

**FIGHTING POVERTY:
COMPANY INTERESTS AND FOREIGN AID
POLICY, AND AN IMPACT ANALYSIS OF
NATURAL DISASTERS**

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INTRODUCTION

Once you have started to think about poverty reduction, it is hard to think about anything else. This is especially so because many people in the developed world like to think about the international community as a global, high-tech village where new insight evolves at a magnificent speed, enabling us to solve most of our problems. As stated by John W. Sewell (1999), the president of the Overseas Development Council:

“Now the key concern of policy makers and the public is how to deal with the forces of *globalization* – the whirlwind of technological change and liberalized trade and investment that is bringing huge gains in communications and efficiency, and effecting huge shifts in wealth and production”

However, many poor countries do not experience any substantial gains from globalization and “the whirlwind of technological change and liberalized trade and investment”. So if Sewell is right in that globalization is the main concern for the decision-makers, then it may not come as a surprise that severe poverty persists in large parts of the world since there seems not to be a general link between globalization and poverty reduction. Widespread poverty is one of the major challenges of our society today and should receive our full attention. It is a puzzle why so many people live without access to clean water, without ever being able to take education and without the opportunity to be immunized against diseases that have been eradicated in the developed world for decades.

There exists a huge literature on each of many research strands that all deal with poverty in one way or another, and that discuss the above question. This dissertation contributes to two of these strands, to the theoretical literature on foreign aid, and to the empirical and methodological work on household income mobility. Both topics are important in the fight against poverty. Foreign aid is viewed as a main instrument to reduce poverty, while income mobility analysis can give answers to how and why people are able to climb out

of, or fall into, poverty. Since the nature of research is to provide building blocks to a larger whole, towards a more complete understanding of a problem, this introduction is devoted to framing the contributions in a wider context.

In the next section, we provide a brief overview of changes in world income and consumption poverty since the late 1980s, together with a discussion of the reliability of these figures. We find that most of the progress can be ascribed to the success of China, and that the poverty in Sub-Saharan Africa has increased drastically and will continue to do so. Then, in section 2, we turn to the literature on the impact of crisis on income mobility. We summarize how disasters may impact on prices and returns to productive factors, but also how reduced endowments may contribute to poverty traps. This part also summarizes essay 1, “Income mobility and cumulative effects of disasters in rural Pakistan: Bootstrap inference and measurement error simulation”, which contributes both to our understanding of the impact of disasters and to the robustness of conclusions on income mobility. Essay 1 also provides a thorough elaboration and investigation on the extent of accuracy in the measurement of the income variable necessary for drawing inferences on income mobility.

Section 3 is devoted to the international donor community’s efforts to use foreign aid as an instrument to increase economic growth in the recipient country. The practice of conditioning large shares of aid on the recipient implementing growth-enhancing policies, based on the belief that growth would reduce poverty, has been controversial and one of the major policy issues in foreign assistance over the last two decades. Four issues regarding this principle of conditionality are discussed in this section. First, we look at the rationale for conditionality by summarizing the evidence on whether economic growth in poor countries reduces poverty. Then we review the nature of aid conditionality and discuss two dilemmas that arise from this practice, and look at recent developments in thinking around this policy instrument. The third issue arises from the view that conditionality is a failure. It is found that the recipient frequently receives aid even when the conditions are not implemented. We provide a brief review of the literature on the failure of aid conditionality, which includes the theoretical explanations of the failure suggested in two of the papers in this dissertation: “Company Influence on Foreign Aid Disbursement: Is Conditionality Credible when Donors Have Mixed Motives?” in essay 2 and “Company Interests and Foreign Aid Policy” in essay 3. Fourth, we assess the short- and medium-term consequences of the same growth-enhancing policies in order to understand why conditionality has been controversial, and to assess whether these policies may lead to increased poverty in the short and medium run. Finally, we

summarize this introduction in section 4 by commenting on four important issues for impact analysis.

1. A brief view on world poverty

This section provides an overview of world income and consumption poverty, but one should bear in mind that poverty is a multi-faceted concept.¹ In order to assess the extent of poverty, to find its causes and to set targets for alleviation, a wide range of measurable indicators of wellbeing are employed. In addition to consumption and income, contemporary economic research also employs health, assets, infant mortality, employment, education, vulnerability or exposure to risk and participation and powerlessness as indicators of dimensions of peoples' wellbeing.² However, measures of income and consumption seem to be the most popular indicators in economic research on poverty. This is mostly because material resources are crucial for achieving a decent standard of living, which is also the main reason we focus on income and consumption in this dissertation. However, it should be mentioned that data on important indicators like health and education are scarce in the developing world (World Bank 2001).

Before we turn to the evolution of income and consumption poverty, we comment on some of the most important general measurement issues to highlight the problems that are immanent in the application of these poverty measures. Firstly, we review some conceptual problems with measuring income or consumption expenditure as an indicator of wellbeing, and secondly, we focus on practical problems that may arise in this measurement.

1.1 Conceptual problems

Most people have a perception of what it means for an individual to be poor, but this may vary in different societies and cultures.³ A main conceptual question that should be raised in poverty assessments that employ income or consumption expenditure as the indicator of

¹ Note that different indicators can give very different incidences of poverty. One example is Dhanani and Islam (2002): in their study of Indonesia they find that measuring poverty according to non-income dimensions such as education and health more than doubles the incidence of poverty compared to consumption-based indicators.

² It should be noted that for some of the aspects of poverty that are employed in recent times, like participation and powerlessness, a coherent methodology for measurement and data gathering has yet to be developed (World Bank 2001).

wellbeing is whether these measures actually corresponds to peoples' own perception of the problem. If the aim of poverty reduction is to help those who feel poor to regard themselves as non-poor, then we should employ other indicators than income and consumption if these are not related to the poor people's perception of poverty. Ravallion and Lokshin (2002) provide an excellent illustration of the problem in their study of poverty in Russia. They find only a weak positive relationship between self-rated economic welfare and a standard income based measure of economic welfare. Moreover, only 40 % of those classified as the poorest by the income based measure identify themselves as poor. Similarly, a majority of those who perceive themselves to be poor are not poor according to the income measure. Disentangling the rationale for individuals' perceptions of their own poverty status, they find that including a range of socio-economic variables doubles the explanatory power. The study suggests that the variables important for poverty perceptions, in addition to present income, are educational attainment, employment, age, marital status, past income, expenditure, assets and average income in the area of residence.

However, we expect that the poorer the society in terms of income, the higher the correlation between the perception of poverty and an income-consumption measure. The reason is simply that below a certain levels of consumption expenditure, one is not able to secure basic needs like enough food, adequate clothing and shelter. Lack of such basic needs can cause severe hardship for the individual, and we believe that most people in this situation would rate themselves as poor. However, the correlation between objective and subjective measures of poverty is an empirical issue that needs further research. Also, even if one accepts income or consumption expenditure as indicators of poverty, it is not likely that people with different cultural norms will agree on what constitutes a bundle of goods consumed by the poor (Srinivasan 2000). Thus, one should be very careful in comparing poverty across countries and within countries over time.

Some of the variables that explain poverty perceptions in the Russian study indicate that people feel that poverty is a relative phenomenon, for example that relative income within the community matters. This is another conceptual issue that poverty analysts need to be aware of. Poverty is often perceived as a relative phenomenon in richer country, while it is usually regarded as an absolute issue in poorer countries. The argument of why poverty should be measured in absolute terms in poor countries concerns the ability to consume the

³ In their preparation for the World Development Report (2001), the World Bank interviewed more than 60.000 individuals from 60 countries, asking them what poverty meant to them. The findings are published in three books, see for more information.

bundle of food that enables an individual to obtain the daily caloric intake required to avoid undernourishment. Undernourishment is an absolute state, and avoiding starvation and even worse outcomes is thought to overshadow any inclination towards relating ones welfare to how others fare.

A relative poverty measure would be unaltered if all incomes increase proportionally, while an absolute poverty measure would show a decrease in poverty. Clearly, the latter measure is more interesting when evaluating the welfare changes of people at the edge of starvation. Also, if the impact of being undernourished on the perception of being poor does not depend on whether or not the other inhabitants in the village also are undernourished, then this provides an additional argument for our above argument of a closer relationship between subjective poverty and income-consumption based measures in poor areas.

Another problem concerns aggregated analysis, which may hide important explanations for poverty. For example, Collier and Gunning (1999) find that while disease and climate are important in explaining poverty in the household level, these variables are usually omitted in aggregated analysis. The same problem applies to government policies since the distribution of income is also a function of the governments' choices (see for example Ravallion and Datt 2002). Thus, attempting to explain differences between countries without taking into account the governments' efforts to eradicate poverty may yield biased results. Such differences may be wiped out when the figures are aggregated over countries, states or regions with different governments, and hence hide important information on what can be achieved when governments have the willingness and capability to take action.

Another way in which aggregating income and consumption expenditures may conceal important poverty patterns is when there are large geographical disparities in poverty or differences between socio-economic groups of the population. Hence, even if a country does not seem to have a large poverty problem, disaggregation may reveal that poverty is widespread in some regions/population-groups, while other are prosperous. So if the cause of geographical or subgroup differences in poverty are due to the characteristics of the area or subgroup, then there may be potential benefits of targeting the areas/subgroups.

Even if income and consumption measures do not capture other important aspects of wellbeing directly, this need not be a major deficiency of income-consumption measures if increases in these measures also improve wellbeing along the other dimensions. For example, poor people often hold liquid wealth to protect themselves against risks, for example as a coping strategy to mitigate possible adverse effects of natural disasters. This implies that higher income may improve the household's ability to put aside enough savings to be

protected against shocks, which again suggest that income can be correlated with another dimension of wellbeing: security and vulnerability. Another example stems from the belief that income poverty is a cause for inequalities in education and health (Ravallion 1996). So if increased income also enables people to get medical treatments when ill, or send their children to school, then the income measure also capture these aspects. However, there is now a consensus on the view that income growth alone will not reduce poverty along these dimensions, and that there is a public responsibility for providing basic health care and primary education (Lipton and Ravallion 1995).

The final conceptual issue that we want to highlight is that poverty assessments usually employ static measures. The most popular approach is to devise an income-consumption poverty line, for example the well-known “living for less than \$1 a day” line, and count the number of individuals below this line at a certain point in time. Then counting the number of poor in the next period yields one opportunity to assess how poverty has changed over time. Unfortunately, this approach may give a biased picture of the welfare changes. Consider the case where 20 % of the population is considered poor in two surveys at different points in time. Then it makes quite a difference whether the poor consist of the same people in both surveys, or whether there has been a complete turnover so that none of those who were poor in the first survey is poor in second one. We return to this issue in more detail in the next section and in essay 1.

1.2 Practical problems

If we assume that income or consumption expenditure is the perfect indicator of wellbeing, what practical problems may we encounter that could influence our analysis? A very important challenge that influences the accuracy of income and consumption figures is that these variables seem to suffer from measurement error. When measuring income, how do you value poor peoples’ backyard production of agricultural products for their own consumption if these products are not traded in a market and hence have no market price?

Deaton (1989) is very illustrative in pointing to several other problems of measuring net income in poor areas:

"The concept of income is itself extraordinarily complex, and most people in developing countries have little reason to distinguish between business and personal cash transactions. A farmer who buys seeds and food in the same market at the same time may not appreciate that, when computing income, he should only deduct the

expenditure on seeds from his receipts. Nor is a seller of street food likely to distinguish accurately between what is eaten by his customers and what by his family. A subsistence farmer, whose outgoings approximately equal his incomes, is quite likely to report that his income is zero. Even in developed countries the measurement of self-employment income is notoriously inaccurate. The problems are not entirely solved even by the detailed questioning of more sophisticated surveys, in which the surveyor, not the respondent, calculates income. And the national accounts data for household saving are not themselves reliable enough to provide a good cross-check that will show what sort of surveys do best or how they should be redesigned to do better.”

However, it is evident that many of these problems are not related to measuring consumption, which is more easily understood. One should also note that consumption expenditure calculations include in kind consumption, since such consumption is often a substantial share of poor people’s consume. A feature of survey data that implies less reliability in the income-consumption figures is that non-market goods are ignored in these calculations. This may introduce a bias in the measured variable.

The bias in the variable may even be reinforced by the fact that the respondent may regard income and consumption expenditure as sensitive information. One example arises from the significant income tax evasion and avoidance in poor rural areas (Srinivasan 2000). Thus, people may be reluctant to state their true income or consumption if they suspect that the government may use the figures for taxation purposes.

It is also difficult to take account of the price variation across local markets. Large inter-village price differences may coexist in poor rural areas due to poor infrastructure, and poor people may pay higher prices than others may pay for the same goods. Since the interesting measure is the real value of the poverty proxy, one should deflate the variable with as much precision as the data allows. The lack of detailed information about prices in most surveys is thus of great concern for the accuracy of the variable. The importance of prices also cast doubt over whether the aggregated poverty figures shown in the next section is meaningful since the purchasing power parity concept used to calculate them only applies average national prices (Srinivasan 2000).

Data contamination is also a source of concern because it creates a discrepancy between the true distribution of the income-consumption variable and the one displayed in a data set. This problem may occur if a proportion of false observations is added to the true

data, usually if data is miscoded or if other types of mistakes are made during data management (Cowell 2000). Both types of errors may exert great influence over different poverty analysis.

Most surveys treat the household as the unit of analysis, that is, they ask about the household's income and consumption expenditure aggregated over the members. Two problems regarding the ability to evaluate each individual's wellbeing of this approach are evident. The first problem is that the members of the household are usually defined as those who usually eat out of the same kitchen (Srinivasan 2000). Take for example the so-called Hindu-undivided-family in India, which is an extended family that pools their income and expenditure. Almost any study of the distribution of income or expenditure based on the kitchen definition of the household will be biased when such family patterns prevail, simply because one will be unable to pick up the actual sharing between the individuals.

The second problem that arises from the practice of focusing on households is that the welfare of the members depends on how the food is shared between husband and wife, and whether there is discrimination against children based on their sex. Haddad and Kanbur (1990) suggest in a study of the Philippines that treating the household as one unit understated the true poverty by more than 25 %, and Borooah and McKee (1994) also illustrate how even modest differences in income sharing between husband and wife could affect their poverty rates.⁴ See Ravallion (1996) and the references therein for a discussion on how to mitigate the problem of intra household inequalities.

Survey methods usually vary across countries and over time, so that comparing figures may give a biased picture of the reality (Chen and Ravallion 2001). In calculating a household's income, some surveys ask the individuals to recall what they earned last month, while others ask what they earned last week. When there are large disparities in income during a year due, for example, to seasonal variation (see for example Dercon and Krishnan 2000), this method may give biased results because of the inaccuracy in calculating a yearly income based on such recalls. However, it is also found that recalling last month's income is found to yield higher poverty estimates than if the same people are asked to recall last week's income (World Bank 2001). Thus, it is questionable whether one should make comparisons between surveys with different recall periods.

⁴ Other measures of wellbeing avoid the difficulties in tracking differences between household members. Health and education, for example, avoid the "household unit bias" simply because they are connected directly to individuals and are therefore valuable in assessing gender differences within the household. In addition, they capture facets of poverty that consumption/income variables may not be able to pick up.

The inaccuracy of these figures is well illustrated by the difference in the estimates of world consumption poverty undertaken in Global Economic Prospects in 2002 compared to those performed in 2003 (World Bank 2003). A telling example is that the increase in poverty in Sub-Saharan Africa from 1999 to 2015 is estimated to be 45 million people in 2002, while this estimate is almost doubled to 89 million people after the revision in 2003. The causes of this increase in the estimate are changes in methodology, change in the estimated relationship between economic growth and poverty reduction, the addition of new surveys and poorer economic prospects (World Bank 2003).

1.3 Changes in world income- and consumption-poverty

Bearing the above caveats in mind, we take a brief look at the evolution of absolute income-consumption poverty since the late 80s. We discuss the trends in poverty in comparison to the United Nation's Millennium Development Goal to halve the proportion of consumption poor from 1990 to 2015. The global poverty line defines an individual as poor if it lives in a household with a per capita expenditure of less than 1.08 dollar a day, and this is close to the median poverty line used in the poorest countries (Chen and Ravallion 2001).⁵ The national poverty lines in these countries are calculated on the basis of the required expenditure to purchase a basket of goods necessary to secure a minimum standard of living, usually according to the ability to sustain a minimum of nutritional requirements. Hence, individuals with less consumption expenditure than this cutoff are often viewed to be living in extreme poverty.

The global poverty line is converted to local currency at purchasing poverty parity in 1993, and national official consumer price indices are used to convert the line to the prices that prevailed at each survey date (Chen and Ravallion 2001). The World Bank data that underlies the estimates in table 1 are based on over 300 household surveys with national coverage of more than 90 countries, and represents approximately 90 % of the total population in the developing world.⁶

⁵Chen and Ravallion (2001) estimates that \$ 1.05 is the poverty line one would expect to find in the poorest country, and that this is not much different from the median poverty line among the poorest 10 countries in the sample.

⁶ See Chen and Ravallion (2001) for details about the data and methodology, but note that the data is updated since then (World Bank 2003).

Table 1: Global consumption poverty rates by region and year (number of poor people in households with per capita expenditure of 1.08 \$ a day or less, in millions)

Region	1990	1999	2015
Sub-Saharan Africa	241	315	404
South Asia	506	488	264
East Asia and Pacific	486	279	80
China	376	222	73
Latin America and the Caribbean	48	57	47
Middle East and North Africa	5	6	8
Europe and Central Asia	6	24	7
Total	1292	1169	809
Total excluding China	917	945	735

Source: World Bank (2003)

The estimates in table 1 suggest that there has been a reduction of 10 % in the number of poor from 1.29 billion in 1990 to 1.17 billion in 1999, and if the prognoses are correct, there will be 800 million poor in 2015 (World Bank 2003). It is also estimated that the global poverty rate has decreased by nearly 23 % from 1990 to 1999, which implies that the proportion of poor decreased from 30 % to 23 % in this period. Based on the existing trends in income growth, it is estimated that the head count rate will decline to 13 % by 2015 (World Bank 2003).

These trends are broadly confirmed by aggregated GDP data in a study by Sala-i-Martin (2002) of the period 1970 to 1998. The approach in this study is to assign the within-country income shares to each person in the world, and define the income poverty rate by the share of people with an income of one dollar a day or less. He finds that this rate declined from approximately 7 % in 1990 to 5 % in 1998.⁷ This represents a 30 % reduction in the rate of income poverty, which is close to the 23 % reduction in the consumption-based rate during the same period. From Sala-i-Martin (2002, fig. 6, p. 48), it seems like the decline in the number of poor has been around 30-40 million people between 1990 and 1998. Since this represents a 10-12 % reduction in the number of absolute income-poor, this pattern coincides with the change in consumption noted above.

However, assessing the time-span between 1987 and 1998 results in a much larger decrease in the income-based measure. During this period, it seems like more than 100 million people are lifted out of income poverty, which amounts to a 25 % decrease in the absolute number of poor. We do not find any such a sharp drop in the consumption-based measure in the years prior to 1990. On the contrary, we find that the number of poor decreased by less than 2 % between 1987 and 1998 (Chen and Ravallion 2001), which implies an increase in poverty of 8 % from 1987 to 1990. Thus, the two measures give the opposite direction of the change in poverty from 1987/88 to 1990.

It appears that the developing countries on average follow the linear projection that leads to fulfillment of the goal of halving the proportion of people living on less than a dollar a day in 2015. However, whether or not the different regions achieve this goal depends on the functional form of the underlying equation that determines the poverty changes. We can easily think of convexities in the poverty reduction path, for example if it is easier and less costly to increase the consumption of the poor when many are below the poverty line compared to when fewer people are poor. Similarly, one can imagine that there are multiple equilibria in an economy that implies that a “big-push” is needed to get from an equilibrium with high level of poverty to an equilibrium with low level of poverty. This may give concavities in the poverty reduction path that could result in large poverty-reduction once you get the economy on track towards the low-level poverty equilibrium.

Even if the aggregated figures give reason to be somewhat optimistic with regards to the fulfillment of the millennium goal, we find very different situations in different parts of the world. Table 1 shows that the transition economies in Europe and Central Asia have experienced more than a quadrupling of their poverty rates during the 90s, but signs of a recovery after the financial crisis in 1997-1999 are now coming to the surface.

However, looking at the situation in the poorer areas of the world yields a less optimistic picture. The largest proportion of poor is found in Sub-Saharan Africa, where the absolute number of poor increased by 74 million people, or 27 %, from 1990 to 1999. This trend will most likely continue, and it is estimated that the number of people living in poverty in this region will increase by another 89 million towards 2015. The proportion of poor will then remain around 50 % of the population through the next decade, mostly due to political and economic instability and civil conflicts, epidemics (the three major are HIV/AIDS,

⁷ Note that since more than 50 % of GDP in poor countries is consumed (Sala-i-Martin 2002), we would expect the income poverty rate to be lower than the consumption based poverty rate.

malaria and tuberculosis), natural disasters, poor infrastructure and high dependence on commodity exports.

One should note the more promising findings in Sahn and Stifel (2000) that study income poverty in 12 Sub-Saharan countries. Because of the large problems with income and consumption data, they construct an asset index as an alternative measure of economic wellbeing.⁸ Then they are able to avoid several of the causes of bias noted in the previous section. They do not have to use price deflators or take into account spatial price differences and the survey methodology will probably not influence the results. Their results indicate that poverty has declined in most of these countries during the last decade, especially in the rural areas. In a recent study using a similar approach with 11 of the 12 countries, however, they conclude that only two of 11 rural populations make progress in accordance with the linear projection that leads to a halving of poverty within 2015 (Sahn and Stifel 2003). The urban areas do slightly better, five of 11 are on target.

