Poorer	0.21		0.21		0.23		0.060	*
Middle	0.20		0.21		0.18		0.001	***
Richer	0.18		0.20		0.14		0.000	***
Richest	0.17		0.16		0.13		0.000	***
HH owns a radio (=1)	0.63		0.66		0.51		0.000	***

Notes: The p-values represent the result of the t-test on the equality of means between the insured and the uninsured. * p<0.10, ** p<0.05, *** p<0.01.
Source: RDHS 2010.

Table A3.3
Probit and marginal effects of the characteristics of enrolment

	Probit	**ME**
Male (=1)	-0.126 ***	-0.040
	(0.042)	
Age (months)	-0.004 ***	-0.001
	(0.001)	
Months breastfed	-0.006 ***	-0.002
	(0.002)	
Mother's age (years)	-0.012 ***	-0.004
	(0.004)	
Mother married (=1)	0.465 ***	0.149
	(0.046)	
No education	Ref.	
Primary	0.036	0.011
	(0.054)	
Secondary	0.122	0.039
	(0.101)	
BMI	0.017 ***	0.005
	(0.007)	
Rural (=1)	0.112	0.036
	(0.074)	
HH head is male (=1)	0.017	0.005
	(0.056)	
# of HH members	-0.013	-0.004
	(0.013)	
# of children under 5	-0.081 **	-0.026
	(0.032)	

Table continues next page.

Table A3.3
(... continued)

	Probit	ME
Poorest	Ref.	
Poorer	0.033	0.011
	(0.063)	
Middle	-0.003	-0.001
	(0.068)	
Richer	0.205	0.066
	(0.073)	
Richest	0.043	0.014
	(0.086)	
HH owns a radio (=1)	0.201 ***	0.064
	(0.049)	
Constant	0.439 *	
	(0.226)	
Log likelihood	-2,391.315	
Pr(l=1)	0.721	
N	4,231	

Notes: Robust, clustered standard errors in parentheses.
*p<0.10, ** p<0.05, *** p<0.01.
Source: RDHS 2010.

Table A3.4
Mean of child-, mother- and household characteristics before and after matching

Variable	Sample	Insured	Uninsured	Diff.	P-value	
Male (=1)	Unmatched	0.51	0.52	-0.01	0.259	
	Matched	0.49	0.54	-0.05	0.003	***
Age (months)	Unmatched	28.19	30.13	-1.94	0.000	***
	Matched	27.89	29.64	-1.75	0.004	***
Months breastfed	Unmatched	8.11	9.96	-1.85	0.000	***
	Matched	8.21	9.51	-1.29	0.002	***
Mother's age (years)	Unmatched	30.62	30.97	-0.35	0.033	**
	Matched	30.50	31.14	-0.64	0.005	***
Married (=1)	Unmatched	0.64	0.45	0.19	0.000	***
	Matched	0.63	0.45	0.18	0.000	***
No education	Unmatched	0.18	0.24	-0.06	0.000	***
	Matched	0.19	0.23	-0.04	0.001	***
Primary	Unmatched	0.74	0.70	0.04	0.000	***
	Matched	0.74	0.71	0.03	0.042	**
Secondary or higher	Unmatched	0.08	0.06	0.02	0.001	***
	Matched	0.07	0.06	0.01	0.110	
BMI	Unmatched	22.71	22.42	0.29	0.005	***
	Matched	22.71	22.42	0.29	0.005	***
Rural (=1)	Unmatched	0.88	0.87	0.01	0.573	
	Matched	0.88	0.86	0.02	0.132	
HH head is male (=1)	Unmatched	0.83	0.76	0.07	0.000	***
	Matched	0.82	0.74	0.07	0.000	
# of HH members	Unmatched	5.46	5.38	0.08	0.084	*
	Matched	5.40	5.54	-0.14	0.046	**
# of children under 5	Unmatched	1.73	1.76	-0.03	0.137	
	Matched	1.72	1.76	-0.04	0.117	

Table continues next page.