While the income based poverty measure of Sala-i-Martin (2002) claims that 95 % of the poor live in Sub-Saharan Africa, the consumption based measure indicate that the largest number of poor live in South Asia (table 1). Unfortunately, no disaggregated data by region is provided for income poverty in Sala-i-Martin (2002). The minor reduction in consumption poverty achieved in this region, about 4 % during the 90s, is concentrated in certain parts of South Asia. So the number of poor has in fact increased in slower growing parts of this region. However, even if the progress in South Asia towards achieving the millennium goal seems to have been slow, this region has much better prospects than Sub-Saharan Africa. The number of poor is expected to decline from 488 million people in 1999 to 264 million in 2015, which amounts to a decline of 45 % in absolute terms. The main reason is the optimistic prognoses for economic growth. The current growth rate for the region is expected to sustain in the medium term and increase slightly in the period 2006 to 2015

The main cause of the more positive average numbers for the developing countries from 1990 to 1999 is the magnificent progress in China. During the 80s and 90s, the average growth in GDP per capita in China is estimated to have been from 6 to 8 %, depending on the data source (Sala-i-Martin 2002). The Chinese success reduced the number of poor by over 150 million in this country alone from 1990 to 1999. So excluding China yields a different overall picture for the remaining developing countries. In this case, there was an increase in the total number of poor by 28 million people during the last decade, which represents a 3 %

⁸ The index includes radio, TV, refrigerator, bicycle, motorized transport, piped drinking water, surface drinking water, flush toilet, no toilet facilities, low quality of floors, and education of the household head.

increase. There is reason to be inspired by the possibility of copying China's success into other regions. China has reduced the number of income-poor from 376 million people to 222 million during the 90s, which amounts to a 40 % decrease. The interesting question then becomes what other regions can learn from China, which is an important issue for future research.

As emphasized at the beginning of this section, these aggregated numbers suffer from several problems. Bhalla (2002) suggests that the above poverty figures are biased upwards, and that 13 % is a more correct estimate of world poverty in 2000, compared to the World Bank estimate of 23 %. If this is correct, then the millennium goal is already achieved, 15 years ahead of time. However, Ravallion (2002a) concludes that the differences in the estimates arise from Bhalla's use of secondary data sources instead of primary household surveys, but also because the estimates apply different poverty lines and consumption adjustments.

Even if many people are lifted out of income poverty by long-term economic growth, this does not imply that these people have experienced reduced poverty along other dimensions of wellbeing. Moreover, we should bear in mind that economic growth alone will not improve several other poverty indicators (Lipton and Ravallion 1995). Now we dive down to the micro level and look at how disasters may impact economic poverty over time. We shall see that following the same household over time can yield a different picture of poverty than the ordinary cross-sections presented in the much of the aggregated statistics above.

2. The impact of crises on poverty and economic mobility

Poverty analysis usually describes a snapshot of the situation, and frequently addresses the characteristics of the poor at a single point in time. However, if our aim is to help people escape poverty, it is necessary to assess how and why poverty changes over time. Interventions favoring the poor need to take account of the fact that a household classified as poor in one period may be experiencing a temporary misfortune, while another is locked into constant poverty.

It makes a great difference whether it is the same households that are poor every year, or whether all households that are poor in one year jump out of poverty in the next year so that former non-poor now constitute the poor.⁹ The literature on the temporal aspect of

⁹ Even though this point has been known for decades (see Thernstrom 1969, quoted in Atkinson et al. 1992), it seems not to be picked up by the policy makers, who continue to stick with the headcount measures.

poverty decomposes total poverty over time into chronic and transitory poverty to capture two different patterns of poverty dynamics.¹⁰ A household defined to be chronically poor is one that has a permanent income below the poverty line, which in practice implies that the intertemporal mean of the welfare indicator is below the poverty line (Baulch and Hoddinott 2000).¹¹ Suitable policy measures to reduce chronic poverty would therefore be to increase the human and physical assets of these people, or the returns to these assets. Transient poverty is then defined as the poverty observed at one date that is due to a short-lived drop in the household's indicator of wellbeing, and is calculated as the residual poverty after subtracting the chronic poverty from the total time-mean poverty rate. Thus, policy measures for reducing transitory poverty typically revolve around income-stabilizing schemes and social safety nets.

An interesting study by McCulloch and Baulch (2000) illustrate the different impact of policies that smooth income versus those that promote income growth. Their simulations of transfers and investment policies show that large reductions in total poverty in rural Pakistan can be achieved by smoothing incomes, while reducing chronic poverty requires substantial investments. Another poverty decomposition is provided by Jalan and Ravallion (2000) for rural China, where education, health and the demographics of the household are found to be important to chronic poverty but not for transitory poverty. Note however, that there may well be complementarities between the policy measures addressing each type of poverty (Jalan and Ravallion 1996): Insurance may also reduce chronic poverty, and increasing the assets of the poor may also reduce transitory poverty.

It is frequently found that a large fraction of those who are poor one year is not poor the next, and many of those who are not poor one year will sooner or later experience spells of poverty (Baulch and Hoddinott 2000). Hence, those who are chronically poor tend to be a much smaller group than those who are poor in a single year. So when a large number of people entering and exiting poverty over time, we need to know how and why these income mobility patterns arise in order to assemble the appropriate policy package to eradicate poverty. Therefore, it is important to track those who manage to escape from poverty, and explain how they are able to exit. Moreover, one should assess why some are able to escape poverty and stay non-poor, and to see what we can learn with regards to those who do not exit poverty. Is there a broad route to poverty eradication (education, non-farm employment

¹⁰ See McCulloch and Baulch (2000) for a formal representation of the decomposition of total poverty.

opportunities, health facilities), and to what extent is it necessary to target groups that will lag behind in a broad strategy?

A major constraint in answering these questions is that we need detailed data for the same households for several years. Tracking households over time is very expensive, especially in poor rural areas where migration may be high and communication cumbersome, so very few data sets are available for a study of this kind (Fields 2001).

Of particular interest for welfare assessments over time is how large crises inflict upon different income groups, especially since such events can have severe outcomes for the poor and vulnerable who often lack insurance (Besley 1995). It is a long held view that the recovery after disasters is usually very rapid:

“what has so often excited wonder, the great rapidity with which countries recover from a state of devastation, the disappearance in a short time, all traces of the mischiefs done by earthquakes, floods, hurricanes, and the ravages of war”

John Stuart Mill (1848)¹²

However, what do we know about the “traces of the mischiefs” made by such disasters and how long do the crises last? If we are able to evaluate the impact of disasters, do we find that the losses and recoveries are similar across income groups? The main focus in the next two sections is to review the literature on the impact of crises and to try to say something about the extent to which the poor are more vulnerable than the relatively wealthy households. Another important issue we will focus on how the poor managed in the aftermath of the crises: did they recover or were they trapped in poverty?

2.1 A brief review of the literature on the impact of crises

The empirical evidence from developing countries on the impact of disasters on poverty and income mobility is quite thin. This is not very surprising, given the fact that there are few panel data sets from developing countries, and because it is impossible to time a survey right before a disaster. A problem with many of the existing studies, as we shall see, is that measurement error is not accounted for, the impact of the disasters is not separated from the

¹¹ Note that Morduch (1995) uses these terms differently: the chronically poor are those that are poor in every period, while the transitorily poor are those that are sometimes poor. For a discussion about the differences in these definitions, see Baulch and Hoddinott (2000).

impact of other events, and statistical inference is seldom carried out. Before we turn to these methodological issues, we group the effects of the disaster according to the nature of the impact. Based on the economic literature on crisis, we focus on short-term and long-term impacts on households of macroeconomic crises and natural disasters.¹³ First we look at the impact of such events on prices and returns to endowments, which not necessarily leads to permanent changes in the aftermath of a crisis. Second, we investigate whether transitory crises have permanent effects on households and hence focus on changes in levels of endowments and possible poverty traps.

2.1.1 Impact on prices and returns to endowments

Inflation, deflation or changes in relative prices affect consumers and producers differently. Note however, that prices also influence the profitability in each sector, the wages and the returns to skills and capital. This implies that price changes may have different impacts in the short, medium and long run, but also that it is a substantial challenge to disentangle the impacts of a crisis empirically since poor households typically are both producers and consumers. These issues will be discussed further in section 3.4, but should be kept in mind when reviewing the empirical evidence.

In a thorough investigation of the impacts in Indonesia of the Asian financial crisis that occurred in 1997 and 1998, Strauss et al. (2002) point to the explosion in the relative price of food as the main effect on households. This finding is also supported by several other sources (Dhanani and Islam 2002). The large increases in food prices relative to non-food prices were mainly caused by an exchange rate depreciation, which increased the relative price of tradable goods. Strauss et al. reports that nominal income also increased during the crisis, but less than food and non-food price increases, which implies that real incomes declined. However, they also argue that those who were net sellers of foodstuffs, especially large farmers, increased their incomes during the crisis.

One advantage of Strauss et al. is that they have panel data, and hence have the opportunity to track changes in the poverty status of individuals. Their results confirm the finding above mentioned finding that there is a large flow of households into and out of

¹² Quoted in Becker et al. (1990).

¹³ Our focus is on income and consumption, but other plausible impacts could be migration, decreases in provision of public services, withdrawal of children from school to help generate income, unemployment, changes in crime and security and also the possible disruption of networks and decline in social capital. See Ravallion (2002b) and the references therein for evidence on the impact of fiscal adjustment on public spending.

poverty over time in developing countries. They find that more than half of those that started out poor in late 1997 were not poor after the crisis (late 2000). Also, 55 % of the poor after the crisis were not poor in the beginning of the crisis. This resembles the mobility pattern found by Lokshin and Ravallion (2000) in Russia during the same financial crisis.¹⁴ They find that 44 % of those that started out poor before the crisis managed to climb out of poverty immediately after the crisis, and that 47 % of those that were poor after the crisis were not poor initially.

Lokshin and Ravallion (2000) also compare the households' income mobility with their expenditure mobility. They find that 18 % of the population fell into income poverty after the crisis, but measured according to expenditure, 20 % of the population became impoverished. In other words, a large share of those that were non-poor before the crisis was vulnerable in the way that they became impoverished after the disaster. Similarly, 16 (9) % of the households actually climbed out of income (expenditure) poverty during the same period.

These findings are supplemented with subjective welfare indicators, which were constructed by asking the adults in the panel sample the following question in both survey years. "Please imagine a 9-step ladder where on the bottom, the first step, stand the poorest people, and on the highest step, the ninth, the rich. On which step are you today?" Comparing the objective figures with the subjective evaluations of the respondents revealed that the different methods yield broadly similar results on the dynamics. Another interesting finding is that expenditure was reduced more than income, which may be due to the negative shock to wealth that many experienced, or that the Russians believed that things would get worse in the time to come.

Looking at determinants of changes in per capita expenditures by their initial (1997) level, Strauss et al. (2002) find that those Indonesians who started with low incomes were likely to increase their income in 2000, and vice versa. The most important factor in determining how the poor were able to get out of poverty from 1997 to 2000 was higher education, and those with higher education were also more likely to stay out of poverty in both years. This is supported by Grootaert et al. (1997) who study consumption dynamics during a recession in Côte d'Ivoire. They find that urban households with well-educated members actually increased their expenditure during a severe recession, in contrast to the

¹⁴ This Asian financial crisis spread to other parts of the world, and Russia was particularly hard hit by the lower demand from Asia and the anxiety for further devaluations of Asian currencies. The Russian GDP contracted by 5 % in 1998, the rouble was devalued by 70 % and the collapse of the major commercial banks lead to the loss of peoples' savings.

average household that experienced 15-20 % reduction in expenditure. Similarly, Glewwe and Hall (1998) find in an urban panel study of Lima, Peru, that households with better educated heads were less vulnerable to the severe macroeconomic recession between 1985 and 1990.

In rural areas, however, Grootaert et al. (1997) do not find any significant relationship between education and change in expenditure, but those with more land increased their expenditure during the period. These findings are supported by Gunning et al. (2000) that suggest that land is correlated with growth in crop incomes during recession for a sample of households that were resettled on former white-owned land in Zimbabwe. An interesting feature of the data for studying the impacts of a crisis, is that these farmers experienced a drought in the first year after resettlement. Finding huge increases in crop income when comparing their incomes fourteen years later, Gunning et al. conclude that the major reason is due to the higher returns to human and physical capital in the normal year compared to the drought year. However, it is difficult to say how much of this change is due to the drought and what can be explained by other factors like change towards higher-value crops, improvements in land quality over time and the fact that these households experienced considerable learning by doing.

The only study that we know of that explicitly compares income poverty in a normal year with poverty during a natural disaster is Reardon and Taylor (1996).¹⁵ They use a small panel survey of farm households in Burkina Faso, collected twice, in 1983/84 and 1984/85. The first round was considered to be a normal situation, while the second was characterized by drought. Comparing a poverty index between the two points in time, they find that the drought increased the numbers of households in income poverty by 250 % in the zone that was most hurt. An interesting finding is that the poor relied more heavily on crop income, and were thus disproportionately hurt by the drought. Dercon and Krishnan (2000) confirm that harvest failure due to natural disasters is a main cause of hardship for rural households. Interviews of Ethiopian rural households reveal that 78 % have experienced losses in income or wealth because of the impact of drought, flood, pests and other weather related phenomena. The year of the most recent serious event is stated by the households to be 1984, which coincides with the beginning of the famine of the mid-80s.

There is also some evidence from Reardon and Tylor (1996) that the loss from the decline in returns to agriculture was compensated to some extent through migration from the

¹⁵ See also Webb and Reardon (1994) for a comparison of the impact of this drought on the farmers in Burkina Faso with the impact of the 1984/85 drought on Ethiopian farmers.

hardest hit area for households in the two highest terciles of the income distribution. On average, it was found that the poorest households lost twice as much income as wealthier households, in absolute terms. The recommendations to policy makers from this study are therefore to increase agricultural productivity and to provide security against agroclimatic shocks. The second aim can be achieved both by improving the agricultural system, but also through the creation of non-farm income activities.

2.1.2 Impact on amounts of endowments and poverty traps

It is a demanding task to investigate whether crises have permanent effects on income, but is very important for policy. If disasters lead former non-poor to become poor and stay poor forever, or plunge the poor into permanent destitution, then there would be immense long-term benefits from policies that protect poor and vulnerable to such transient shocks. Thus, short time crisis relief may be an important tool in long run poverty reduction, and not only a mitigation of a transient hardship.

The direct effects of a lost harvest, a temporary increase in food prices or economic decline are transitory in nature. Thus, these events are not expected to reduce future income opportunities when insurance and credit markets function properly. The problem is that such markets often do not exist at all in poor rural areas, and that local informal insurance and credit networks are under severe strain in times of crisis because most of the members will draw on the arrangement simultaneously (Morduch 1999). In this section we look at the direct relationship between crisis and future income that comes into play when the disaster leads to depletion of endowments. Damage to productive capital and distress sales of land, cattle and other productive assets would on average cause a reduction in future income.

A qualitative study of the 1997 drought in Burkina Faso by Roncoli et al. (2001) reveals an interesting pattern. Several of the wealthier households were able to take advantage of the crisis, and in fact increased their income during the disaster. They find that rich farmers took advantage of the record low prices of cattle that occurred due to distress sales, and due to poor animal health caused by lack of water and grass, and bought young animals to raise. The low prices of cattle also attracted traders from surrounding areas making great profit from the drought. In addition, they find that those who were able to invest in peanut farming profited greatly from the huge price increase that resulted from the drought. So if it is true in general that those who are wealthy profit from a natural disaster while the poor lose, then a

government that aims at smoothing the effects of the crisis over the population has a rationale for redistributing resources from the rich to the poor.

However, livestock is often used as a self-insurance mechanism. Thus, it is difficult to disentangle whether the loss from such sales only represents an expected insurance premium. However, the poor have small stocks of animals and distress sales could deplete their insurance mechanism towards a dangerous level, leaving them highly vulnerable for a consecutive crisis. Reardon and Tylor (1996) find such a pattern in Ethiopia, where livestock sales increased on average by more than 150 % from a normal year (1983) and a year of drought (1984), but where it increased nine times for the poorest. Even if the poorest tercile only have one-fifth of the animals of the upper tercile, it is found that the poor increase the income share from animal sales up to the same income share as the more endowed households. Similarly, Scott (2000) employs a poverty measure that is sensitive to the incomes of the poorest and finds that livestock losses due to three years of consecutive drought in Chile increased this poverty measure by 30 %.¹⁶ In contrast, the headcount ratio was unchanged, which indicates that the average impact only worsened the situation for the poor.

In the Ethiopian case one can expect that the relative large depletions of assets would also decrease future income for many of the poor. In fact, the interviews of Ethiopian farmers in Dercon and Krishnan (2000) reveal that 35 % of the households quote that disease, drought related death, and distress sales etc. in 1984 caused considerable hardship. In addition, the drought continued through 1985, and 16 % of the households reported asset losses in this year as a severe problem. However, neither of the studies have the data necessary to assess the duration of the impact of the Ethiopian drought.

Panel data that spans over a longer horizon may give the opportunity for analysis of how changes in assets influence income mobility. Gunning et al. (2000) investigate changes in assets in a small 14 year panel from Zimbabwe where the initial year was characterized by drought, and where the GNP per capita fell by 7 % during the period. They look at income dynamics of households that were resettled on former white-owned land in 1982. In the year of drought, 21 % of the households did not report any income from crop production. This may have caused considerable problems since a very large share of total income comes normally from agriculture, a share that amounted to 80 % for the sample in 1995/96.

¹⁶ Remittances and benefits from public works programmes were excluded from this income measure.

Assessing the changes in the period from the drought year in 1982/83 to the normal year in 1995/96, they find that the huge increases in crop income are explained in part by accumulation of assets. Moreover, they report that the households that were poorer in 1982/83 appear to have the highest growth rates and that only two households experienced decreased crop income during the period. Given that these households also had to tackle the problems of learning how to farm, we can conclude that the drought does not seem to have led to poverty traps or permanent poverty. However, since the households in this particular sample starts out by being allotted a substantial amount of land, the conclusions does not apply to less endowed households.

In a long panel of rural farm households in Chile, Scott (2000) examines each of the households that were classified as non-poor in 1967/68 and poor in 1985/86 to find out whether they fell permanently into poverty or not. Three checks are proposed on whether or not the poverty-status of these particular households was transitory. The first (second) is that loss of harvest (livestock) in 1985/86 is taken to indicate transitory poverty if the household had positive output from this income-source in 1967/68. The third check is that if any of these households accumulated wealth in the years prior to 1985/86, then the poverty classification is seen as transitory. Only one household can be scrutinized by this check, and it is found that this household bought a television, three beds and a new house just before being classified as poor in the 1985/86 survey. The two former checks do not seem to provide any convincing evidence on transitory changes: Loss of an entire harvest may result in a debt trap and hence a lower permanent income. Loss of livestock can be seen as a reduction in the level of capital, and thus also reduce permanent income.

A promising framework that has received little attention in the poverty and income dynamics literature is found in (Lokshin and Ravallion 2001). They investigate whether households fell into poverty traps during the sharp decline in GNP for Russia and Hungary during the transition from centrally planned economies towards market economies during the 90s. A main conclusion is that it is not likely that a short-lived shock will create a permanent state of poverty for a household. Moreover, households tend to recover from such shocks, even if they do so slowly. Jalan and Ravallion (2001) also support the hypothesis that shocks do not create poverty traps in their study of income dynamics rural China. They use a six-year household panel survey in their attempt to investigate whether large temporary shocks may lock a household permanently into poverty. Acknowledging that this is a demanding task, they find that there is no evidence of any poverty traps induced by crises when they calibrate

their model. On the contrary, households tend to recover from the shocks, but those with lower initial income recover much more slowly than those with higher initial income.

Another finding that indicates that households on average are not trapped into poverty when hit by crises is found in Strauss et al. (2002) in Indonesia. Bearing in mind that the financial crisis seemed to be over by the end of 1998, it is an interesting finding that real per capita expenditure actually increased for the poor from beginning of the crisis in late 1997 to late 2000, while it decreased for the non-poor.¹⁷ This indicates that the poor on average seem to have experienced a complete recovery less than two years after the crisis.

Whether these crises drive some households into poverty traps or not is an important question, but also whether their long-run income opportunities are severely constrained by the shock. If either is true, it may not be sufficient for governments to provide subsidized food or other short term programs to compensate for the loss. Education and permanent employment opportunities may then be more appropriate policy measures.

Even if no causal relationship is established, the findings above indicate that governments should provide education to the vulnerable to attempt to make them better able to cope during crisis, especially since this may reap the huge benefits from avoiding possible poverty traps. However, only two studies that we know of address the issue of poverty traps convincingly and both are yet to be published in international journals. Empirical evidence on the existence of poverty traps is an important strand for future research.

2.1.3 Methodological problems

Three limitations noted in Lokshin and Ravallion (2000) apply to several of the above studies. The first concerns the timing of the crisis relative to when the data are collected. The financial crisis in Russia started in August 1998, but the final data were collected in November the same year, which was too soon to capture the full impact of the crisis.

The second issue is that other events may influence the results. The first round in the Russian study was collected in 1996, so the data reflect all changes between 1996 and 1998 and not only the impacts of the crisis. The problem of separating the effect of the crisis from other important events concerns both Strauss et al. (2002) and Dhanani and Islam (2002) in their studies of the 1997–98 financial crises in Indonesia. As Strauss et al. (2002) notes,

¹⁷ It is of great interest to know when a crisis can be said to have ended. In Indonesia, real GDP declined by 12 – 14 % during 1998, while remaining constant during 1999 and grew by 4.5 % in 2000. In addition, the rupiah experienced an enormous volatility during 1998, but were much more stable in 1999 and 2000. See Strauss et al. (2002) for details.

Eastern Indonesia was hit by drought and forest fires in the second half of 1997 and early 1998, which most likely influenced the poverty statistics in the period. The final weakness is shared with all of the above mobility studies, namely that it is not possible to evaluate how the households would have fared without the crisis since there is no comparison group sample that avoided the crisis.

Lokshin and Ravallion (2000) also illustrate how ordinary assessment of headcount poverty rates before and after a crisis may conceal important information about the true changes between the years. Income (consumption) poverty was 2 (11) percentage points higher after the crisis. When they use the panel dimension of the data and compare each household's income (consumption) record, they find that 18 (20) % of the population fell into poverty after the crisis. So the 2 (11) percentage point net increase in income (consumption) poverty results from the fact that 16 (9) % of the households actually climbed out of income (consumption) poverty during the same period.¹⁸ The Reardon and Taylor (1996) study of Burkina Faso fails to explore the panel dimension of the data and the tracking of each particular household. It would be interesting to see how many of those who were poor in 1983/84 moved out of poverty the year after, despite the drought, and compare the mobility between the agroclimatic zones.

In the light of this finding, Scott's study seem to suffer from a shortcoming when we are presented with the view that the only mobility that has taken place is found by comparing the income status in 1968 with the status in 1986. However, the most likely scenario is that a majority of the households jump into and out of poverty every year between the data points. Hence, concluding with "Thirty four households rose out of poverty between the two surveys, while 12 households became impoverished over the period." (Scott 2000, p. 167) is not very meaningful. Despite the checks discussed above on whether the changes were transitory, it is just as possible that the mentioned thirty-four households had a temporary fortune in 1986, while the 12 registered as poor had bad luck that year.

Scott's investigation of the panel of small rural farm households in Chile contains information from interviews that were conducted twice, in 1968 and 1986. During this period, there were consecutive drought years. Admitting that an 18-year gap between the interviews leaves a very long time span, which raises several methodological questions for mobility analysis, Scott also points to several other deficiencies in the data set. The changes in incomes

¹⁸ Note that this finding is not made explicit in Lokshin and Ravallion (2000), but can be calculated on the basis of their table 4a, pp. 277. See Ravallion (2001) for an explicit remark on this point.

may have been severely affected by the hyperinflation that incidentally occurred in the period. The measurement of income may also have been biased by lack of information on actual prices, from likely underestimation of domestic production (vegetables from own plots, handicrafts consumed by the household and common property yields like fish and firewood), and from change in the coverage between the two surveys in income from public transfers. However, Scott does not provide an analysis of how this may influence his mobility matrix.

Another question is whether the changes in poverty are robust: could they be due to normal inter-year variation? This comment could for example be directed towards the conclusion in Reardon and Taylor study of the impact of the drought in the Sudanian zone. They conclude that the poverty measure for this zone has increased, but it is not possible to see whether the change is statistically significant (Reardon and Taylor 1996, p. 910).

Note that several of the above studies are not aiming towards disclosing a causal relationship between changes in welfare indicators and the different explanatory variables. However, some of these studies provide important knowledge for policymakers with budget constraints on how to target those that experience downward trends in income or consumption. Take the finding of Grootaert et al. (1997) that the older is the head of the household, the larger is the reduction in consumption. This is one example of how this research forwards suitable criteria for targeting assistance, but where the causal relationship is not established. As emphasized above, “before and after” studies cannot control for how welfare would change in the absence of the crisis. It may very well be that households with older heads experience declines in consumption in Côte d’Ivoire regardless of the economic trend. However, even if regressions should show this pattern irrespective of economic trends, there may be other factors than age that drives the result. For example, if the actual relationship is that bad health leads to lower earnings and if health and age is correlated, then the cause of the decline in consumption is health and not age. The differences in policy implications with regards to poverty are obvious.

2.2 The impact of natural disasters on income mobility in rural Pakistan

The second essay in this dissertation evaluates the impact of natural disasters on income mobility of rural households in Pakistan. We make use of a survey that was conducted before, during and after three different natural disasters that occurred at three different points in time in three different districts, making this panel data particularly suitable for studying the possible impact of such crisis. To the extent that these disasters hit the rural population

randomly, the data provide us with “natural experiments” where we have a control group of households that are not inflicted by the disaster. 800 households were interviewed in 14 rounds over five years from 1986 to 1991 with considerable weight given to measuring rural households’ income from different sources. In addition, they also recorded a wide range of factors important to income change over time (Adams and He 1995).

We create a control group sample by separating the households affected by the disaster from those who avoided the crisis. This yields a situation that is close to the ideal for evaluating the impact of the disaster on income mobility. Hence, we are able to overcome one of the major shortcomings in the existing literature, namely that they are unable to control for other factors than the actual impact of the crisis.

We find that those who started poor have a much higher probability of remaining poor when entering a crisis compared to normal times. Moreover, there is also a substantial higher probability of remaining poor in the year after the crisis for those that were hit, compared to those who avoided the disaster. Looking at movement out of a crisis and into a normal year, we find that the probability of remaining poor increases by approximately 15% compared to households that were not hit by these disasters. This is especially interesting because what is often seen as a recovery phase is here found to resemble the original crisis. Moving out of the crisis and into a normal year has an impact on the probability of remaining poor amounting to more than a third of the original shock compared to movement between normal years.¹⁹

Our results indicate that poor households experiencing a crisis also have their incomes substantially depressed in the subsequent year. However, the more privileged households seem not to be much affected by the crisis. There is a small negative impact of the disaster on the income mobility of these households, but only when moving out of a year of crisis.

This paper also proposes two methodological improvements for income mobility studies. The first addresses the shortcoming that statistical inference is almost never carried out in most analyses of mobility matrices, even if such matrices are common in the literature.²⁰ Mobility patterns arising from this approach are purely descriptive, and we are

¹⁹ The direct effect of the crisis was a 40 % larger probability of remaining poor compared to normal mobility.

²⁰ Statistical inference is also frequently omitted in static poverty analysis. One approach that is related to ours is found in Osberg and Xu (2000) where the bootstrap is applied to compute confidence intervals for measures of poverty intensity in order to compare poverty rates between nations. For the statistical test procedures for decomposable poverty measures like the Foster, Greer and Thorbecke measure, and the formal sampling theory for their empirical application, see Bishop et al (1995). An analytical procedure for calculation of confidence intervals for poverty measures is provided in Kakwani (1994). Similarly, the analytic derivation for a dominance test of truncated income profiles is found in Xu and Osberg (1998), which enables us to reveal whether income distributions among the poor can be ranked unambiguously. All of these studies focus on absolute poverty lines, and Zheng (2001) provides a statistical inference test for decomposable poverty measures when relative poverty lines are used.

frequently left to guess whether observed differences are statistically significant. The lack of inference seems to arise from the fact that statistical properties of mobility measures have been neglected. However, Schluter (1998) derives the asymptotic distribution of indices based on mobility matrices, and hence validate comparisons of aggregated mobility indices.

It is evident that a lot of information is lost in aggregated mobility indices, compared to studying transition matrices. We propose a simple bootstrap method to facilitate statistical inference based on the elements in absolute mobility matrices, and construct confidence intervals for the probability estimates.²¹ This facilitates judgments of the robustness of probabilities of the movements, and yields the opportunity for comparisons across time, states, policy interventions or populations.

The second methodological contribution concerns the impact of poor data quality on mobility patterns. Cowell and Schluter (1998) have explored the impact of data contamination on measurements of income mobility. Thus, if data are miscoded or if other mistakes during the process lead to the inclusion of a proportion of false observations, this may influence mobility estimates and comparisons. The other main cause of poor data quality, namely measurement error, is less convincingly addressed in the mobility literature.

A few studies constructed for investigating the nature of measurement error in panels of earnings data from the USA offer some insight into this issue. The approach has been to acquire what is assumed to be the correct earnings, for example from the payrolls of a firm or from official earnings records, and contrast them with the employees' responses to a questionnaire (see Pischke 1995 and Brownstone and Valletta 1996 for an overview and discussion of these studies). One important finding is that measurement error in US earnings data seem to be negatively correlated with true earnings and positively auto-correlated over time, and thus violates the assumption that the error is "classical" in form.²² This approach is similar to the one taken by Rendtel et al. (1998), where they utilize two independent measures of the same income variable, and define measurement error to be present if the two measures classify a household differently. Thus, if one measure classifies a household as poor while the other classifies it as non-poor, then measurement error is said to be present.

²¹ For inequality measures, the bootstrap was first used by Mills and Zandvakili (1997), but for a thorough validation of the use of the bootstrap for several procedures of inequality, mobility and poverty measurement, see Biewen (2002). An introduction to the bootstrap is found in Efron and Tibshirani (1993).

²² The "classical" measurement error is the standard text book assumption that the error is normally distributed with zero mean and constant variance, uncorrelated with the true variable and other explanatory variables, and uncorrelated for an individual over time (see for example Green 1997).

For the purpose of assessing measurement error in household surveys from poor rural areas, three shortcomings of the above approach require attention. Firstly, measurement error may still be present even if the household is uniquely classified by two independent measures, for example if the error in the two measures moves in tandem for each household. Secondly, it is not evident that measurement error in US earnings data has the same structure as measurement error in poor rural household's income, so it is problematic to generalize these findings to be representative for such data. Finally, it is rare to have two independent measures of the same variable, and it may be very costly or even infeasible to collect validation data. Hence, the approach is not promising for most empirical studies of poor countries.

Some studies (Bane and Ellwood 1986, Bound and Krueger 1991) correct for measurement error by eliminating one-period spells of poverty.²³ This approach does not seem appealing because it is not plausible that all short spells of poverty is caused by measurement errors. Important information about short-time mobility may be lost by this procedure, and this could bias mobility analysis. This is especially the case for poor rural areas where short-term mobility is typically high due to seasonal variation and high uncertainty in agricultural outcomes.

A more promising framework for analyzing the impact of measurement error on income mobility is proposed in McGarry (1995). This method assumes that measurement error can be approximated by the white noise error term in a variance components model. This implies that any true random income shocks are included in the measurement error term, and is thus applicable when the true random shocks are small compared to measurement error.

Our contribution is that we illustrate the potential magnitude of the impact of measurement error on absolute transition matrices by simulating different types of errors. Assuming that the actual structure of the collected data reflects the true structure, we see what happens if the collected data are influenced by standard measurement error, a method that can be extended to a wide range of different assumptions about the nature of the error. We find that relatively small errors may induce a substantial downward bias in the probability of remaining poor.²⁴ However, comparisons across states may be quite robust against this error,

²³ Bane and Elwood (1986) eliminate one-period spells of poverty arising from changes in income less than one-half of the income to poverty-line ratio.

²⁴ The finding that classical measurement error overstates measures of change from one period to the next is as expected (see Ashenfelter et al 1986).

which is a valuable finding for impact analyses. Straightforward simulations of different types of measurement error improves our understanding of how such errors influence mobility figures, and are easily applied to most kinds of mobility analysis.

3. Poverty, foreign aid, policy lending and strategic behavior

Now we turn to the other side of the coin and look at poverty reduction from a macroeconomic perspective, and focus solely on income or consumption poverty. The main question in the donor community on this issue in recent decades has been how to increase economic growth in the poor countries, because growth is perceived to be the main vehicle for alleviating poverty.²⁵ To explain the background for this position, we start by taking a quick look at the empirical relationship between long run economic growth and poverty reduction.

Then, in the next section, 3.2, we look at how the donor community has tried to increase growth in poor countries by giving aid conditioned on certain “good” policies. This principle is termed conditionality, and has been used extensively by the Bretton Woods institutions in structural adjustment lending since the beginning of the 1980s (Gwin and Nelson 1997). We discuss the shortcomings of conditionality and the dilemmas raised by this practice.

In section 3.3, we present the empirical finding that conditionality has failed as an instrument to make recipients implement these policies. We give an overview of the explanations, which includes our contributions in essays 2 and 3. The negative consequences for many individuals of these “good” policies may also be an explanation for the unwillingness of the recipients to implement these reforms. Moreover, it is often asserted that structural adjustment programs increase poverty. This view may arise from the suggestions that the short-term consequences of these policies may increase poverty, or the fact that there are distributional consequences of most policies. Therefore, we take a brief look in section 3.4 at the short-term impacts of macroeconomic policies on poverty and distribution, and we pull the strings together by proposing an alternative to contemporary conditionality.

3.1 To what extent does growth reduce absolute poverty?

Taking a long term perspective of absolute poverty reduction, there is little doubt in the literature that high economic growth over several years will on average reduce the number of

²⁵ See for example World Development Report (1978, 2000).

poor and increase economic wellbeing for the majority of the people in a country (Squire 1993, Ravallion and Chen 1997, Bruno, Ravallion and Squire 1997). This is reaffirmed in a recent study of 137 countries where the income of the poorest quintile on average is found to rise proportionally to the rise in average income (Dollar and Kraay 2002). However, these averages conceal important differences in the impact of growth on poverty reduction, both between countries and within countries over time. The above studies focus on the means for a large number of countries, and disaggregating usually reveals that several countries have experienced increased poverty during periods of growth (see for example Ravallion 1997).

The most important factor explaining differences in poverty changes for a given growth rate is found to be the extent of inequality in the country (Deininger and Squire 1998, Ravallion 1995, 1997, 2001, Ravallion and Datt 1996, 2002). A more equal distribution of income will imply that growth reduces absolute poverty more compared to less equality in incomes. The reason is that a 1 % increase in income growth yields on average a 1 % increase in incomes for all income groups, which implies that growth tends to be distributed proportionally across the existing income distribution.²⁶ Hence, the poor will have a lower share of the growth in an unequal society. One should also note that sufficiently high levels of inequality may actually be contributing to increased poverty (Ravallion 1997).

Note however, that even if growth does not change the income distribution on average, this does not imply that growth never influences this distribution. On the contrary, going behind the averages reveals that several countries also experienced increased inequality during periods of growth. In fact, Ravallion (2001) finds that around half of the growing developing countries in his sample also experienced increasing inequality. Hence, policy makers concerned about the growth effect on income distribution should analyze the particular impact on their own population over time. It may also be of political concern that the average empirical growth pattern results in the rich having a much larger share of a country's increase in national income than the poor.

²⁶ Empirical studies find that there is little or no correlation between growth in average household income per person and change in measured inequality (Ravallion 1995, Ravallion and Chen 1997, Ravallion 2001, Dollar and Kraay 2002). Moreover, Dollar and Kraay also find that several factors claimed to be important for growth (macroeconomic stability, property rights, financial development and rule of law) seem not to have had any impact on the share of income to the poor. Tsangarides et al. (2000) find, however, that growth raises the incomes of the poor less than one-to-one, and that lower inflation, lower government spending, higher educational status and higher level of financial development increases the share of growth that accrues to the poor. In total, however, more evidence points towards income growth tending to increase income in proportion to the existing income distribution. This also implies that the absolute incomes of the rich will increase much more in absolute terms than the incomes of the poor. For example, Ravallion (2001) calculates that the income gain for the richest decile in Brazil will be 19 times higher than the gain to the poorest quintile.

A main point from the above findings is that policy makers trying to reduce poverty should be concerned not only with increasing growth, but also about reducing inequality. One important candidate for reducing inequality seems to be higher primary and secondary school enrollment rates, which will increase the effect of growth on poverty reduction.²⁷ Before we quantify the growth and inequality effects on poverty, note another argument in favor of redistribution: High inequality seems to impede growth.²⁸ This mechanism may for example go through credit constraints that keep the poor from growth-promoting investments in physical and human capital (Aghion et al. 1999). It should be added, though, that redistribution may work in the opposite direction if it leads to conflict or reduces investments (Deininger and Squire 1996), or if the measures impose distortions to external trade or the domestic economy (Ravallion 2001).

Several studies have tried to quantify the impact of growth on the number of people below the poverty line, and some have also investigated the effect of inequality on poverty. Ravallion and Datt (1996) investigate the evolution of poverty in India over 40 years, drawing on 33 household surveys. Their estimates show that a 10 % increase in mean consumption would reduce the share of people below the poverty line by approximately 13 %. Building on their earlier work, Ravallion and Datt (2002) find that rural economic growth in India reduces poverty more than urban economic growth. Also, more equitable states with respect to rural and human resource development reduced poverty rates considerably more than other inequitable states.

The highest average elasticity of poverty to growth is found by Ravallion (2001) in a study of 47 developing countries in the 80s and the 90s. It is estimated that a 10 % increase in the mean income or expenditure would reduce the proportion of those who live on less than \$ 1 a day by 25 %. In another study of 20 countries from 1984 – 1993, Ravallion (1995) finds that a 10 % increase in mean consumption would reduce the fraction of those who live for less than \$ 1 a day by 20 %. Illustrating the change in impact of growth on poverty for different distributions of income, Ravallion (1997) finds that a mean consumption increase of 10 % for the country with the lowest inequality (Gini index of inequality of 0.25) in his sample would reduce the proportion of poor by 33 %. The same consumption increase in the country with the most unequal distribution, however (Gini index was 60 %), would only decrease the

²⁷ For empirical evidence of factors that reduce inequality, among them education, see Bourignon and Morrisson (1990) and Papanek and Kyn (1986), see Fields (2001) for a recent survey.

poverty rate by 18 %. These studies also test for the possibility that it is only those close to the poverty line that are lifted out of poverty by growth, but find that the gains accrue to the entire group of poor.

Since poverty reduction is a main aim for the international community, these findings should spur a focus on pro-poor growth, i.e. on growth-increasing policies that has the largest poverty-reducing effect. However, one should keep in mind that the above correlations represent averages not only between countries, as noted above, but also within countries. So even if increased growth usually reduces poverty, the growth-increasing policies may impoverish some people that were not poor initially. The argument has been that growth yields the potential for redistributive policies to compensate those inhabitants who lose from growth-increasing policies, but there may be no such policy instruments available in the short run. We return to this topic in section 3.4, but now we turn to how donors have tried to reduce poverty in developing countries.

3.2 The nature and evolution of conditional aid

In the late 1970s and early 1980s, the view that poor policies in the developing countries were a major obstacle for economic growth began to gain ground (Gwin and Nelson 1997). In a response to this position, the donors started to condition their grants on the recipient implementing what was believed to be good policies. These policies promoted macroeconomic balance and efficiency, and were coupled with market-oriented reforms aiming at increasing economic growth.

In this section, we concentrate on World Bank conditionality. This is not only for illustrative purposes, but also because there is a contemporary discussion on whether all World Bank lending should be tied to conditionality (World Bank 2002). During the last 20 years, policy-based (conditionality) lending has accounted for only 20 -25 % of the total World Bank lending, so the new proposal represents a large shift that is addressed in section 3.4.

Note, however, that the World Bank behavior is often used as a proxy for other donors' behavior: The World Bank acts as a coordinator for bilateral donors (Dollar and Svensson 2000), but these donors may also withhold aid when the Bank does because they tie themselves to the presumed tougher agent, for example through co-financing with the Bank

²⁸ Ravallion (2001) reviews the existing literature on cross-country growth and concludes that there is more support for the view that inequality is harmful to growth than the earlier view that inequality was good for growth.

(see Kanbur 2000b). Bilateral donors also condition foreign assistance on several demands (see Collier 1997), most recently illustrated by the drop in aid to Zimbabwe and Kenya due to violations of human rights. Hence, from both a practical and a theoretical point of view, conditionality need not differ between multilaterals like the World Bank and bilateral donors.

Receiving a structural adjustment loan requires the country to undertake, in principle, two types of reform (World Bank 2000): The first condition is that the macro-economic policies must be in line with what is perceived by the Bank to be good policies. These are typically a floating exchange rate with a minimum of trade distortions and regulations and overall fiscal and monetary discipline. The second condition is that the country must implement a structural reform, like privatization of governmental companies and parastatals, removing price and incentive distortions, improving labor market efficiency and so on. When these two conditions are satisfied, the World Bank will disburse the loan in tranches in proportion to the degree of implementation of the reforms.

The main rationale for imposing conditionality is the unwillingness of the recipients to implement the right policies. If the recipient in fact favors the policy package, there is no need for the donor to set the implementation of these policies as a prerequisite for aid disbursement. Hence, conditionality corresponds to buying a political reform, and the practice of sequencing disbursement in response to the recipient's efforts can be seen as pricing each part of a reform (Collier 1997). It may not come as a surprise that such use of aid as a political instrument raises several dilemmas.

The first dilemma is evident when we assess aid conditionality in a democracy perspective. What if a government is elected on a political program that promises to keep the exchange rate fixed at the present level, and donors condition aid on letting the currency float? A government in desperate need of funds may choose to abandon its program, and hence, important political issues are determined by agents that are not accountable to the country's electorate. This also creates a signaling problem between the government and the electorate. The government would supposedly point to the donor as the scapegoat when the losers from the policy change demand an answer, and this may blur the responsibility of those in office.

The second dilemma is what to do about poor countries not willing to implement the reforms. Even if the donor has poverty reduction as its main objective for yielding assistance, conditionality implies that no aid is disbursed to countries that reject the policy packages. Any channeling of funds to these countries, even by omitting the government through granting to NGOs or the private sector, will reveal that conditionality is not credible. So conditionality

creates large problems ex post for an altruistic donor: Should one give aid even if the conditions are not implemented to try to reduce poverty, but at the cost of destroying conditionality as a credible instrument? Or should one tacitly accept that poverty is higher than it would be with aid in order to teach the government a lesson?