Table A3.4
(... continued)

Variable	Sample	Insured	Uninsured	Diff.	P-value	
Poorest	Unmatched	0.21	0.32	-0.11	0.000	***
	Matched	0.21	0.27	-0.06	0.000	***
Poorer	Unmatched	0.21	0.23	-0.02	0.060	*
	Matched	0.22	0.24	-0.02	0.250	
Middle	Unmatched	0.21	0.18	0.03	0.001	***
	Matched	0.21	0.20	0.00	0.771	
Richer	Unmatched	0.20	0.14	0.06	0.000	***
	Matched	0.21	0.14	0.07	0.000	***
Richest	Unmatched	0.16	0.13	0.03	0.000	***
	Matched	0.15	0.14	0.01	0.406	
HH owns a radio (=1)	Unmatched	0.66	0.51	0.15	0.000	***
	Matched	0.65	0.53	0.12	0.000	***

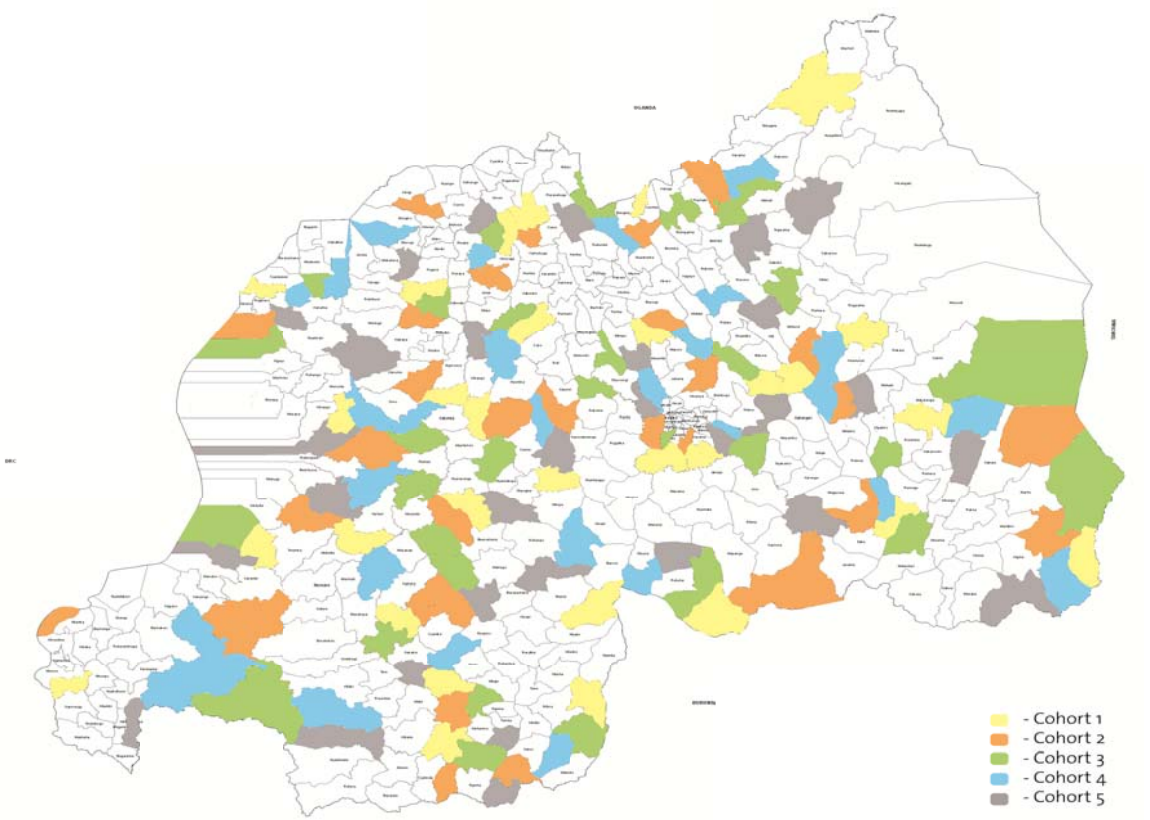
Notes: The p-values represent the result of the t-test on the equality of means between the insured and the uninsured. * p<0.10, ** p<0.05, *** p<0.01.
Source: RDHS 2010.

Table A3.5
Impact of Mutuelles coverage on child health outcomes and health behaviour (OLS)

	(1) Total	(2) Bottom 20%	(3) 40%	(4) Top 60%	(5) 6-24 months	(6) >24 months
Child health outcomes						
Weight-for-height z-score (SD)	0.038	0.006	0.003	0.063	0.042	0.011
	(0.042)	(0.082)	(0.089)	(0.056)	(0.089)	(0.043)
N	3,881	864	871	2,146	1,206	2,354
Height-for-age z-score (SD)	0.336 ***	0.132	0.003	0.167	0.207 **	0.029
	(0.073)	(0.101)	(0.097)	(0.072)	(0.083)	(0.059)
N	3,839	855	866	2,118	1,196	2,328
Infant died (=1) [+++)]	-0.063 ***	-0.036	-0.106 ***	-0.077 ***		
	(0.018)	(0.034)	(0.036)	(0.027)		
N	2,031	422	469	1,064		
Health care behaviour						
Medical treatment (=1) [+++)]	0.195 ***	0.247 ***	0.225 ***	0.161 ***		
	(0.028)	(0.054)	(0.002)	(0.041)		
N	1,541	393	333	805		
Slept under bed net (=1) [+++)]	0.042 ***	0.029	0.049 *	0.045 ***		
	(0.012)	(0.027)	(0.026)	(0.017)		
N	7,408	1,683	1,608	4,117		
Water purified (=1) [+++)]	0.081 ***	0.062 **	0.079 **	0.093 ***		
	(0.014)	(0.026)	(0.032)	(0.020)		
N	5,822	1,373	1,296	3,180		

Notes: For the outcomes marked [+++)] the marginal effects are reported. Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.
Source: RDHS 2010.

Figure A4.1
VUP coverage by sector (2008-2011)



Source: Author's illustration.

Table A4.2
Sample composition (in-depth interviews)

	#
Public works beneficiaries	
Male	8
Female	10
Public works graduates	
Male	1
Female	3
Non-beneficiaries	
Male	2
Female	2
Total	26

Source: Own data, fieldwork conducted in December 2011.

Table A4.3
Basic characteristics (in-depth interviews, N=26)

	Mean
Household characteristics	
Head of household is male (=1)	0.73
Interviewee characteristics	
Male (=1)	0.42
Age	35.19
Head of household (=1)	0.46
Marital status (shares)	
Married	0.65
Widowed	0.03
Divorced	0.11
Single	0.19
# of children	2.46

Source: Own data, fieldwork conducted in December 2011.

Table A4.4
Descriptive statistics of households in VUP and non-VUP sectors
(VUP sectors: N=941; non-VUP sectors: N=1,816)

	VUP sectors		Non-VUP sectors			
	Mean	**SD**	**Mean**	**SD**	**P-value**	
Characteristics of the household head						
Male (=1)	0.62		0.61		0.674	
Age	47.55	17.07	47.44	16.47	0.864	
Handicapped (=1)	0.44		0.46		0.297	
Literate (=1)	0.48		0.51		0.230	
Household characteristics						
# of household members	4.49	2.23	4.62	2.25	0.154	
# household members able to work	1.61	1.18	1.66	1.26	0.245	
# elderly (65+)	0.22	0.46	0.19	0.45	0.157	
# children (0-5 yrs.)	0.82	0.96	0.81	0.92	0.662	
# of rooms in house	3.03	1.72	3.12	1.95	0.245	
Household owns house (=1)	0.88		0.89		0.406	
Household is rent-exempted (=1)	0.05		0.05		0.507	
Grass hatched roof (=1)	0.14		0.14		0.792	
Earth floor (=1)	0.90		0.85		0.001	***
Household has electricity access (=1)	0.02		0.04		0.043	**
Landholding <0.25 ha (=1)	0.49		0.51		0.187	
Distance to nearest road (min.)	73.81	102.95	73.99	174.76	0.978	
Distance to market (min.)	98.09	160.29	88.58	170.95	0.157	
Distance to school (min.)	45.08	96.19	46.25	177.37	0.851	
Distance to health centre (min.)	94.60	108.76	90.99	213.06	0.626	
Distance to bank (min.)	117.39	101.93	119.60	202.34	0.753	
Distance to nearest transport (min.)	106.38	99.57	94.68	132.56	0.017	**
Distance to administration (min.)	50.16	186.06	50.76	204.98	0.940	
Participation in social mapping (=1)	0.60		0.61		0.408	
# of village meetings attended	9.72	9.02	10.88	10.23	0.003	***
# of sector meetings attended	7.59	7.04	7.92	8.05	0.292	
# of district meetings attended	3.84	6.98	3.29	4.28	0.010	***

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Table A4.4
(… continued)

	VUP sectors		Non-VUP sectors			
	Mean	**SD**	**Mean**	**SD**	**P-value**	
Ubudehe category (shares)						
1	0.14	0.35	0.18	0.39	0.004	***
2	0.37	0.48	0.33	0.47	0.021	**
3	0.32	0.47	0.32	0.47	0.939	
4	0.13	0.33	0.14	0.34	0.413	
5	0.04	0.19	0.03	0.16	0.097	*
6	0.00	0.05	0.00	0.07	0.345	
Cell characteristics						
# of households in the cell	774.67	342.47	843.14	358.06	0.000	***
# of markets in the cell	0.23	0.42	0.33	0.62	0.000	***
Electricity in cell (=1)	0.15		0.19		0.007	***
Phone network in cell (=1)	0.30		0.30		0.944	
Internet in cell (=1)	0.01		0.03		0.005	***

Note: The p-values represent the result of the t-test on the equality of means between the households in the VUP and non-VUP sectors. * p<0.10, ** p<0.05, *** p<0.01.
Source: 2009 VUP household survey.