Several studies evaluate the practice of aid conditionality, and all conclude that this policy instrument is a failure (World Bank 1992, Rodrik 1996, Collier 1997, Alesina and Dollar 2000, Burnside and Dollar 2000, Kanbur 2000b). Many recipients do not change their policies or implement the reforms, but aid is disbursed anyway. Before we turn to the explanations for this failure, in the next section, we glance at one alternative to buying reform.

The current model for policy lending is to give incentives for a country with poor policies to reform by rewarding the implementation of good policies. However, it is also possible to direct aid towards those policy environments that are already defined as good. Based on the finding that a better policy environment makes aid increase growth more, (see Isham and Kaufmann 1999, Burnside and Dollar 2000 and Collier and Dollar 2002), it is argued that this type of selectivity will ensure the maximum growth effect of aid. Hence, this will also reduce poverty the most, since poverty and growth are found to be negatively correlated. In addition, one supposes that neighboring countries, inspired by the success of the combination of good policies and aid, will also implement such policies to qualify for assistance (Collier 1997).

The selectivity model of conditionality is the core element in the Bush administration's new Millennium Challenge Account (MCA) proposed to the Congress in 2003. Five billion dollars are to go into this account, and will be disbursed to poor countries that fight corruption, prioritize education and have liberalized their economies. In the words of US Secretary of State, Colin L. Powell, the MCA will "target[ing] poor countries that govern well, invest in their people, and open their economies to enterprise and entrepreneurship"²⁹. So in a situation where selectivity gains ground, an interesting question for research is then to what extent redirection of foreign assistance towards good policy environments will improve poverty reduction.

Collier and Dollar (2002) illustrate the potential benefits of reallocating the current aid towards those countries with good policy environments. Compared to contemporary aid disbursement, they estimate that nearly twice as many people would be lifted out of poverty if donors allocated the assistance based on maximum poverty reduction. These findings are also

²⁹ Speech given by Colin L. Powell at the World Economic Forum 2003 in Davos, Switzerland. See for example the website of the New York Times for the full text (www.nytimes.com).

interesting because they enable us to say something about the opportunity cost of pursuing other objectives with foreign aid. A country that has both commercial interest and poverty reduction as a rationale for resource transfers to poor countries may then balance the economic benefits of promoting its industries with the forgone reduction in poverty.

Accepting that selectivity looks promising on paper, one should assess the possible pitfalls of the new approach. Note first that the democratic dilemma is sustained because those in need will change their policies to be eligible for aid. Selectivity may also be a new masquerade because recipients may mimic good policies to get aid while impeding the practical effects of these policies. The second dilemma, about what to do if the poorest countries are not those who qualify for aid, may be deepened by selectivity because this model poses a stronger requirement for receiving aid. The effort to reform is no longer rewarded, only the actual achievement. Since poor countries have less ability to implement the required reforms, this may skew resources towards the more endowed countries. A consequence may be that the gain in poverty reduction comes from low income countries that are already on track towards poverty reduction by enhancing their performance, while the poorest of the poor are left to them selves. Our prediction will therefore be that this model will not be viable for the donor community at large. We propose an alternative that reaches the poorest without overruling the recipient government, in section 4.4, but first we look at the explanations for the failure of aid conditionality.

3.3 The failure of aid conditionality

As noted above, the literature on foreign assistance indicates that aid conditionality has been a failure. Even if donors have conditioned large funds on the implementation of certain policies, it is found that the recipients have usually not implemented these policies. Moreover, even when the conditions are not fulfilled, it is found that the aid is disbursed irrespective of the implementation record. This led Kanbur (2000b) to pose a puzzle called “the weakness of strength”: If it is vital for the recipients to get aid, and also essential for the donor to have the conditions implemented, why cannot the seemingly powerful donors force the seemingly weak recipient to implement the conditions before aid is disbursed?

Several explanations for the failure have been proposed, but the theoretical modeling of conditionality has received little attention (Drazen 2000). One argument that has been formalized by Svensson (2000) is that if donors are altruists, then the recipient knows that the threats of not giving aid are not credible. This is because withholding the funds to a recipient

after the conditions are not implemented yields a higher level of poverty, and hence, altruistic donors will hurt themselves by refusing to disburse. Another explanation is that the political forces will do whatever is possible to backtrack or impede reforms that lead away from the domestic political economy equilibrium, and some donors were motivated by political considerations and thus paid conditionality little attention (Collier 1997). Others have argued that aid flows had to be sustained in order for the recipient to service its existing debt, and that the World Bank needed to disburse new loans to secure repayment of older World Bank loans (Mosley et al. 1995). Finally, it is suggested that since the incentives in aid agencies are related to a continuous aid flow, then a halt in disbursement could work against the career of the agency staff (Kanbur 2000b). This argument is strengthened by the practice of governments discrediting aid agencies if they “are not able” to disburse the funds.

In essay 2 and 3, we suggest a new explanation for the failure of aid conditionality. Could it be that a donor enforcing conditionality upon a non-compliant recipient, and hence refusing to give aid, could trigger the recipient into canceling contracts with companies from donor countries? By using such a mechanism strategically, a recipient could induce the companies to put pressure on the donor to grant aid, and we show the conditions necessary for the donor being forced to disburse even when the conditions are not implemented.

In essay 2, we use a triadic model of a recipient, a donor and a company where each of the three agents takes account of each of the two other agents’ actions. We show that this triadic structure can be crucial when explaining recipients’ use of companies to influence donors to give aid unconditionally. In an infinitely repeated game, the recipient is able to get aid without implementing the conditions. In contrast to the Samaritan’s dilemma explanation proposed by Svensson (2000) for the failure of conditionality, we do not rely on time-inconsistencies in our argument.

In essay 3, we use a multi-agent triadic model of the relationship between a recipient and two donors and two companies to illustrate that relaxing the assumption of only one donor-company pair implies that there exists a subgame perfect equilibrium in the stage game where the recipient’s threat of not giving a contract to a company that does not cooperate is credible. We also show that assuming traditional dyadic relations is insufficient to explain the failure of conditionality in this model.

One should take great care in recommending policies from a theoretical model that remains to be empirically tested. Empirical work is warranted to reveal the actual pattern in these relationships, but this must be left for future research. However, if this triadic structure gives rise to non-implementation of conditions for aid, we point to governmental guarantees

as a potential solution. In this case, the companies do not risk losing the contract, and the recipient is forced to implement the policies.

3.4 To grow or not to grow: That is not the question

On the background that growth does not always reduce poverty and that policies aimed at maximal growth are not implemented by the recipients, the main question becomes how to put together policy packages that increases growth in a way that protects the poor and the vulnerable during adjustment, maximizes poverty reduction and is viable to the government. This question concerns the distribution of the burden of adjustment, and is one of the most debated issues in development (Bruno, Ravallion and Squire 1997). It is also important to note that governments with the willingness and ability to reduce poverty are likely to increase the living standards of the poor by direct intervention. This political factor is difficult to fit into the standard econometric framework of the determinants of poverty and may therefore be omitted as a explanatory variable. However, see Ravallion and Datt (2002) for evidence that spending on development matters to poverty reduction.³⁰ Hence, for the growth-increasing policy package that is most favorable to the poor, one can always reduce poverty more by adding specific poverty-reducing programs.

Before we discuss how donors should implement their foreign aid policies, we illustrate why the distributional effects of programs may lead to controversies over these policy-packages. We look at the distributional consequences of two of the most recommended growth-increasing policies embedded in many structural adjustment reforms: agricultural liberalization and openness to trade. Note that we need micro-data that track families over time in order to assess the actual relationship of the impact of these policies. From a methodological point of view, this analysis brings us back to the issues raised in 1.2 above.

Look first, however, at the reform from the inhabitants' perspective. Even if growth-increasing policies reduce poverty in a country on average, it is cold comfort for the poor who get even poorer by pro-growth policies to be told that next generation may be better off, or that others may gain. Very few families that balance on the edge of starvation, needing to pull their children out of school and selling their assets for "nothing" due to distress sales would have approved of the policies that caused this situation, even if the gains in five to ten years were certain. Hence, from the poor country's politicians' angle, it is not self-evident that they

³⁰ Ravallion and Datt (2002) find that public spending on development in states in India, and in particular spending on rural human and resource development, had strong synergies with poverty reduction, and that improved literacy also reduced poverty significantly.

would be willing to implement policies that may hurt important constituencies. One example is the reluctance against some of the policies that aims at increasing agricultural productivity, because this resistance arises from the negative effects that these reforms have for the important electorate in the cities. Hence, the diversity in outcomes between groups may in itself be an explanation for the failure of aid conditionality.

Note also that there is a broad agreement on the structural adjustment programs in the 1980s taking too little account of how short-term consequences of the programs could have a negative impact on the poor (Lipton and Ravallion 1995).³¹ The lack of focus on the poor during the 80s is also evident from the first two volumes of the Handbook of Development Economics printed in the late 80s, which almost did not cover the analytics of poverty measurement, the determinants and trends in poverty or the growth-poverty issues (Behreman and Srinivasan 1995). From the end of the 1980s, the economic reform programs increasingly incorporated measures to protect poor and vulnerable groups, and currently most economic reform programs include safety nets and measures targeted at poverty alleviation.

Looking at distributional effects, we start with market-orientated liberalization of the agricultural sector, which usually removes price controls, governmental regulations and agricultural taxes. In a study of the agricultural reform in Madagascar in the late 80s and early the 90s, Barrett (1998) finds that the price of rice rose considerably after the reform, by 42 %, and that the price variability also rose (by 53 %). Despite the increase in production, up to the highest level in 20 years, and the fact that the largest relative increases came from the smallest farms, income poverty rose during this reform, especially in rural areas. Data on nutrition, education and expenditures point in the same direction: the living standard declined. The main reason was that most of the poor were net consumers of rice, and hence suffered from the price increase. Note also that the higher variability in prices may have more severe effects on the poor due to lack of insurance.

Two policy implications arise from these findings. First, if poverty reduction is the main aim, then this reform may not be the most suitable means because a cumbersome, targeted redistribution is required to achieve the goal. Second, the conclusions concerning the impact of a price rise could have been drawn *ex ante*. Thus, the agricultural reform should have been accompanied by poverty-reducing measures.

Now turn to another popular reform widely believed to increase economic growth - liberalizing trade. The theoretical benefits of openness to the world economy may be large.

³¹ See Grootaert (1995) for evidence that the adjustment itself may be less harmful to the poor compared to the absence of managed structural change.

Investment, capital, intermediate goods, technology and ideas may be attracted from the developed world and increase development in the poor country. Consumption goods may be imported at a lower price than the cost of producing them domestically, and exports may yield higher prices than achievable at home.³²

Take a stylized example of a government-controlled overvalued exchange rate that is now left for the market to value. This results in a devaluation, and inspired by Kanbur (2000a) we analyze this policy change in standard textbook model with two sectors and two factors. Assume now that we have one labor-intensive exporting sector, and one capital-intensive sector producing for domestic consumption. The immediate effect of the devaluation is that the price of those goods that are produced for export increases, which raises the profitability in this sector while nothing is changed in the other sector. Also, the prices of imported goods increase.

Hence, before anyone adjusts to the change, the impact on poverty depends on the distribution of the entrepreneurs and the consumption pattern of the poor. So if the poor are net producers of export commodities and do not consume imported goods, then poverty will be reduced. On the other hand, if this group produces for the domestic market and consumes imported goods, then poverty will rise.

It takes some time before entrepreneurs invest in the now more profitable export sector, especially in developing countries with capital constraints, lack of infrastructure and poor institutions. However, those entrepreneurs already in the export sector will start bidding up wages to attract more workers to increase production. So what happens in the short run after the immediate effects is that wages in both sectors have increased, but now more workers have gone over to export production. Since the wage increases less (in percent) than the price (in percent), the returns to capital must increase in the export sector, while they decrease in the other sector. At this stage, the effect on poverty depends on the size of the wage increase for the poor workers compared to their increased cost of living due to the more expensive imports. On the other hand, the poor entrepreneurs in the export sector will benefit

³² One caveat is that the potential gains from openness may not be realized if complementary policies and institutions are not in place. Hence, relying on liberalization as the vehicle towards growth, as some countries have done, is not a viable path to pursue. Moreover, Rodrik (1999) goes through a wide range of evidence and conclude that it is, at best, only a weak relationship between indicators of openness and economic growth. Thus, openness may not be the vehicle towards development that many seem to think. Our question in this section then becomes: If the right institutions and policies are in place, how does increased openness affect poverty?

if the increased profitability makes up for increased expenditure, but poor entrepreneurs in the other sector will lose from both changes.

After some time, the entrepreneurs will manage to transfer capital to the more profitable sector. Capital will flow to the export sector until the rate of return is equal between these sectors. While this process is going on, it is important to note that one machine transferred to the more labor-intensive sector increases the net demand for labor, because one unit of capital in this sector needs more workers than one unit in the capital-intensive sector. Hence, wages continue to increase. So the long run outcome will be, if the theory's predictions are correct, that the wages will be higher than before the devaluation, while the returns to capital are lower. The net effect on poverty thus depends on whether the poor are laborers or capital owners, in addition to the effect of increased costs of imported goods.

The experiences of the East Asian tigers may be explained by this model: large increases in labor-intensive export production which had an equitable effect because the poor were wage laborers. This is the background for including openness in the structural adjustment packages in Africa and Latin America and for claiming that it would have an equitable effect (Kanbur 2000a).

The bottom line is that one needs to assess the distributional effects of growth-enhancing policies for each particular country, both during the reform and for the long run outcome. Then, if the government wishes to maximize poverty reduction and protect the poor, it can assemble a policy package that has the largest probability of reducing poverty, during both adjustment and stabilization, and that leads to the highest poverty reduction over time. As noted above, such a policy package does not only contain the growth strategy that reduces poverty the most, but also specific interventions towards the poor.

However, it is likely that the recipient government in practice chooses policies that are in line with its own political preferences. Then, if these policies are acceptable for the donors, then conditionality is redundant and aid should be given as pure budget support with no strings attached. On the other hand, if the recipient is not willing to implement such a policy combination, then donors may prefer to omit the recipient government from the provision of aid. The donors can tie the aid to specific projects or rely on NGOs and the private sector to help the poor, and this also mitigates the democratic problem if the electorate is informed about the origins of the projects.³³ The perspective that aid is wasted if it does not increase

³³ On the other hand, the electorate may give credit to the government if the responsibility for the aid projects is not common knowledge. In this case, the donor projects may actually strengthen bad governments, but it does not seem like a difficult task to spread information.

economic growth, which gave rise to the belief that aid does not work, is unfounded. Reducing health and educational poverty by using aid to invest directly in these sectors may be efficient, even if growth is unaffected by these improvements.

One argument against this position may arise from the assertions that aid is fungible (see for example Feyzioglu, et al. 1998). If aid is fungible, this implies that the investment project undertaken by the donors would have been realized by the recipient anyway. Thus, the recipient's funds intended for the investment project may be spent on whatever the recipient government likes, because the donor realizes the profitable investment. However, it seems a bit odd to assume that a government not willing to implement poverty-reducing macro economic policies would undertake the same poverty-reducing investments as the donor. Tying aid to particular sectors or investments should only be necessary if the donor and the recipient have different preferences with regards to poverty reduction. And in this case, there may be no correlation between what is perceived as profitable investments by governments and recipients. This may for example arise from spatial differences in the preferences with regards to expenditures. To illustrate this point, take donors' investment in schools in northern Iraq. This would not affect the Iraqi government's expenditure on education because it is not regarded as profitable investment. With no such correlation in perceptions, aid is not fungible. This needs to be modeled, but is left for future research.

4. A summarizing comment on impact assessment

The above discussions highlight four important issues for impact assessments. One of the most critical factors in such an evaluation is to what extent it is possible to say something about the counterfactual. In other words, what would be the outcome if the event we investigate had not occurred? Since the counterfactual is not observable, this is always very difficult to evaluate. Consider the assessment of a reform program like structural adjustment. In this case, it is important to take account of the situation in the country at the starting point of the reform. Several of the countries that implemented these reforms were initially in severe economic crisis, others struggling with the transition from centrally planned systems to market economies, and others from a fairly solid foundation attempting to boost economic growth.

Given the initial conditions when the reform was implemented, the question becomes how to attribute any change in poverty to the program versus other factors. If poverty has increased, is that due to the economic crisis or to the reform? Or could it be that other factors

like world recession, declining export prices or natural disasters like floods, drought or earthquakes were more important? It is evident that the same challenge of correcting for other factors also applies to the analysis of impacts of disasters. Care has to be taken in attributing causal relationships between any single event and poverty trends. It is unfortunate that data limitations is a hindrance to the most promising approach to reveal casual relationships, namely the comparison of a treatment group with a control group.

A second critical point when evaluating impact is that one must decide on the time frame for measurement. Take structural adjustment again: These programs were meant to create long-run economic growth, but frequently entailed short-run costs for at least some people. In this case, the timing of the assessment may influence the conclusion. Consider a privatization and splitting up of a large inefficient parastatal monopoly. Then one would expect that the immediate impact would be negative for those who lose their jobs, and that no gains of this reform were apparent. However, if the reform led to competition between the different units of the former monopoly in the longer term, which in turn increased production and lowered prices, evaluating the reform at this point would clearly give a different picture. Possible long-term results may be increased revenue for the government, cheaper products for the consumers and that many of those that became unemployed have found new jobs.

Evaluating the impact of a natural disaster poses the problem in a different manner. Ideally, one should monitor the situation continuously. But for a given research budget, when should one measure the indicators? During the crisis? A main challenge is that one usually does not know when it will end, and the duration would affect the impact. If one measures the indicators right after the crisis physically ended, how do we know that there will not be after-crisis shocks that exacerbate the impact?

A third point is that evaluating the impact requires a measurement of the degree of implementation of the policies in the reform, and the severity of the disaster. For reforms, the difficulties arise because of the complexity of the programs and the large number of specific, technical instruments. Moreover, the literature on conditionality finds that structural adjustment policies are frequently not implemented. Despite this, the World Bank has continued disbursing funds. So, using disbursement as an indicator of a country implementing structural adjustment policies may yield severe flaws in the analysis.

Finally, we must take account of diversity in outcomes, and not only focus on aggregates and means. Although researchers agree upon the correlation between economic trends and poverty – i.e. that poverty on average declines in times of economic growth and increases in times of recession, it does not follow that growth moves in tandem with poverty

in every country. As noted above, increasing growth can coexist with increasing poverty in some countries, so growth policies should be designed to maximize poverty reduction for each country if poverty reduction is the main objective. It is important for policymakers to be aware of the fact that identical policy reforms and programs may have different effects in different countries, but also that they may yield different results in the same country at different points in time.

The aggregated nature of many indicators may also conceal important differences. Take an example of a reform that reduces poverty on average, and assume that this reform is liberalization of trade. Trade liberalization would normally change the relative prices; some products get more expensive, while others get cheaper. So even if poverty is reduced on the average, for example because poor rural farmers increase their profits due to higher prices of their products, it is likely that some get impoverished due to the increases in prices of some of the commodities they consume. In addition, we can also expect that some of those that are poor will become even poorer due to the same price increases.

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ESSAY 1

THE EFFECTS OF DISASTERS ON INCOME MOBILITY IN RURAL PAKISTAN: BOOTSTRAP INFERENCE AND MEASUREMENT ERROR SIMULATIONS*

Abstract: This paper evaluates the impact of natural disasters on income mobility of rural households in Pakistan drawing on several “natural experiments”. We find that not only do the poor have a much higher probability of remaining poor when entering a crisis compared to normal times, but there is also a substantial negative effect in the following year. The more privileged households seem to be not much affected by the crisis. We propose a simple bootstrap method to facilitate statistical inference based on mobility matrices, and construct confidence intervals for the probability estimates. We illustrate the potential magnitude of measurement error on absolute transition matrices and find that relatively small errors may induce a substantial downward bias of the probability of remaining poor. However, comparisons across states are found to be quite robust against this error, which is promising for impact analysis.

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1. Introduction

Despite the crucial role played by crises in poor rural people's lives, the literature on income mobility has largely ignored the potential cumulative effect of disasters. The scarcity of detailed household studies on such spillover effects represents a particularly serious lack of knowledge of processes of economic mobility (Baulch and Hoddinott 2000). This paper contributes to this knowledge by drawing on several "natural experiments" to evaluate the impact of natural disasters on income mobility of rural households in Pakistan.

The gap in the literature is unfortunate because government interventions to mediate the impact of a disaster necessitate knowledge of its nature. Firstly, if there are effects from these short-time shocks also in the aftermath of the crises, then the duration of crisis relief programmes might have to be reconsidered. Secondly, if the disaster causes long-term reduction in income, for example due to distress depletion of capital, then government protection against such short-term adverse adaptation to the crisis may yield immense long-term benefits.

A main reason for the lack of attention to how crises impact on economic mobility is that this requires detailed panel surveys with data collected both before and after a crisis. Also, to distinguish between the impact of the disaster and other events, one would prefer data on a comparison group that was not affected by the crisis. These requirements pose a considerable obstacle to such impact studies, especially in areas that are likely to be most vulnerable to disasters since there are few panel surveys in poor countries (Fields 2001).³⁴

Our data from rural Pakistan are particularly well suited to analyzing the effects of large covariant shocks. The panel covers almost 800 households that were surveyed in 14 rounds over a period of five years, and during the panel period three different natural disasters occurred in three different districts at three different points in time. To the extent that these disasters hit the rural population randomly, the data provides us with "natural experiments".