Table A4.5
Descriptive statistics of public works households (N=141) and non-participant households (N=800) in VUP sectors and public works eligible (N=685) and non-eligible households (N=1,131) in non-VUP sectors

	VUP sectors				Non-VUP sectors					
	Public works participants		Non-participants		Public works eligible		Non-eligible			
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	P-value	
Characteristics of the household head										
Male (=1)	0.67		0.61		0.52		0.67		0.001	***
Age	46.55	15.04	47.73	17.40	45.70	16.11	48.49	16.59	0.567	
Handicapped (=1)	0.34		0.45		0.47		0.45		0.005	***
Literate (=1)	0.43		0.49		0.41		0.56		0.623	
Household characteristics										
# of household members	4.80	1.95	4.44	2.27	4.28	1.94	4.82	2.39	0.004	***
# household members able to work	1.82	1.22	1.57	1.17	1.85	1.13	1.55	1.33	0.778	
# elderly (65+)	0.13	0.36	0.23	0.48	0.16	0.41	0.21	0.46	0.517	
# children (0-5 yrs.)	0.94	0.97	0.80	0.95	0.81	0.92	0.81	0.92	0.133	
# of rooms in house	2.78	1.24	3.07	1.79	2.56	1.12	3.46	2.25	0.032	**
Household owns house (=1)	0.90		0.88		0.84		0.92		0.075	*
Household is rent-exempted (=1)	0.04		0.06		0.07		0.03		0.104	
Grass hatched roof (=1)	0.17		0.14		0.21		0.10		0.336	
Earth floor (=1)	0.96		0.89		0.93		0.80		0.209	
Household has electricity access (=1)	0.02		0.02		0.03		0.04		0.603	
Landholding <0.25 ha (=1)	0.50		0.48		0.68		0.41		0.000	***
Distance to nearest road (min.)	82.72	105.06	72.24	102.56	67.76	143.14	77.76	191.35	0.240	
Distance to market (min.)	117.94	255.58	94.60	136.74	89.37	150.78	88.10	182.14	0.075	*
Distance to school (min.)	48.93	127.26	44.40	89.70	47.73	164.12	45.35	184.99	0.935	
Distance to health centre (min.)	84.01	70.58	96.47	114.11	84.72	151.31	94.79	242.93	0.957	
Distance to nearest transport (min.)	126.67	130.45	115.76	96.04	111.16	124.36	124.72	237.34	0.182	
Distance to bank (min.)	118.65	94.21	104.21	100.39	89.11	93.94	98.06	151.17	0.001	***
Distance to administration (min.)	48.83	202.10	50.39	183.22	55.87	227.59	47.66	190.03	0.734	

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Table A4.5
(… continued)

	VUP sectors				Non-VUP sectors					
	Public works participants		Non-participants		Public works eligible		Non-eligible			
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	P-value	
Participation in social mapping (=1)	0.72		0.58		0.59		0.63		0.003	***
# of village meetings attended	9.91	7.73	9.68	9.23	10.29	9.51	11.24	10.63	0.655	
# of sector meetings attended	8.82	6.71	7.37	7.08	7.46	7.74	8.19	8.22	0.053	*
# of district meetings attended	4.96	6.91	3.65	6.98	2.86	3.53	3.54	4.66	0.000	***
Ubudehe category (shares)										
1	0.11		0.15		0.31		0.11		0.000	***
2	0.46		0.35		0.69		0.10		0.000	***
3	0.33		0.32		0.00		0.52		0.000	***
4	0.09		0.13		0.00		0.22		0.000	***
5	0.01		0.04		0.00		0.04		0.002	***
6	0.00		0.00		0.00		0.01		---	
Cell characteristics										
# of households in the cell	680.35	294.52	791.29	347.76	867.33	356.40	828.49	358.44	0.000	***
# of markets in the cell	0.16	0.37	0.25	0.43	0.33	0.57	0.34	0.66	0.001	***
Electricity in cell (=1)	0.10		0.16		0.18		0.20		0.023	**
Phone network in cell (=1)	0.22		0.32		0.29		0.31		0.061	*
Internet in cell (=1)	0.01		0.01		0.03		0.03		0.350	

Notes: The non-participants and non-eligible include the beneficiaries and those eligible for direct support. The sample does not include any financial services beneficiaries. The p-values represent the result of the t-test on the equality of means between the public works households in the VUP and the eligible households in the non-VUP sectors. * p<0.10, ** p<0.05, *** p<0.01.
Source: 2009 VUP household survey.

Table A4.6
Descriptive statistics of the household outcomes by participation status (public works participants, N=137; eligible non-participants, N=237) and year of cohort 3

	2009						2011					
	Public works participants		Eligible non-participants				Public works participants		Eligible non-participants			
Variable	**Mean**	**SD**	**Mean**	**SD**	**P-value**		**Mean**	**SD**	**Mean**	**SD**	**P-value**	
Per capita food consumption (RwF/day)	738.75	543.34	717.00	528.42	0.708		729.01	422.37	723.25	377.70	0.893	
Per capita food consumption (ln)	6.35	0.76	6.33	0.73	0.819		6.44	0.56	6.44	0.54	0.893	
Protein consumed (=1)	0.20		0.11		0.017	**	0.18		0.11		0.057	*
Livestock holding (TLU)	0.47	0.80	0.38	0.62	0.216		0.69	0.87	0.48	0.69	0.013	**
Crop investment (=1)	0.36		0.34		0.757		0.45		0.43		0.696	
Crop input (RwF/year)	2,688.54	6,690.65	1,808.61	5,120.17	0.154		4,002.84	9,920.73	2,659	6124.94	0.104	
Crop input (ln)	8.33	1.14	7.99	1.07	0.086	*	8.46	1.08	8.13	1.11	0.065	*

Notes: Asset information was only collected in 2009 and is therefore not reported. The p-values represent the result of the t-test on the equality of means between the public works participants and the eligible. * p<0.10, ** p<0.05, *** p<0.01.
Source: 2009 and 2011 VUP household surveys.

Table A.7
Descriptive statistics of matched public works participants (N=141) and hypothetical participants (N=507)

	VUP sectors				
	Public works participants		Hypothetical participants		
	Mean	SD	Mean	SD	P-value
Characteristics of the household head					
Male (=1)	0.65		0.65		0.957
Age	46.26	15.81	45.91	15.49	0.827
Handicapped (=1)	0.38		0.36		0.664
Literate (=1)	0.50		0.49		0.828
Household characteristics					
# of household members	4.83	1.93	4.78	2.20	0.833
# household members able to work	1.84	1.28	1.86	1.20	0.921
# elderly (65+)	0.16	0.39	0.14	0.40	0.653
# children (0-5 yrs.)	0.95	0.97	0.97	0.96	0.805
# of rooms in house	2.83	1.23	2.81	1.31	0.846
Household owns house (=1)	0.91		0.93		0.609
Household is rent-exempted (=1)	0.03		0.02		0.450
Landholding <0.25 ha (=1)	0.48		0.50		0.606
Distance to nearest road (min.)	76.38	88.53	76.10	103.68	0.978
Distance to market (min.)	92.20	69.64	87.96	106.37	0.684
Distance to school (min.)	49.28	139.77	43.36	135.86	0.675
Distance to health centre (min.)	84.15	70.41	84.60	76.06	0.954
Distance to nearest transport (min.)	126.28	137.17	122.02	109.41	0.720
Distance to bank (min.)	113.65	90.49	117.53	112.42	0.730
Distance to administration (min.)	33.27	34.16	32.05	26.85	0.677
Participation in social mapping (=1)	0.70		0.74		0.360
# of village meetings attended	9.59	7.35	9.81	8.73	0.799
# of sector meetings attended	8.60	6.56	8.92	8.81	0.714
# of district meetings attended	3.84	3.65	3.96	4.57	0.794

Table continues next page.

Table A4.7
(... continued)

	VUP sectors				
	Public works participants		Hypothetical participants		
	Mean	SD	Mean	SD	P-value
Ubudehe category (shares)					
1	0.13		0.11		0.587
2	0.41		0.44		0.569
3	0.36		0.36		0.929
4	0.10		0.08		0.555
5	0.01		0.00		0.508
6	0.00		0.01		0.409
Cell characteristics					
# of households in the cell	695.95	287.62	662.05	279.37	0.243
# of markets in the cell	0.17	0.37	0.13	0.37	0.332
Electricity in cell (=1)	0.12		0.10		0.504
Phone network in cell (=1)	0.25		0.23		0.659
Internet in cell (=1)	0.02		0.01		0.490

Notes: The p-values represent the result of the t-test on the equality of means between actual and hypothetical participants. * p<0.10, ** p<0.05, *** p<0.01.
Source: 2009 VUP household survey.

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Resume

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