³⁴ Poor people in the rural areas of developing countries are frequently subjected to large income shocks, and the consequences might be starvation, or worse (Lipton and Ravallion 1995). Since a large fraction of this population is dependent on agriculture as their main source of income, several studies suggest that the severe impact of natural disasters such as floods, droughts or storms is deepened by missing insurance markets for these types of covariant shocks (Besley 1995). However, the poor are often able to mitigate risk through risk management strategies like diversification of crops, fields and employment decisions. They also engage in risk coping through saving and informal risk-sharing arrangements and adjusting labor supply (Morduch 1995). However, for large covariant shocks such as natural disasters, neither of these strategies may be sufficient for avoiding starvation, and it is found that local informal insurance networks are put under considerable strain because all members will draw on the arrangement when the shock is covariant (Morduch 1999). Foster (1995) in Bangladesh makes this point, where he finds that the body size of children suffers after a flood due to the parents' inability to borrow or get insurance. For a survey of the literature on risk and consumption in developing countries, see Alderman and Paxon (1992).

Hence, by comparing the income mobility of the households that were subjected to crises with the mobility of the others, we may be able to evaluate the impact of the disaster on income mobility. However, both measurement error and statistical inference are issues that are important for what conclusions we can draw from this type of studies. We address both issues here before we turn to the conclusions.

The first issue is that transition matrices, a powerful tool often used to evaluate economic mobility and an instrument employed in this study, is only descriptive if not accompanied by the variance of the estimates of the transition probabilities. Hence, it is impossible to evaluate whether differences between transition probabilities are statistical significant or not. However, this issue is seldom addressed in the literature. In general, most poverty statistics are usually computed from one sample of the population, which implies that having a large number of samples would provide us with the standard error of point estimates of poverty measures. However, it is a well-known problem that the analytic estimate of standard errors of estimators can be very difficult or impossible to calculate. This complexity seems to be the main reason why several mobility studies do not carry out statistical inference when making use of transition matrices (see for example Bane and Ellwood 1986, Hentschel and Lanjouw 1996, Dercon and Krishnan 2000, Scott 2000, Birchenall 2001, Parker and Gardner 2002).

The difficulties in calculating the standard errors have spurred the application of the bootstrap in recent econometric studies because it provides a tractable method of estimating the sampling distribution of a statistic (see Mills and Zańdvakili 1997, Osberg and Xu, 2000). By generating random samples with replacement from the original sample, it is possible to simulate the original sampling procedure and hence statistical inference can be based on the bootstrapped distribution of the estimator. A comprehensive treatment of the validity of the bootstrap for a variety of different aggregated inequality, poverty and mobility indices is provided in Biewen (2002).

Much information is lost in aggregated indices, so transition matrices may be preferred for studying a range of empirical issues. Our objective is to provide a straightforward application of the bootstrap to construct confidence intervals for transition probabilities based on absolute income. Due to the complexity of the analytical derivation of the standard errors of the transition probabilities, this method facilitates statistical inference based on absolute mobility matrices.

The second issue important for our ability to conclude from studying transition probabilities is that they may depend on the accuracy of the measurement of income. Since

there are many sources of errors in micro household data on income, one should always be concerned with the quality of data when studying economic mobility. One important contribution towards assessing the impact of poor data quality is Cowell and Victoria-Feser (2002), who investigate how data contamination influences welfare rankings.³⁵ On the other main problem of data quality, that variables are measured with error, it is widely recognized that this may cause bias in several poverty and mobility measures. This is particularly the case for income data from developing country household surveys where agriculture accounts for a large share of income. Despite its importance, little has been done to investigate how this error influences absolute mobility matrices. This is unfortunate because transition matrices are a powerful tool for making rigorous statistical inferences (Schluter 1997). An objective of this paper, therefore, is to simulate the standard model of measurement error to evaluate the potential influence on absolute transition matrices.

Our results indicate that evaluating the crisis by the immediate effects on income mobility substantially underestimates the impact of natural disasters such as droughts, hailstorms and flooding compared to including the effect in the subsequent year. We find that the spillover effect is large for the poor. Investigating the recovery phase, i.e. the households moving out of a crisis and into a normal year, we find that the probability of remaining poor increases by approximately 15% compared to households that were not hit by these disasters. During the “crisis phase”, i.e. for those that move from a normal year and into a crisis, we find that the probability of remaining poor increases by 40% compared to normal income mobility. Taken together, these results indicate that poor households experiencing a crisis also have their incomes substantially depressed in the subsequent year. Households in the upper income classes seem not to be much affected by the presence of disasters. We find only a small negative lagged impact of the disaster on the income mobility of these households.

Our simulations of measurement error show that this usually increases the income mobility in the transition matrices in our data, as expected.³⁶ More surprisingly, this turns out not to be a general rule since the error seems to reduce mobility for some middle income groups. This implies that policy recommendations based on these types of analysis warrants a

³⁵ Data contamination occurs if a proportion of false observations is added to the true data set, for example by miscoding or other types of mistakes.

³⁶ A mean zero independently distributed error would cause attenuation bias in a regression of income on past income. Since a low coefficient implies high mobility, because past income then explains little of present income, this error increases mobility. This is explicitly illustrated in Ashenfelter et al. (1986) for mobility analysis, but is implicitly treated in most text books of econometrics (see for example Greene 1997, pp. 436-437).

thorough investigation of the nature and impact of measurement error. However, for comparison of the poorest (and the richest) groups across states, as in our investigation, measurement error seems to have little impact. Moreover, our simulations find that the error induces a downward bias in the probability estimates of remaining poor (rich) that is of similar size between the group that was hit by a crisis and the group that was not. Hence, the estimated difference in the probability of remaining poor (rich) across states seems to be a close approximation to the true difference for plausible values of measurement error. Irrespective of the size of the errors, however, we find that the estimated differences in the probabilities represent a lower bound of the true difference. Our simulations also support the finding that the probability of remaining poor is underestimated by measurement error (see for example McGarry 1995).

We describe the data in more detail in the next section, and then in section 3 we explain the methodology that lies behind our results. Our analysis of how shocks influence income mobility is contained in section 4, and some final comments and tentative conclusions are drawn in section 5.

2. Data

The Pakistani panel data set used in this study was collected in 14 survey rounds from 1986 to 1991 in four different districts, where around 800 households in 52 villages were tracked.³⁷ Three of the districts, Badin in Sind, Dir in North-West Frontier Province, and Attock in Punjab, were chosen purposively (so each district represents a stratum) as some of the poorest areas of rural Pakistan. The data is therefore not representative for Pakistan or rural Pakistan, but except for Faisalabad, which was selected as a more prosperous control district, it can be regarded as representative for the poor rural areas in Pakistan. Two markets within each district were chosen at random, making these market clusters the primary sampling units. For each of these markets, villages were divided into three categories³⁸ according to their

³⁷ Some households were observed only once, while other observations did not contain all the required information for our purposes. Deleting these observations can be seen as random, and causes no bias in the remaining sample. Comparing the income data in our sample with the original data, we find no significant differences, see appendix 2 and 3. From the original data set, our sample consists of 685 households which are tracked each year.

³⁸ Villages were categorized by the following distances to the market: Those within 5 kilometres of the market, those within 5 to 10 kilometres and those within 10 to 20 kilometres.

proximity to the particular market, and villages were then randomly chosen from each category. Then the households were drawn from a complete list of all families in each village.

The survey was conducted by the International Food Policy Research Institute (IFPRI) and the data were collected on a wide range of topics important to gauging the well-being of poor people. Considerable weight was put on measuring the rural households' income from different sources, and also recorded a wide range of factors important to income change over time (Adams and He, 1995). An imputed value for income in kind was calculated, as well as for household consumption of crops and crop by-products and home-consumed livestock. It has been argued that expenditure is preferred over income as a more accurate measure of long-term economic well-being because of consumption smoothing. However, if the aim is to analyze the impact of disasters, and to compensate for the shock, then using consumption as the measure may blur the true impact due to informal insurance arrangements. Also, the procedure for collecting consumption data differed between the three first and the two last years. Hence, the expenditures were rendered incomparable between the two time periods of different sampling methods, so we are unable to compare the income dynamics with the consumption dynamics.

Since many people in these areas live in severe poverty, small income changes can determine whether or not a family is subjected to starvation. Thus, we are particularly interested in the household's absolute income, as opposed to the relative rankings of households implicit in quintile analysis.³⁹ Most government poverty statistics also focus on absolute income (Zheng 2001), and it is a clear advantage to provide policy recommendations on indicators regarded as important by the decision-makers.

It is widely recognized that children need fewer calories than adults in order to function normally. However, there is no agreement on how this should be used to improve comparisons of households with different numbers of adults and children. One argument against adjusting for caloric requirements has been that they differ according to the activity level of the individual and to individual heterogeneity for given activity level, but also that other nutrients are important in determining equivalence scales. A more important argument has been that even though the child needs fewer calories than adults, the child needs more of

³⁹ Most studies of economic mobility ignore absolute income in transition matrices, and focus solely on relative income (quintiles). This is unfortunate because the relative categorisation will not capture general welfare trends, as for example increasing or decreasing living standards for the whole population over time. In addition, a relative poverty classification is quite arbitrary, and it is not clear why one should use a certain percentage point cut-off instead of another. Moreover, the percentage point chosen can influence the characteristics of those defined to be poor (Lanjouw, 2002).

the household expenditure for education, clothing and medicine. So if the food component of total expenditure is low, there is little reason for adjusting for caloric needs (Lanjouw 2002). In our sample, food expenditure for the 3 first years accounts for 70% of total expenditure.⁴⁰ Hence, on average, food is dominant in the household budgets. Then the poor use an even larger proportion of their resources to meet the required food intake, and in this situation it seems necessary to adjust for different caloric requirements between adults and children.

We therefore grouped the households by their absolute per-adult-equivalent⁴¹ reported yearly income, which hereafter will be denoted income. According to the alternative food energy intake method an individual needs Kcal 2,100 per day, which could have been achieved with around Rs 2000 in income with the prices that prevailed in our time frame (McCulloch and Baulch, 2000). Hence, we take an income of Rs 2000 to serve as the poverty line in this study.⁴² We classify those who have an income below Rs 2,000 as income class 1, and will frequently denote this group as “the poor”. Taking this class as a starting point and looking at the income distribution, it seems natural to divide the rest of the sample into the following groups: those who have an income between Rs 2000 - Rs3000, Rs 3000 – Rs 4000, Rs 4000 – Rs 5000 and those who earned more than Rs 5000, respectively. The distribution of households in these groups over the years is shown in table 1.

⁴⁰ Reliable expenditure data were only collected for the first three years in our Pakistan panel data, so food's share of total expenditure is calculated using the data from 1986/87 to 1988/89.

⁴¹ The adult-equivalent income is found by using the WHO caloric equivalent scale in table 4, and we also adjust for gender. Hence, we assume that the costs of supporting a child decrease with the age of the child, but are linear in the number of children at each age. If one does not take account of the different costs, or if households face economies of size, then the standard method of dividing income according to household size would deem larger households to be poorer than what might be the case (Lanjouw and Ravallion 1995).

⁴² Malik (1993) uses a similar absolute poverty line for rural Pakistan: Rs 1800 (in 1984/85 prices) per capita yearly expenditure, and also provides an overview of the work on Pakistan national household expenditure data. Alderman and Garcia (1993) uses the poorest quintile of a range of different per capita variables (expenditure, income calorie consumption, landless, food share and so on) to classify the poor in our IFPRI data, while Adams and He (1995) uses income per capita as the measuring rod for the same data.

Table 1. Yearly distribution of households in each income category, by the absolute number of households.

Income Category \ Year	1	2	3	4	5
1	138 (20%)	145 (21%)	173 (25%)	188 (27%)	205 (30%)
2	162 (24%)	160 (23%)	162 (24%)	187 (27%)	153 (22%)
3	122 (18%)	108 (16%)	131 (19%)	116 (17%)	105 (15%)
4	83 (12%)	74 (11%)	77 (11%)	66 (10%)	68 (10%)
5	180 (26%)	198 (29%)	142 (21%)	128 (19%)	154 (22%)
Sum	685 (100%)	685 (100%)	685 (100%)	685 (100%)	685 (100%)

As we can see from table 2 below, the mean income for the full sample seems to be fairly constant for the two first years, and then drops by approximately 11% from the second to the third year. For the three latter years, the income remains almost constant on the lower level. The picture of the poor is somewhat different. While the first year is the best in terms of mean income for the poor, the second year brings about a 12% reduction making this the worst year for this group. In the subsequent years, the poor household's mean income level does not fluctuate much.

Table 2 also reveals the unfavorable position of the poor; the mean income over the 5 years for those who live below the poverty line is close to a quarter of the mean income for the non-poor. Also, it seems as though the fluctuations of the income of the poor over the years are negatively correlated with the variation of the full sample.

Table 2. Yearly mean income for the full sample, for the non-poor and for the poor.

Year	Mean income for the full sample (std. deviation)	Mean income for the non-poor (std. deviation)	Mean income for the poor (std. deviation)
1	4364 (3989)	5101 (4145)	1443 (450)
2	4411 (3815)	5259 (3871)	1251 (534)
3	3963 (3678)	4853 (3860)	1330 (453)
4	3802 (3866)	4725 (4143)	1359 (924)
5	4025 (4725)	5182 (5221)	1317 (567)
1 to 5	4113 (4036)	5027 (4261)	1338 (625)

To see whether there are any differences for the poor and the rich during the crises compared to normal times, we categorized households in income group 1 and 5 according to whether they lived in a district hit by a disaster. In 1986/87, crops were damaged in Faisalabad due to a hailstorm at harvest time, Badin experienced flooding in September 1988 and Attock was hit by drought in 1987/88 (Alderman and Garcia 1993, EIU 1988a,c,d, 1989). Irrigation and water supply are crucial factors in determining the impact of a drought, and most of Pakistan's agricultural production came from irrigated areas in 1987/88. So even if larger parts of Pakistan were hit by the drought that started in 1987 (EIU 1988a), Attock was particularly vulnerable because of the very low ratio of irrigated lands. It is noted by EIU (1988b) that "The unprecedented drought which affected Pakistan last year during the summer monsoon season and which continued through the winter rain period has made its impact felt upon the unirrigated areas, but in the irrigated areas water supply seems to have been sufficient to overcome the worst effects." In our sample, only 2 % of the land owned by the inhabitants of Attock was irrigated in 1987/88, while the ratio of irrigated land in Faisalabad, Badin and Dir was 100 %, 76 % and 27 %, respectively. Good weather conditions just before harvest time and a new record in cotton yields in Sind and Punjab in the third quarter of 1988 indicates that the drought was limited to 1987 and early 1988 (EIU 1988c,d). Hence, our income data collected in 1987/88 corresponds exactly to the period of the drought.

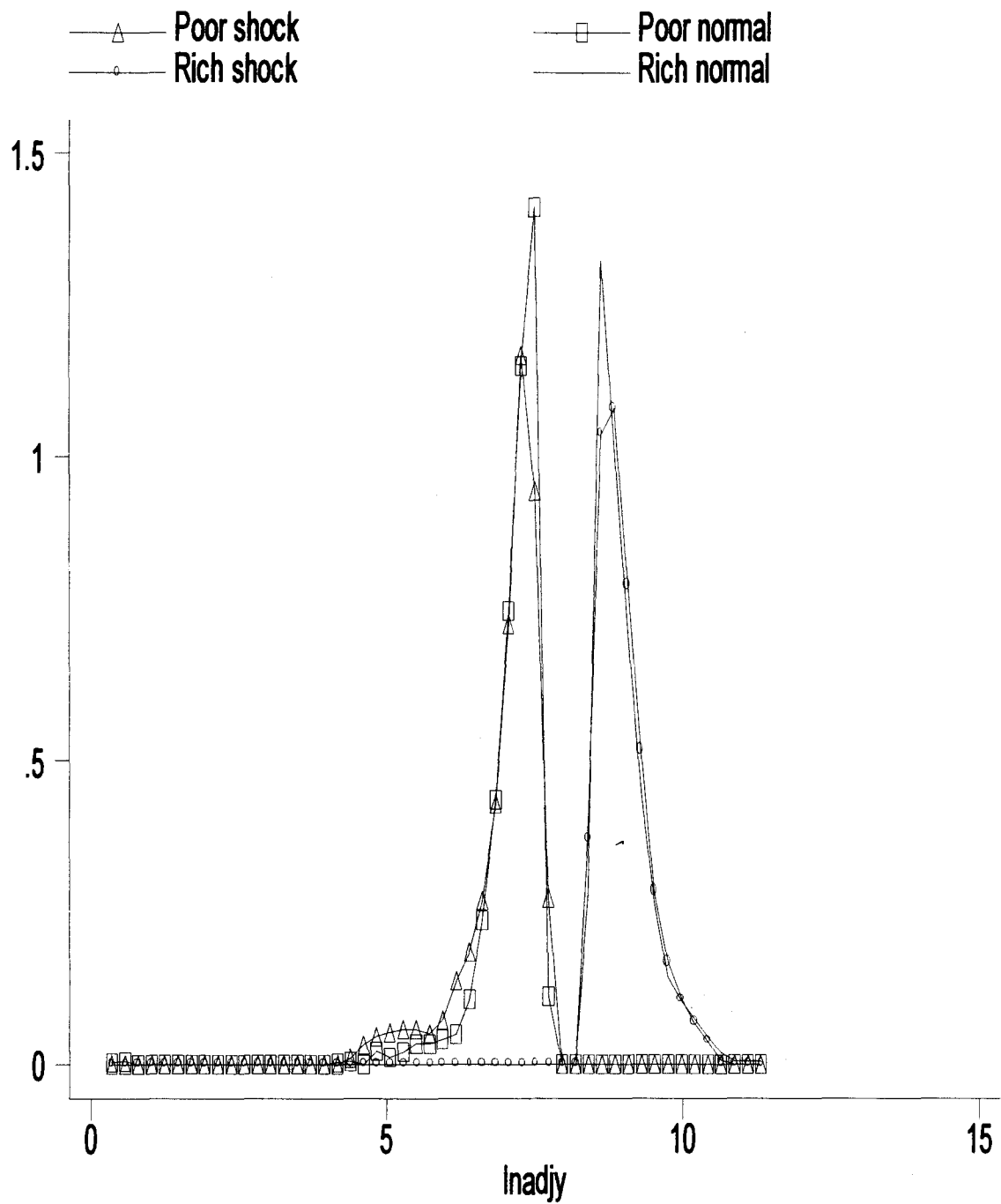
We can see from table 3 that the mean income for the rich is approximately the same for households subjected to the crisis compared to those that experienced normal times. On the other hand, the poor households subjected to a disaster had a 10% lower mean income than the other poor.

Table 3. Income statistics during normal times and during crisis: for the poor and for those households with an income above 5000 Rupees.

Income and state	Number of observations	Mean income	Standard deviation	Minimum value	Maximum value
All Rich	802	9015	5808	5003	73222
Rich Normal	664	9043	6014	5003	73222
Rich Crises	138	8881	4709	5006	33108
All Poor	849	1338	626	-9481	1999
Poor Normal	720	1360	634	-9481	1999
Poor Crises	129	1216	561	-354	1987

From the kernel densities for the poor and the rich displayed in figure 1 below, it appears that the external shape of the income distribution for both groups was almost unaltered when a crisis occurred. We find no traceable effect of the crisis from the income distribution of the rich, while there is a somewhat larger proportion of the poor with lower incomes than in normal times. However, the actual role of the crisis for the poor is not easily traced by these static measures. Households that were better off may fall into income category 1 because of the disaster, and this effect may actually lead to an increase in the mean income for that group. Hence, we need to make use of the panel dimension of the data and evaluate intra-distributional mobility to explore the full effect of the crisis.

Figure 1.



Income densities for the rich and the poor in normal times and in a crisis

3. Methodology

We are interested in evaluating how large covariant shocks affect the income mobility of the rural poor compared to the rich. Then transition matrices can be a powerful tool to get a picture of income movement over time across states. Let $S = \{1, 2, 3, 4, 5\} \times \{0, 1\}$ be the state space where a state $s \in S$ is defined by (y, k) where y is income class and k is an indicator of whether a crisis occurs, $k = 1$, or not, $k = 0$. The change in the crisis indicator over time can then be indexed by 0 and 1, so that the transition matrix between normal years can be denoted $M_{00} = [p_{ij}(t_{00})]$ where i denotes income class in year t and j the class in $t+1$. Then the matrices for movements into and out of crisis can be denoted $M_{01} = [p_{ij}(t_{00})]$ and $M_{10} = [p_{ij}(t_{00})]$, respectively. Each of the elements in M then represents the probability of movement between income classes from year t to $t+1$, conditional on y at t and change in k .

Assuming that the unknown probability of being hit by a disaster is θ , then the true Markov transition matrix can be denoted $\Lambda_\theta = \begin{bmatrix} (1-\theta)M_{00} & \theta M_{01} \\ M_{10} & M_{11} \end{bmatrix}$ where M_{11} is the transition matrix for two consecutive disasters.⁴³ However, since we do not have any observations of households experiencing a crisis in two following years, we let $\Pr(k_t = 0 | k_{t-1} = 1) = 1$, which implies that $M_{11} = \theta$. So if a disaster strikes at t , then y of the affected households follows M_{01} from $(t-1)$ to t , and then y follows M_{10} with certainty from t to $(t+1)$. In case no disaster occurs, which has the probability of $(1-\theta)$, then y follows M_{00} between any years.

The true number of households with p_{ij} can be denoted $n_{ij}(t)$, and the total number of transition counts in each row i of M can be denoted $n_i(t) = \sum_{j=1}^n n_{ij}(t)$. The first order Markov transition probabilities can then be estimated by maximum likelihood, and this estimator of $p_{ij}(t)$ is given by

$$(1) \quad \hat{p}_{ij}(t) = \frac{\hat{n}_{ij}(t)}{\hat{n}_i(t)}$$

⁴³ There is not enough information in our sample to estimate θ .

where $\hat{n}_{ij}(t)$ and $\hat{n}_i(t)$ are the observed number of households moving from i to j and the observed number of households that started out in income class i , respectively.⁴⁴ That is, \hat{p}_{ij} is the observed share of those which started in income class i that ends up in income class j . Then let $\hat{M}(t) = [\hat{p}_{ij}(t)]$ denote the estimated transition matrix.

Inference from a single transition matrix on a sample requires strong simplifying assumptions (Atkinson et al. 1992). First, one assumes that the same transition probabilities apply to all households (population homogeneity). We divide our sample into two main categories, those hit by a disaster and those who are not, and thus assume a different mobility pattern for each group. The second standard assumption is that transition probabilities are constant over time. In our framework, however, we not only allow the matrices to vary over time, but more importantly, we investigate whether the probabilities for those affected by a crisis differ over time. We calculate the transition probabilities of households moving into a disaster and compare them with households moving out of the same state.

The last assumption usually implicitly employed in work using these matrices is the first order Markov assumption: A transition probability is independent of past history. We also use this assumption, but see Schluter (1997) for some evidence that the income in year $(t-1)$ also influences the transition probability from year t to year $(t+1)$. However, even if second-order Markov processes are better approximations to reality than first order processes in most circumstances, it is reasonable to believe that the first order impact of natural disasters like the ones present in our data will be much larger than eventual second order effects. Due to the usual constraints, the application of the second-order model is left for future research.

When constructing the income transition matrices, we separate the income movement of the households in the three districts that were hit by a natural disaster. Excluding these observations, we construct a matrix that represents the movement for the households when no crisis occurred, and let this represent the “normal” movement. In order to distinguish between the mobility experiences when households enter or exit a year of crises, one matrix is calculated for each event. The first matrix includes only observations where households move from a normal year and into a year of crises, the “entering crises matrix”. The second, the “exiting crises matrix”, is restricted to those observations where households move from a year of crisis and into a normal year.

⁴⁴ See Schluter (1997) for the explicit derivations of the ML estimator.

Calculating \hat{M} is straightforward, but evaluating the statistical significance of the transition probabilities can be more cumbersome because the analytical estimate of the standard deviation of $\hat{p}_{ij}(t)$ is very difficult to calculate. We therefore propose a simple bootstrap procedure to obtain estimates of these standard errors of each of the estimators of the transition probabilities.⁴⁵ In order to preserve the original panel's potential information about the impacts of crises on household mobility, each household must be treated as a cluster. So when we draw households randomly with replacement to create a new sample N^i with the same size as the original sample N , then each draw not only contains that particular household's 5-year income category record but also indicators of whether the movement between years is classified as normal, into-crisis or out of crisis. The new sample is then used to calculate the particular transition matrix $\hat{P}^i(t) = [\hat{p}_{ij}^i(t)]^i$, which we store.⁴⁶ Replicating this procedure as many times as practically feasible yields a set of estimates of each transition probability of $M(t)$. Thus, T bootstrap replications yields $\hat{p}_{ij}^1, \hat{p}_{ij}^2, \dots, \hat{p}_{ij}^i, \dots, \hat{p}_{ij}^T$ for $i, j \in [1, n]$, which represents an estimate of the true distribution of each of the transition probabilities. This estimate of the distribution of $p_{ij}(t)$ is then used to calculate confidence intervals.

Even if we are able to apply the bootstrap and construct an estimate of the distribution of the transition probabilities, the possibly severe problem of data imperfections still remains. It is very likely that our income data, as is frequently the case with household income data from developing countries, is measured with error (Alderman and Garcia, 1993).⁴⁷ This stems not only from the difficulty of measuring all the relevant variables that compile to household income, as for example to calculate the correct return from assets, or from recall bias, seasonality and long questionnaires. More important, especially for the societies we study where agriculture is a major income source, seems to be that personal and farm incomings and outgoings are often mixed (Deaton 1997). Since it is not necessary for a household to separate consumption expenditure from the outlays on farm inputs, errors in income data may arise from the difficulty in deducting the correct cost of production from the receipts. In addition, the net value of home-produced food, which also tends to be an important component of a

⁴⁵ The idea of using the sample data to generate an estimate of the true distribution stems from Efron (1979).

⁴⁶ The computation was performed in Stata, but the *xttrans* command does not allow storage of each element in $\hat{P}(t)$. The do-file modifying the *xttrans* command and the bootstrap programs are available upon request.

⁴⁷ Note also that as long as the income bins in the matrix are exogenously determined, transition matrices are robust against contamination (Cowell and Schluter 1998).

poor rural household's income, is difficult to measure particularly when there are no well functioning markets for these items.

A few studies have attempted systematically to evaluate the impact of measurement error on mobility measures. Rendtel et al. (1998) categorize households according to two independent measures of the same income variable. Then if the two variables classify a household in two different categories, for example as poor by one and non-poor by the other, this is taken as evidence of measurement error. However, their assertion that identical categorizations by the two measures provide evidence for a true change between poverty states requires rather strong assumptions. It is straightforward to show that if the measurement error is correlated in the two measures of income, this could result in identical but false classifications. So even if one posits two independently measured income variables, this approach requires measurement errors in the two income variables to be relatively uncorrelated.

Bound et al. (1991) correct for measurement error by eliminating one-period spells of poverty, which is also the approach in Bane and Ellwood (1986) for changes in income less than one-half of the income to poverty-line ratio. Eliminating several one-year spells of poverty seems not to be plausible for studies of societies with a high true inter-year mobility because it would omit a large part of the actual changes in welfare. Moreover, it is not clear that one can attribute short spells of poverty to measurement errors even in societies where income is more stable.

A general framework for analyzing the impact of measurement error on income mobility is proposed in McGarry (1995), where a variance components model containing a white noise error term is estimated. This component is then treated as an approximation of the error in observed income. Because this method includes any true random income shocks in the measurement error term, correcting for the stochastic variance provides a lower bound of poverty rates. Hence, this approach is appropriate as long as the true random shocks are small compared to measurement error, which may be hard to verify.

Taking the static headcount index of poverty as a starting point, we know from Ravallion (1988) that a measurement error that increases variability in the welfare variable causes the expected value of the index to increase if the poverty line is less than the mode welfare and if the individual welfare function is quasi-concave. Looking at this index for a panel, one can classify the households that are defined as poor in every period as the "always poor". Now, even if measurement error increases the number of poor in every period, the empirical study in McGarry (1995) suggests that the same error causes the number of "always

poor” to be biased downwards. She states that the reason is that the increased variability from the error causes several false transitions out of poverty, in at least one period, for those who in reality did not move upwards. However, the analytical derivation of this result seems to be impossible to calculate, and one might wonder if this error also works in the opposite direction, i.e. that some non-poor are classified as always poor due to measurement errors.

In order to assess the direction and magnitude of measurement errors on the transition matrices derived from our data, assume now that our measured income variable, y^* , represents the true structure of the data. Then we can simulate how a typical measurement error influences mobility matrices by calculating a new “observed” income, y , which has been influenced by a mean zero normal distributed random error term u_{it} that is uncorrelated over years and has a variance σ_u^2 :

$$(2) \quad y_{it} = y_{it}^* + u_{it}, \quad \text{where } u_{it} \sim N(0, \sigma_u^2)$$

The error may either be multiplicative or additive, so we simulate each type for a wide range of plausible variances to see if any differences in the impact on transitions emerge. The impacts of the errors on the matrices are discussed next.

4. Impacts of disasters on income mobility using noisy data

Since we are particularly interested in the mobility of the poor in the aftermath of the disasters, we set up two hypotheses for the movement from a year of crisis into a normal year. The first is that the year after the disaster may be a recovery year, in which many households experiencing temporary bad fortune during the shock would move upwards when their incomes returned to a normal level. If life went back to normal after the disaster, we could expect the probability of remaining poor to be equal to or lower than the normal-to-normal transition probability. This is because we expect the number of poor to be larger during the crisis, and when things return to normal, ordinary income movement suggests that (1) will be lower than normal since the denominator is larger. Those affected by the disaster might also work harder than normal to compensate for the loss, or they might receive transfers or benefits from other formal or informal insurance mechanisms. In this case, the poor might get a higher income the year following the shock compared to normal times, which also implies a lower than normal probability of remaining poor. Equality between the two might be the

result if the chances of improving their income were exactly as before the shock. Thus, the recovery hypothesis cannot be rejected if we find that the exiting matrix is not significantly different from the normal matrix or if the probability of escaping poverty is larger compared to a normal situation.

Our second hypothesis was that a disaster in one year might lead to depressed incomes also in the subsequent year. This might be the result if the disaster led to erosion of productive capital, either by depletion of capital for consumption purposes or by direct damage to assets.⁴⁸ In addition, floods may damage important infrastructure like roads, and the aftermath of natural disasters may bring pest infestation.⁴⁹ If productive assets were run down, we would expect the probability of rising out of poverty to be lower than normal in the aftermath of the crisis. Another reason for the spillover may be that in the year after the disaster, there will often be a reduced demand for individual providing services. This may reduce the incomes of the poor, since these groups get a substantial share of their incomes from such occupations.⁵⁰ From this reasoning, we would expect the probability of remaining poor to be somewhere between the probabilities in the entering matrix and the normal matrix: Worse than a normal transition, but better than being hit by a shock.

The transition matrices for the three states are displayed in table 4. The bootstrap, as described in section 3, was performed to construct estimates of the true distribution of each transition probability. The resulting estimates of the transition probabilities' standard errors are displayed below together with the estimate of the transition probability from the original sub-sample.⁵¹

⁴⁸ Livestock died both during the drought in Attock in 1987/88 and the flood in Badin in 1988 (EIU 1988c). Floods are known to cause erosion of productive soil and damage trees.

⁴⁹ One example of pests following in the aftermath of natural disasters is the 1988 flood in Pakistan, where the following pest infestation damaging cotton production was believed to have been caused by of the flood (EIU 1988c).

⁵⁰ As Sen (1981) notes, one will frequently see a dramatic fall in the demand for barbers and tailors after drought. For the decomposition of non-farm income sources, at least for the three first years of our panel, see Adams (1994).

⁵¹ Note that the estimates of the transition probabilities are from the original sample, and not from the bootstraps. This is because any bias in the estimates from the original sample will be exaggerated in estimates from the bootstrapped samples (StataCorp 2001).

Table 4. Transition matrices according to movement relative to the crisis.

Income class 1: $y \leq Rs\ 2000$

2: $Rs\ 2000 < y \leq Rs\ 3000$

3: $Rs\ 3000 < y \leq Rs\ 4000$

4: $Rs\ 4000 < y \leq Rs\ 5000$

5: $y > Rs\ 5000$

Normal matrix

		Income class in year (t+1)					Total
		1	2	3	4	5	
Income class in year t	1	48 (2.5)	27 (2.2)	11 (1.5)	6 (1.2)	7 (1.3)	100
	2	31 (2.0)	32 (2.2)	17 (1.7)	9 (1.3)	12 (1.5)	100
	3	14 (1.9)	28 (2.5)	24 (2.4)	15 (2.0)	20 (2.3)	100
	4	12 (2.4)	23 (3.0)	21 (2.8)	14 (2.5)	30 (3.3)	100
	5	5 (1.1)	10 (1.6)	15 (1.8)	16 (1.8)	54 (2.8)	100
Total		24	25	17	11	23	100

Entering shocks matrix

		Income class in year (t+1)					
		1	2	3	4	5	Total
Income class in year t	1	67 (5.4)	16 (4.2)	9 (3.4)	5 (2.6)	3 (1.8)	100
	2	35 (5.4)	30 (5.1)	20 (4.6)	9 (3.2)	6 (2.7)	100
	3	18 (4.9)	34 (5.9)	18 (4.8)	12 (4.1)	17 (4.7)	100
	4	11 (4.7)	22 (6.2)	20 (6.0)	17 (5.7)	30 (6.9)	100
	5	6 (2.3)	11 (3.0)	17 (3.7)	11 (3.0)	56 (4.9)	100
Total		28	21	17	10	24	100

Exiting shocks matrix

		Income class in year (t+1)					
		1	2	3	4	5	Total
Income class in year t	1	55 (4.4)	25 (3.8)	12 (2.8)	4 (1.7)	5 (1.9)	100
	2	38 (4.7)	33 (4.6)	19 (3.8)	6 (2.3)	6 (2.3)	100
	3	20 (4.1)	32 (4.8)	20 (4.1)	11 (3.1)	18 (4.0)	100
	4	27 (6.3)	35 (6.7)	22 (5.8)	6 (3.3)	10 (4.2)	100
	5	9 (2.5)	10 (2.6)	20 (3.5)	12 (2.8)	49 (4.2)	100
Total		30	25	18	8	20	100

4.1 Implications for the poor

In order to compare the magnitude of any post-crisis effects with the actual disaster, we start by analyzing the income mobility for households that are in a normal situation in one year and experience a disaster in the next.

4.1.1 Direct effects of disasters

In a given normal year, almost half of the households below the poverty line (income class 1) remain poor in the proceeding year. However, this group has a much lower probability of rising out of poverty when the sample enters a disaster. More than two-thirds of those below the poverty line remain in that group when the negative shock occurs in the subsequent year. To evaluate the robustness of this result, we use the bootstrapped distribution of the probability estimates. Constructing 99% confidence intervals from this estimated distribution shows that the large discrepancy between the two estimates of transition probabilities for the poorest group moving from a normal to normal situation contra moving from a normal into a shock year is highly significant. Moreover, we find that even very large measurement error would not influence this conclusion, as is evident from table 5.⁵²

⁵² To find plausible values of the measurement errors, we compared the “true” income variance with the income variance after being influenced by m (see table 2). Whether the error is additive or multiplicative has a large impact on the contribution of the error to measured variance. For example, we find from the Monte Carlo experiments that the “true” income variance accounts for approximately 80%, 60% and 50% of the observed income variance for the poor in the first year when $m \sim N(0, 600)$, $m \sim N(0, 1000)$, $m \sim N(0, 1500)$. However, for incomes below 2000 Rupees, the multiplicative error does not change the variance of the true income for errors with a standard deviation of less than 20% of income. For larger errors, we find that $m \sim N(0, 0.3adjY)$ and $m \sim N(0, 0.4adjY)$ accounts for 6% and 20 %, respectively, of the observed variance of the income of the poor. For our purpose, however, the importance of the error lies in how it affects the transition matrices, not in its share of observed income variance.

Table 5. Monte Carlo simulations of the impact of a multiplicative measurement error on the probability of remaining poor in normal times and when entering a crisis, according to variability of the error.⁵³

	Staying probabilities: $p_{11}(t, x)$		
	Entering crises	Normal	Difference entering-normal
Sample	0.67	0.48	0.19
$m \sim N(0, 0.05adjY)$	0.65	0.48	0.17
$m \sim N(0, 0.10adjY)$	0.64	0.48	0.16
$m \sim N(0, 0.15adjY)$	0.63	0.48	0.15
$m \sim N(0, 0.20adjY)$	0.61	0.47	0.14
$m \sim N(0, 0.25adjY)$	0.59	0.47	0.12
$m \sim N(0, 0.40adjY)$	0.54	0.45	0.10

Table 5 shows that the larger the multiplicative measurement error, the lower is the difference between the probability of remaining poor during normal times and the same probability when entering a shock. This indicates that the gap between these two sample estimates, which amounts to 19 percentage points, represents a lower bound of the discrepancy between the true transition probabilities in these two situations. This result is also sustained if the error is additive, see appendix 6, table A6.1.

A similar picture can be depicted for the poor households' chances of improving their position under the different circumstances. In a normal-to-normal transition we find that the poor have almost a 70% higher chance of moving one income class upwards, compared to the same movement in a normal-to-shock situation. Thus, there is a much higher probability of rising out of poverty when the households are not affected by shocks, which is not a surprising result. This is also a robust finding, indicated by the fact that this estimate of the normal-to-normal (normal-to-shock) transition probability is not contained in the 95% confidence interval of the normal-to-shock (normal-to-normal) distribution. In addition, this

finding is also robust against measurement error in that the gap between the estimates represents a lower bound.⁵⁴

That entering a shock severely worsens the situation in terms of income mobility for the poor is also indicated by the probability estimates of households in income class 2 that move one class down. If the subsequent year is normal, these households have a 31% chance of moving down, while the probability rises to 35% if they enter a year of shock instead. However, the difference between the two is statistically rather weak. Even if the normal-to-shock probability is not present in a 95% confidence interval of the corresponding normal-to-normal distribution, we cannot reject the possibility that this latter estimate is not contained in confidence intervals of the former, even if we narrow the interval considerably. The simulations of the measurement errors support the hypothesis that households in income class 2 did not have a different probability of moving one class down when entering a shock. The probability in normal times for this movement is very robust against small and medium errors, while the corresponding probability for those who enter a crisis increased relatively much for small errors.⁵⁵ Hence, measurement error may account for the observed differences in the respective probabilities.

4.1.2 Recovery in the aftermath of the disaster?

Now compare the mobility of the poor in the exit matrix with the normal matrix in figure 1. We find a seven percentage point higher probability of remaining poor when moving from a year of crisis to a normal year compared to transitions between normal years⁵⁶. This amounts to a 15 % higher probability of remaining poor, which must be said to be considerable because the crisis in fact ended the previous year. This supports the hypothesis that the

⁵³ We use 1000 repetitions in measurement error simulations in this paper.

⁵⁴ See the impact of simulated measurement error on these estimates in appendix 6 table A6.2 for an additive error and appendix 7, table A7.1 for a multiplicative error.

⁵⁵ See appendix 6, table A6.3 and appendix 7, table A7.2.

⁵⁶ The existence of a spillover from the shocks is supported by our estimates (bootstraps) of the distribution of the probabilities. This is suggested because the estimate of the movement of the poorest group from a year of shock and into a normal year (55%) is not contained in the 99% confidence interval of the “normal to normal” year distribution of the same income group and movement. Similarly, but not as significant, the estimate of the probability of going from a normal to normal year (48%) is not contained in an 87% confidence interval for the shock to normal year distribution.

negative impact on the poorest spills over to the year after the shock. We also find that this result is very robust against likely measurement error.⁵⁷

Table 6: Monte Carlo simulations of the impact of a multiplicative measurement error on the probability of remaining poor in normal times and when exiting a crisis, according to variability of the error.

	Staying probabilities: $p_{11}(t,x)$		
	Normal	Exiting crisis	Difference Exiting-normal
Sample	0.48	0.55	0.07
$m \sim N(0, 0.05adjY)$	0.48	0.54	0.06
$m \sim N(0, 0.10adjY)$	0.48	0.54	0.06
$m \sim N(0, 0.15adjY)$	0.48	0.54	0.06
$m \sim N(0, 0.20adjY)$	0.47	0.54	0.07
$m \sim N(0, 0.25adjY)$	0.47	0.54	0.07
$m \sim N(0, 0.40adjY)$	0.45	0.51	0.06

We also find a similar result for those that start out in income class 2 and fall into poverty the subsequent year. There is more than a 20% higher probability for households in group 2 of falling into poverty if a shock occurred in the previous year compared to movement between normal years. However, neither the probability of remaining in income class 2, nor the probability of moving out of poverty and into income class 2 differs significantly between the two matrices.

Taken together, these findings indicate that the situation does not revert back to the normal mobility when moving from a year of shock to a normal year. Rather, this provides support for there being relatively large negative spillovers over time for poor households subjected to the crisis. This may explain the observation that there is a larger share of poor households in the year after the shock (30%) compared to the normal year share (24%).

⁵⁷ The same result is found if the error is additive, see appendix 6, table A6.1.

The next step is thus to investigate the magnitude of this spillover on mobility in comparison to the impact of the actual disaster. From the exiting shocks matrix and the entering shocks matrix, we find that there is a significantly lower probability of remaining in poverty for a household moving out (55 %) compared to moving into a shock (67 %)⁵⁸. Note also that households starting out in income group 2 have approximately the same probability of being impoverished the year after, irrespective of whether they enter or exit a shock.⁵⁹ Thus, households that are close to the poverty line are just as inclined to fall below the line whether they are subjected to a shock or to the spillover effect.

When it comes to opportunities to move out of poverty, however, we see that the probability of moving from the poorest group and into income class 2 is close to 60 % higher when exiting a shock compared to entering one. So when moving from a year of shock, the situation for poor people climbing from group one to two is very similar to the normal situation. The same can be said for those that remain in income group two; this transition probability is not significantly different irrespective of which matrix we study.

Before we turn to the more privileged households, we summarize our most important findings. When a shock occurs in a particular year, there will be a significant negative spillover in the subsequent year that reduces the households' probability of moving out of poverty, and increases the probability of falling into poverty for those just above the poverty line. While the shock has a much more severe effect on the poor, by increasing the probability of remaining poor by 40% compared to normal, we find that the spillover effect is also substantial. A movement from a crisis to a normal year increases the probability of remaining poor by approximately 15% compared to mobility for households not directly hurt by a shock.

4.2 Implications for the privileged

4.2.1 Entering shocks

The households in the upper income levels seem to have experienced the disasters very differently from the poor in terms of the mobility pattern. There is no significant difference in the probability of remaining in the highest income class (5) between normal to normal years and normal to shock years. One reason may be that the income class 5 has no upper bound. Thus, it might well be that these households are hurt by the disaster, but that most of them have such a high income that the reduction does not bring them down the income ladder more

⁵⁸ Neither of the estimates are included in the other's 95% confidence interval.

than normal. However, if the households are evenly distributed over the income range, we would expect that being hit by a disaster would increase the transitions from the upper to the lower classes. Note also that these differences are very robust against measurement errors, see appendices 6 and 7, tables A6.4 and A7.3.

The probability of moving from the highest class to income class 4 is larger for a transition from a normal to normal year (16%) than one from a normal to a shock year (11%). This difference is significant on the basis of a 95% confidence interval for the normal to normal distribution, and a 87% interval for the normal to shock distribution. It is also remarkable that there is the same probability of going up from class 4 to 5 in the two cases, which we take as support for a hypothesis that richer households do not experience very different mobility patterns when a shock occurs compared to normal times. Likewise, the probability of staying in income class 4 in the two different situations seems to be the same. The probability of remaining in class 4 in normal to normal years (14%) is included in narrow confidence intervals of the normal to shock distribution, which indicates that the two situations may not be significantly different with respect to transition probabilities. The probability of staying in income group 4 when entering a shock (17%) is not included in confidence intervals wider than the 85%, which indicates that there is some chance that the probabilities are different. Taken together, however, we reject the hypothesis that the two situations are different in terms of transition probabilities.

Looking at possible lagged effects, it seems as though going from a disaster into a normal year implies less opportunities for income generation for higher income groups than both the two other types of transitions. To see this, note that those in income group 5 had a probability of 49 % of remaining in this group when moving out of the disaster and into a normal year, compared to 54 % in a normal transition. This aspect is also reflected in the proportion of households in the two upper categories being larger in normal situations (34%) compared to the movement from a disaster (27%), and that the probability of falling from category 4 and 5 to 1 is twice as large in the latter situation (compared to normal to normal transition). Note also that the probabilities for households starting in group 4 (5) in a normal year of being in group 4 or 5 in a year of shock is 47% (67%), which is close to the normal to normal year transition probability. Summing up for the upper income groups, then, it seems that the only impact of natural disasters on income mobility is a small negative lagged effect.

⁵⁹ For plausible confidence intervals, we cannot reject the hypothesis that the probability is the same in the entering matrix and the exiting matrix for households in income class 2 of moving one class down.

5. Conclusion

The aim of this paper is to use some “natural experiments” to investigate the impact of natural disasters on the income mobility of rural households in Pakistan, and to propose some methodological procedures for evaluating the robustness of transition matrices. In addition to the expected result that the poor have a higher probability of remaining poor when entering a crisis compared to normal times, a main result is that there seems to be a substantial negative effect in the following year. Moreover, the poor have a 15% higher probability of remaining poor in the so called “recovery phase” after a disaster, compared to normal mobility. The more privileged households, to the contrary, seem not to be much affected by the crisis. We find no other impact than a slightly higher probability of moving out of the most favorable income group the year after the crisis (compared to normal movement). These results suggest that crisis relief for the poor should not only be provided during a natural disaster, but should also be maintained through the subsequent year in order to avoid increased impoverishment.

We propose a simple bootstrap method to facilitate statistical inference based on mobility matrices, and construct confidence intervals for the probability estimates. We illustrate the potential magnitude of measurement error on transition matrices and find that relatively small errors may induce a substantial downward bias of the probability of remaining poor. More encouragingly, however, simulating different types of measurement error gives a reasonable foundation for evaluating the impact of measurement error, in particular for comparison of the probabilities of remaining poor.

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Appendix 1: Adult equivalents

The scale is based on calorie requirements from the WHO, which is the same scale McCulloch and Baulch (2000) use for this IFPRI data set .

Age	Male weight	Female weight
0-1	0.33	0.33
1-2	0.46	0.46
2-3	0.54	0.54
3-5	0.62	0.62
5-7	0.74	0.70
7-10	0.84	0.72
10-12	0.88	0.78
12-14	0.96	0.84
14-16	1.06	0.86
16-18	1.14	0.86
18-30	1.04	0.80
30-60	1.00	0.82
60+	0.84	0.74

Appendix 2: Comparing the original data with our sample: Yearly household income for all households

	Original data			Our sample		
	N	Mean	Std. dev.	N	Mean	Std. dev.
Year 1	734	29368	34223	685	28911	33072
Year 2	734	34430	33928	685	34091	34047
Year 3	734 733*	34877 33577*	48447 33286*	685	33463	33162
Year 4	752	37246	50138	685	36230	46916
Year 5	730 729*	47019 43825*	99485 49538*	685	42969	47999

* Deleting one outlier

Appendix 3: Comparing the original data with our sample: Yearly household income for the poorest and the richest households.

To investigate whether our sample is skewed in the tails compared to the original data set, we divided the households in two categories reflecting the rich and the poor. Here, the poor households are those who have a household income of 10000 Rupees or less, while the rich are defined by an income level above 60000 Rupees. Note that these figures are not deflated. As we can see, there are no significant differences between the statistics.

		Original data			Our sample		
		A) Y<10000 B) Y>60000			A) Y<10000 B) Y>60000		
		N	Mean	Std. dev.	N	Mean	Std. dev.
Year 1	A	121	6900	2396	110	6771	2412
	B	66	101085	75522	58	100150	74898
Year 2	A	99	5994	2995	93	5958	3050
	B	106	100102	42911	95	101365	44366
Year 3	A	98	6805	2686	89	6780	2711
	B	96 95*	110088 100848*	101378 45872*	85	101515	47766
Year 4	A	73	5157	11218	65	5353	11685
	B	96	127734	95353	83	123562	90588
Year 5	A	61	5753	4354	56	5920	4418
	B	144 143*	133410 117732*	200739 70255*	130	116396	68474

* Deleting one outlier

Appendix 4: Quintile matrices.

**Entering shocks
quintile matrix**

		Income quintile in year (t+1)					
		1	2	3	4	5	Total
Income quintile in year t	1	62	14	15	8	1	100
	2	35	20	26	15	5	100
	3	19	24	19	27	11	100
	4	9	18	20	29	24	100
	5	6	5	10	17	61	100
Total		26	16	18	19	21	100

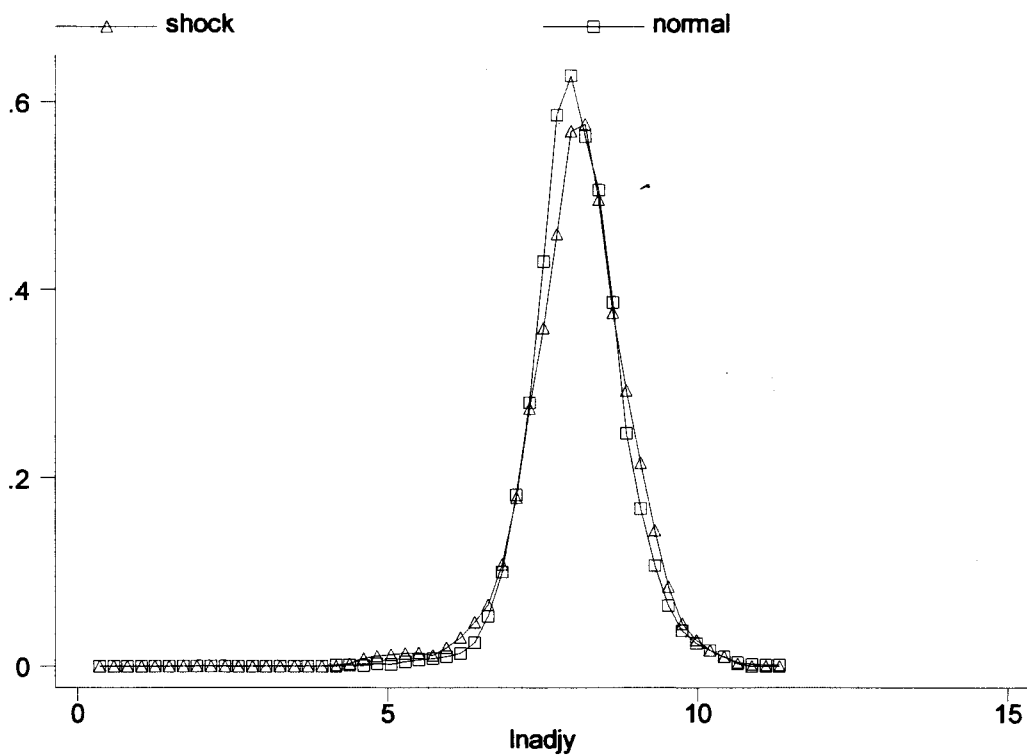
Normal quintile matrix

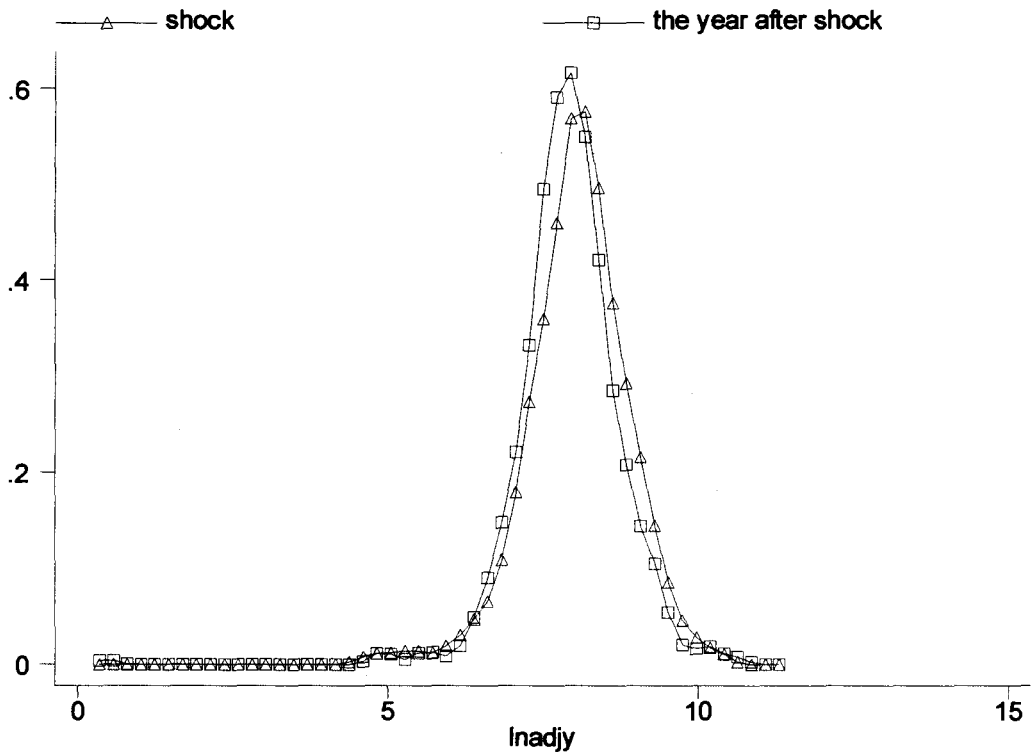
		Income quintile in year (t+1)					
		1	2	3	4	5	Total
Income quintile in year t	1	41	24	18	11	7	100
	2	23	30	24	16	7	100
	3	14	23	26	23	13	100
	4	8	15	23	30	24	100
	5	4	7	12	23	54	100
Total		18	20	21	21	21	100

**Exit shocks
quintile matrix**

		Income quintile in year (t+1)					Total
		1	2	3	4	5	
Income quintile in year t	1	48	25	16	7	5	100
	2	29	29	23	14	6	100
	3	19	27	24	22	9	100
	4	20	21	20	27	12	100
	5	3	10	15	23	48	100
Total		24	22	19	18	17	100

Appendix 5: Kernel density functions of log income for those households that were subjected to a covariant shock and for those that were not hurt.





Appendix 6: Monte Carlo simulations of the impact on transition probabilities in the normal matrix, crisis matrix and exiting matrix of an additive measurement error, according to variability of the error.

Table A6.1. The probability of remaining poor.

Staying probabilities: P11					
	Entering crises	Normal	Exiting crisis	Difference entering-normal	Difference Exiting-normal
Sample	0.67	0.48	0.55	0.19	0.07
M N(0,200)	0.64	0.47	0.54	0.17	0.07
M N(0,400)	0.60	0.46	0.53	0.14	0.07
M N(0,600)	0.56	0.44	0.51	0.12	0.07
M N(0,800)	0.53	0.42	0.49	0.11	0.07
M N(0,1000)	0.50	0.41	0.47	0.09	0.06
M N(0,1500)	0.46	0.39	0.45	0.07	0.06

Table A6.2. A poor household's probability of moving one class up.

	P12				
	Entering crises	Normal	Exiting crisis	Difference entering-normal	Difference Exiting-normal
Sample	0.16	0.27	0.25	-0.11	-0.02
M N(0, 200)	0.18	0.27	0.25	-0.09	-0.02
M N(0, 400)	0.20	0.27	0.25	-0.07	-0.02
M N(0, 600)	0.21	0.26	0.26	-0.05	0.00
M N(0, 800)	0.22	0.25	0.25	-0.03	0.00
M N(0, 1000)	0.21	0.23	0.24	-0.02	0.01
M N(0, 1500)	0.19	0.19	0.19	-0.00	0.00

Table A6.3. The probability for households in income class 2 of becoming poor.

	P21				
	Entering crises	Normal	Exiting crisis	Difference entering-normal	Difference Exiting-normal
Sample	0.35	0.31	0.38	0.04	0.07
M N(0, 200)	0.37	0.31	0.37	0.06	0.06
M N(0, 400)	0.37	0.31	0.37	0.06	0.06
M N(0, 600)	0.38	0.32	0.38	0.06	0.06
M N(0, 800)	0.38	0.32	0.38	0.06	0.06
M N(0, 1000)	0.38	0.33	0.39	0.05	0.06
M N(0, 1500)	0.38	0.34	0.39	0.04	0.05

Table A6.4. The probability for households in income class 5 of remaining in class 5.

	Staying probabilities: P55				
	Entering crises	Normal	Exiting crisis	Difference entering-normal	Difference Exiting-normal
Sample	0.56	0.54	0.49	0.02	-0.06
M N(0,200)	0.55	0.54	0.47	0.01	-0.07
M N(0,400)	0.54	0.54	0.46	0.00	-0.08
M N(0.600)	0.54	0.53	0.45	0.01	-0.08
M N(0,800)	0.54	0.53	0.44	0.01	-0.09
M N(0,1000)	0.53	0.52	0.43	0.01	-0.09
M N(0.1500)	0.51	0.49	0.43	0.02	-0.06

Appendix 7: Monte Carlo simulations of the impact on the transition probabilities in the normal matrix, crisis matrix and exiting matrix of a multiplicative measurement error, according to variability of the error.

TableA7.1. A poor household's probability of moving one class up.

	P12				
	Entering crises	Normal	Exiting crisis	Difference entering-normal	Difference Exiting-normal
Sample	0.16	0.27	0.25	-0.11	-0.02
M N(0, 0.05adjY)	0.17	0.27	0.25	-0.10	-0.02
M N(0, 0.10adjY)	0.17	0.27	0.25	-0.10	-0.02
M N(0, 0.15adjY)	0.18	0.26	0.25	-0.08	-0.01
M N(0, 0.20adjY)	0.19	0.25	0.24	-0.06	-0.01
M N(0, 0.25adjY)	0.19	0.25	0.23	-0.06	-0.02
M N(0, 0.40adjY)	0.19	0.22	0.21	-0.03	-0.01

Table A7.2. The probability of a household in income class 2 of becoming poor in the next period.

	Staying probabilities: P21				
	Entering crises	Normal	Exiting crisis	Difference entering-normal	Difference Exiting-normal
Sample	0.35	0.31	0.38	0.04	0.07
M N(0, 0.05adjY)	0.38	0.31	0.37	0.07	0.06
M N(0, 0.10adjY)	0.37	0.31	0.37	0.06	0.06
M N(0, 0.15adjY)	0.37	0.31	0.37	0.06	0.06
M N(0, 0.20adjY)	0.37	0.31	0.38	0.06	0.07
M N(0, 0.25adjY)	0.37	0.32	0.38	0.05	0.06
M N(0, 0.40adjY)	0.40	0.36	0.41	0.04	0.05

Table A7.3. The probability of remaining in income class 5.

	Staying probabilities: P55				
	Entering crises	Normal	Exiting crisis	Difference entering-normal	Difference Exiting-normal
Sample	0.56	0.54	0.49	0.02	-0.05
M N(0, 0.05adjY)	0.55	0.54	0.47	0.01	-0.07
M N(0, 0.10adjY)	0.54	0.54	0.45	0.00	-0.09
M N(0, 0.15adjY)	0.53	0.53	0.44	0.00	-0.09
M N(0, 0.20adjY)	0.52	0.51	0.43	0.01	-0.08
M N(0, 0.25adjY)	0.51	0.50	0.42	0.01	-0.08
M N(0, 0.40adjY)	0.47	0.46	0.39	0.01	-0.07

Essay 2

Company Influence on Foreign Aid Disbursement: Is Conditionality Credible when Donors have mixed motives?

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January 2003

Abstract

When donors enforce conditionality upon recipients who do not implement the conditions, companies can suffer from cancellation of their contracts with the recipient when aid dries up. A strategic recipient may avoid implementing controversial conditions by only granting a contract to a company that puts pressure on the donor to keep aid flowing. In our model, each of the three agents takes account of each of the two other agents' actions. We show that this triadic structure can be crucial when explaining recipients' use of companies to influence donors to give aid unconditionally. In contrast to the Samaritan's dilemma explanation for the failure of conditionality, ours is time-consistent.

Keywords: Triadic; Foreign Aid; Credibility; Fungibility; Samaritan's dilemma

JEL classification: E61; F35

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1. Introduction

Empirical evidence indicates that poor countries frequently abstain from implementing the conditions that the donors have set as a requirement for granting foreign aid. Still, it is found that the aid is disbursed irrespective of the recipient's implementation record (Sachs 1989, World Bank 1992, Mosley et al. 1995, Collier 1997 and Svensson 2000a). The World Bank (1992) concluded that even though the compliance rate on World Bank conditions was only 50 %, the release rate of loans was nearly 100%. In other words, despite the donors' intentions of inducing the recipients to undertake what is perceived by the donor to be "good policies", usually regarding fiscal, monetary and trade policies to increase economic growth, it is found that aid does not induce these policies (Burnside and Dollar 2000).⁶⁰ Even more uncontroversial conditions like setting a certain minimum level of expenditures on health care and education seem to fail (World Bank 1992, Mosley et al 1995, Oxfam 1995).

The malfunctioning of conditionality is a serious problem for the donor community and the multilaterals because this instrument is viewed as a necessity for achieving the goals of aid (Kanbur 2000). At the same time, receiving aid is a very important income source for poor countries. On average, aid accounted for more than half of the central government expenditures for fifty of the most aid-dependent countries from 1975-1995 (World Bank 1998b), and a typical low-income country now receives around seven to eight percent of GNP in foreign aid (World Bank 1998a). This gives rise to a puzzle: If it is vital for the recipients to get aid, and also essential for the donor to have the conditions implemented, why cannot the seemingly powerful donors force the seemingly weak recipient to implement the conditions before aid is disbursed?

Ravi Kanbur's (2000) observations as a World Bank representative in Ghana in 1992 illustrate one potential explanation for the failure of conditionality. At this time, the Ghanaian government had refused to implement the conditions set by the World Bank for granting a loan, and the bank had to decide whether or not to disburse this loan. In this situation, private companies that had contracts with the Ghanaian government put pressure on the World Bank to release the loan because they were afraid of not getting paid. Eventually, the loan was disbursed without the implementation of the conditions, and Kanbur concludes that the pressure surrounding conditionality is important in explaining its failure. Thus, strategic

⁶⁰ There is a discussion in the literature about whether or not "good" macroeconomic policies are necessary for aid to induce economic growth. In addition to Burnside and Dollar (2000), see Hansen and Tarp (2000, 2001), and Dalgaard and Hansen (2000).

recipients may refuse to implement the conditions, and then threaten to cancel contracts with companies in order to put pressure on the donor to disburse aid.

Building upon the triadic⁶¹ modeling structure of Basu (1986), we consider the interdependence that sometimes arises between donors, recipients and large companies with interests in both countries.⁶² In this model the donor takes into account both his own and the company's relationship with the recipient when deciding on aid disbursement and, more generally, each of the agents always takes account of the triadic structure when making their decisions. If the recipient can influence the company to put pressure on the donor to disburse the aid, we show that this could make the donor provide the aid even when the recipient has not implemented the conditions. Hence, the recipient is not necessarily as weak as it may seem, because the recipient might be able to utilize the company's influence over the donor.

This paper is related to the literature on foreign aid in general, and to the work on the failure of aid conditionality in particular. Despite its importance, conditionality has received little attention with regards to theoretical modeling (Drazen 2000). The main contribution to the understanding of the failure of aid conditionality is Svensson's (2000c) principal-agent model where he illustrates how altruistic donors' time inconsistency problem gives rise to continued aid even when conditions are not implemented.⁶³ In Svensson's framework, the donor and the recipient share the perception that implementing the conditions improves the wellbeing of the recipient, so the recipient would implement some of the conditions even if the donor did not exist. The failure of conditionality arises because the level of poverty determines the amount of aid, and this gives incentives for the recipient not to implement costly poverty-reducing policy-conditions. Another contribution that illuminates the problem is Mosley et al. (1995) where they model the interaction between the donor and recipient as a

⁶¹ Most models of economics are dyadic, which means that all the agents interact pairwise. In a triadic model, an agent i does not only take account of his relationship with agent j , but also takes account of his own and agent j 's relationship with a third agent k . See Basu (2000) for a discussion on dyads and triads.

⁶² The main difference between our approach and Basu (1986) is that Basu aims at explaining how a landlord in a rural economy can be able to use a third party (a merchant) to extract a larger surplus from a laborer than would be possible without the third party's influence. Our focus is on foreign aid and, as opposed to Basu's model, we do not operate explicitly with markets. However, the important triadic structure is the same as the rural setting in Basu (1986).

⁶³ For other principal-agent models that discuss foreign aid, see Pedersen (1996) on how it is crucial for the donor to have the first mover advantage if aid is to increase investment, or Pedersen (2001) for an illustration of how adverse incentive effects of aid may cause poverty to increase due to a Samaritan's dilemma problem. See Drazen (2000) for a survey of the political economy of foreign aid. A related problem to the failure of conditionality is that aid can be fungible, see for example Hagen (2001).

dyadic bargaining game. They find that there will always be some slippage on the conditions that the recipient has agreed to implement.

In our model, we incorporate the empirical finding that there are frequently disagreements between the donor and the recipient on what constitutes “good policies” (Mosley et al. 1995, Dollar and Svensson 2000b, Kanbur 2000). The policies stated in the conditions will often harm politically important groups in the recipient country, and this can be critical for the political viability of the implementation of the conditions (Summers and Pritchett, 1993).⁶⁴ So we assume, *ceteris paribus*, that the recipient would prefer not to implement the conditions.

To substantiate the rationale for imposing conditionality, we assume that the donor follows the World Bank (1998a) in adhering to the empirical findings of Burnside and Dollar (2000) that aid only increases economic growth if the right macroeconomic policies are sustained. Thus, the donor conditions aid on these policies believing that implementation of the policy conditions is essential in order to achieve the intended effect from aid. So even if aid has some positive effects if the conditions are not implemented, the donor’s assessment is that granting aid is wasted in this situation. With this divergence of opinion, it is not necessary to restrict our focus to Samaritan donors, and this differs substantially from the existing work on foreign aid policy where time-inconsistency is crucial (see Mosley et al. 1995, Pedersen 1996, 2001, Svensson 2000c). Hence, our results are not related to the Samaritan’s dilemma.

Obviously, as Svensson (2000c) and World Bank (1998a) also note, donors’ rationale for giving aid may in reality be guided both by altruistic and self-interest motives. The empirical studies of Burnside and Dollar (2000), Trumbull and Wall (1994) and Alesina and Dollar (2000) all suggest that both motives are present among donors. Thus, we incorporate a self-interest motive and an altruistic motive in the donor’s preferences. So if a donor has self-interests with regard to its own domestic industries, and an altruistic motive for maintaining aid conditionality, we show how recipients can grant contracts strategically to companies with origin in the donor country and that this may cause a time-consistent failure of conditionality.

In general, the literature on foreign aid uses traditional dyadic models to explore the donor-recipient relationship, and we show why the triadic framework may be important in explaining the failure when companies are able to influence the donor’s disbursement decision. In our model, restricting the donor, the recipient and the company’s interaction to be

⁶⁴ Policy-conditions can yield a change in relative prices, reduced government spending and reduced absorption to achieve external balance, which in turn may hurt or benefit different groups in a country (Summers and Pritchett (1993).

dyadic yields the opposite results in comparison to allowing for triadic relations: Assuming dyadic interactions implies that the recipient is unable to influence the company's eventual pressure on the donor; this causes the recipient to implement the conditions, and conditionality becomes successful. Our framework should thus be regarded as complementary to Mosley et al. (1995) and Svensson (2000c). One novel policy implication that may be important for the players on the foreign aid scene is that this setup provides a rationale for donor guarantees to companies (from the donor countries) that operate in the recipient country.

This paper is organized as follows. The institutional background for triadic interactions in international relations is described in section 2, and a formal game-theoretic framework that models the interdependency between donors, recipient and companies is proposed and analyzed in section 3. Section 4 discusses suggestions for improving the record of conditionality, and section 5 provides some concluding remarks.

2. Institutional background

The literature on international relations offers anecdotal evidence of a number of triadic institutions in the world economy, and in this section we briefly provide some examples of how private companies are used as a third party to influence transactions between two agents. In explaining how parties other than the recipient influence a donor's decision of disbursing a loan, Kanbur (2000) reports his experience in 1992 when the World Bank assessed whether or not to release a tranche to Ghana:

“ In fact, as the representative of the World Bank on the ground, I came under pressure from several sources, some of them quite surprising, to release the tranche with minimal attention to conditionality. There was a steady stream of private sector representatives, domestic and foreign, arguing for release of the tranche both because of fears of what macroeconomic disruption would do to the business climate in general, and also because some of them had specific contracts with the government which were unlikely to be paid on time if the government did not in turn get the money from the World Bank and other donors. Yet others found their projects slowing up because government counterpart funds were not available, and many project agreements stipulate that donor money flows in a fixed relationship to government contributions. ... In the end, ... the tranche was released. ”

This illustrates the potential gain to a recipient of strategically influencing companies and other third parties to put pressure on the donor's disbursement decision. When Ghana's government is aware of this link between the donor and the company, it can effect cuts where it hurts companies most in order to increase the pressure on the donor. So if there is a company with strong ties to the donor waiting for a payment from the recipient, the recipient government could announce that there will be no payment unless the loan is disbursed. If the announcement is credible and the company is able to influence the donor, then the recipient could neglect conditionality and expect that the pressure towards the donor will release the loan. The recipient's actual reason for withholding the payment, whether it is due to lack of liquidity or because the recipient is using strategic behavior, is difficult for the other parties to reveal.

Strategic use of third parties in international lending need not involve donors. Gwynne's (1983) account of his role as a loan officer in an American bank in a ten million dollars loan to a Philippine construction company gives insight into private banking decisions that are seldom revealed to the public. The construction company had a leverage ratio of seven to one, meaning that the debt was so high compared to the equity that, in Gwynne's own words, "it might be pure insanity to make this loan". However, the construction company was going to use the loan to purchase equipment from an American company that was also an old client of this particular bank. The chief financial officer of this equipment company put pressure on the bank's loan officer to grant the loan so they could get the contract with the construction company. Even though it is not explicitly stated, both the bank and the equipment company were aware of the large amounts of funds the bank was administering for the equipment company through demand deposits and pension funds. Ten minutes after a call from one of the executives of the equipment company, emphasizing the importance of the deal, the president of the bank called to put pressure on the loan officer to submit the case to the bank's loan committee, irrespective of the borrower's repayment ability.

It seems clear that no loan would have been approved if it had been just a two-way relationship between the bank and the Philippine construction company. This illustrates the large potential for important customers of a bank to influence the bank's lending decisions to other parties. Lucrative contracts to a firm can imply large deposits to the bank, which in turn enable the bank to expand its lending.

Darity and Horn (1988) discuss similar relationships where American banks' lending to foreign companies was initiated for financing American exports both in the 1920s and the

1970s, particularly for lending to third world companies.⁶⁵ As the quote from Lewis (1938)⁶⁶ of observations in the 1920s illustrates, the phenomenon of companies securing a contract after influencing banks to grant credit to the company's customer is not a new one:

“...big American construction companies [that] sometimes helped finance public works in foreign countries sometimes secured their contracts on a competitive basis after the financing had been arranged.”

Similar ties can also be found between multinational companies and their home country governments, particularly because of the national interests attached to exports and to the companies' impact on the domestic economy.⁶⁷ Promoting their own companies' interests abroad is often part of a country's foreign policy.

3. The triadic structure

Let us now take a closer look at the difference between a dyadic and a triadic structure. Assume first that there is a traditional bilateral relationship between a donor and the recipient, where the donor adheres to conditionality. From the donor's point of view, maintaining conditionality implies that aid is only disbursed if the recipient has implemented the conditions. In line with the empirical findings, we also assume that the recipient would prefer not to implement these conditions, but subjects to the donor's demand because implementation results in aid being disbursed. Hence, in this pair-wise (dyadic) relationship, conditionality is successful. With these preferences established, we now open the stage for a *third* party that interacts with both of the two other agents. Introducing the third party could alter the outcome between the donor and the recipient so that conditionality fails, and whether we assume triadic or dyadic relations may be crucial for this result as we shall see below.

In our setting, the recipient is going to build a road. Let a construction company be the potential constructor and hence the third party. Assume also that the company is large and influential, so it has some leverage on the donor. We could treat the company's influence on

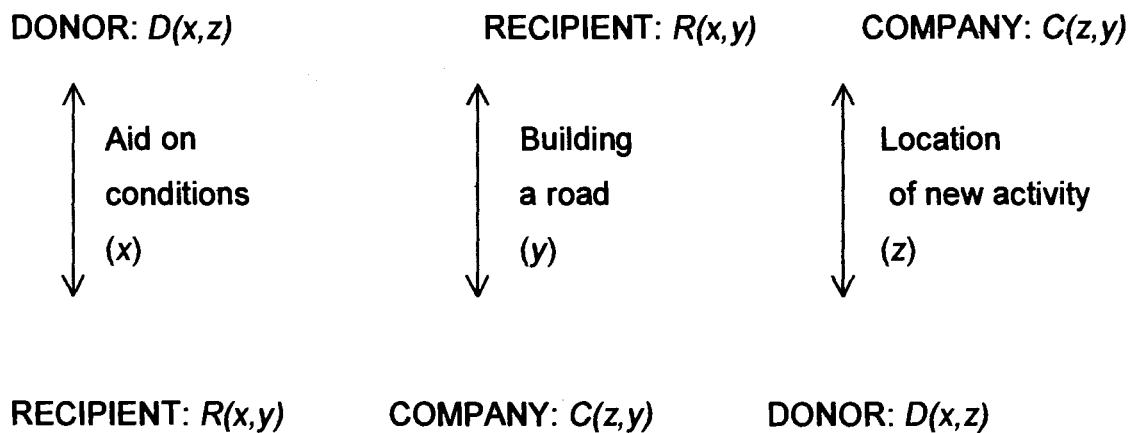
⁶⁵ For some indirect support of banks following their customers abroad, see Jain (1986), where he finds strong statistical support for US bank loans to a country and the contemporaneous US investment and trade activity.

⁶⁶ Quoted in Darity and Horn (1988).

⁶⁷ See for instance Cohen (1986), Darity and Horn (1988) and Wellons (1986) on the close relationships between “transnational” banks and the government in the country where the bank's headquarters are situated.

the donor as a black box, but for illustrative purposes we assume that the company is about to locate a new project, and that the donor is interested in having this project located in its own country. Note also that the donor is indifferent to whether or not the road is built. Let the aid conditionality relationship be denoted x , building the road y and the location z , and the payoff functions to the donor, recipient and company as $D(x,z)$, $R(x,y)$ and $C(z,y)$, respectively. Usually, one would think of the interactions between the three parties as dyadic, and such pair-wise relations between the parties can be illustrated by the following figure:

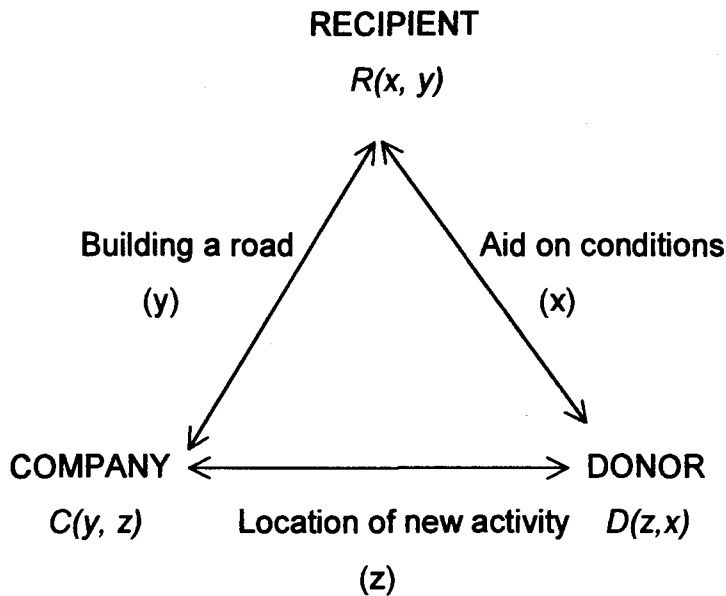
Figure 1. The traditional dyadic relationship



As can be seen from figure 1, each pair of agents interacts in isolation under the dyadic assumption, which implies that aid conditionality is not influenced by the introduction of the company.

However, assume now that the three agents are not bound to act pair-wise. In a general triadic structure with three agents, each agent's optimization problem does not only take into account its own interaction with the two other agents. In addition, each agent also takes account of the other agents' interaction with each other, as is illustrated in figure 2:

Figure 2. The influence of a third party on the donor-recipient relationship in triadic interactions.



The interesting cases in the triadic structure arise when one agent takes actions it would not have taken in traditional dyadic relations. In our triadic setting, the recipient may be able to make the company influence the donor's conditionality decision by making the contract to the company contingent upon the company's pressure towards aid disbursement. Assume that the recipient announces that it will give the road contract to the company only if the company manages to influence the donor to disburse the aid even when the conditions are not implemented. Thus, the company may be forced to use the location decision to influence the donor's disbursement decision in order to secure the contract: The company can let the donor know that it will only locate in the donor country if the donor disburses the aid. If the location is more important to the donor than enforcing aid conditionality, this pressure may cause the donor to disburse aid even if the conditions are not implemented, which is opposite to the result in dyadic relations.

Models of triadic interactions are usually *not* straightforward to solve, and in particular, the literature on triadic models raises important credibility issues. We therefore

develop the donor–recipient–company relationship in a formal framework to analyze the interactions.

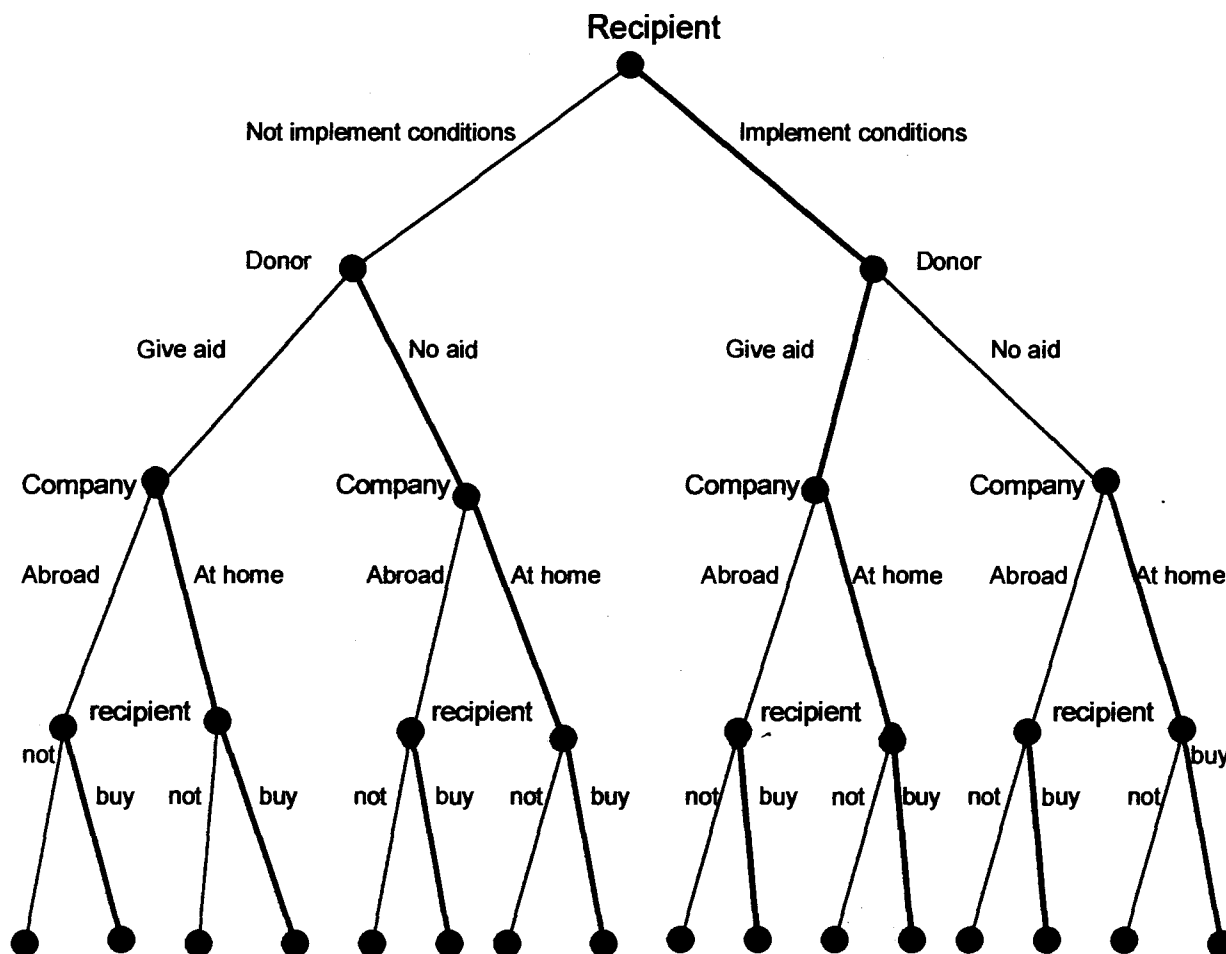
4. The Model

We use a game-theoretic framework to model the interaction between a recipient, a donor and a company, where the company has business in both the donor's and the recipient's country. In section 4.1 we develop the utility functions for the agents, and section 4.2 describes the payoffs necessary to illustrate the important features of the game. The outcome of the game when assuming dyadic relations shows that conditionality is successful under traditional assumptions of pair-wise interaction. This result is described in section 4.3. Section 4.4 discusses a triadic solution: Even though the recipient's threat of not giving the road contract to the company is not credible in the stage game, it becomes credible under certain conditions when we allow for infinitely repeated interactions. The subgame perfect equilibrium of the infinitely repeated game shows that it is possible for the recipient to lock the donor into repeatedly granting aid even if the conditions are not implemented.

In this game, it is common knowledge that the recipient will link the donor's disbursement decision to the road contract. No threat is explicitly stated, but the agents know that if the donor does not disburse the aid, then the recipient's intention is to refuse to give the contract to the company unless it locates the new activity abroad. This implicit triadic threat is meant to create a pressure towards the donor to give aid even if the conditions are not satisfied, and we will return to the credibility issue.

The timing of the game is as follows. At stage one, the recipient decides whether or not to implement some conditions defined by the donor *ex ante*, and at stage two the donor chooses whether or not to give aid to the recipient.⁶⁸ At stage three, the company decides on whether to locate a new activity in the donor's country, termed "at home", or some other country, which is denoted as "abroad". Finally, at stage four, the recipient decides on whether or not to pay the company for building a road in the recipient's country. The game tree in figure 3 illustrates the feasible actions, which will be elaborated upon in the following sections.

Figure 3. The game tree.



4.1 The general structure of the payoff functions

All three agents are assumed to be rational, forward-looking and acting in a utility- or profit-maximizing manner. The profit of the company can be represented as

$$(1) \quad C = C(m, s) \\ \quad \quad \quad + \quad +$$

⁶⁸ For other models with recipients as first movers, see Pedersen (1996), Svensson (2000) and Hagen (2001).

where s denotes the level of activity the company has in the donor country and m is the recipient's payment for the road. The company can choose to allocate its business between the donor's country and some other country different from the recipient. Let s^* denote the optimal size of its business in the donor's country. Assume that the company gets an assignment from an agent other than the donor and the recipient. Then the company must choose between locating these new activities to the donor's country, or to some other (third) country. Assume further that the optimal choice for the company, *ceteris paribus*, is to locate the new activities to the donor's country, and let the optimal size of the company's activities in that country be denoted s^* . Hence, if the new activities is located elsewhere, this would represent a net cost for the company compared to locating in the donor's country. Let this non-optimal size of the company's activities in the donor's country be denoted by $s'' < s^*$, and let the difference $s^* - s''$ be interpreted as the cost of locating abroad.

The recipient's payment to the company, m , takes only two values: $m = m_0 = 0$ if the recipient does not buy the road, or $m = m_1 > 0$ if the recipient does buy the road. The price m_1 for the road should be understood as the result of negotiations between the recipient and the company, and hence we can assume that both parties are better off if the road is built for the price of m_1 compared to not having the road built.

The recipient, in addition to being better off paying m_1 and having the road built, also experiences an increase in utility R if the donor grants bilateral aid $a > 0$. However, the donor specifies a set of conditions, for instance some "sound" macroeconomic policies, which the recipient must implement in order to receive the aid. Let c be a dummy variable that indicates whether or not these conditions are implemented, let $c_1 = 1$ denote that the conditions are implemented, and $c_0 = 0$ that they are not.

Even if implementing the conditions would result in increased growth in the recipient's country, we assume that the altered policies would redistribute resources from groups that are favored by the recipient government. Hence, when we incorporate the political costs of implementing conditions, we assume that the net impact on the recipient's utility of implementation is assumed to be negative.^{69,70} So, in the absence of aid, or if aid was given

⁶⁹ Net costs from implementing conditions that increase growth could also arise if the conditions also increase inequality, if equality is highly valued by the government. Note also Hansen and Tarp's (2001) empirical finding that aid increases growth irrespective of policies, which implies that implementing the conditions will *not* increase growth. This supports our assumption of negative utility of implementation because in this case there is no gain from growth of implementation, only the political costs.

unconditionally, the recipient in this model would not implement the policies stated in the conditions. The recipient's utility function can then be expressed as

$$(2) \quad R = R(m, a, c)$$

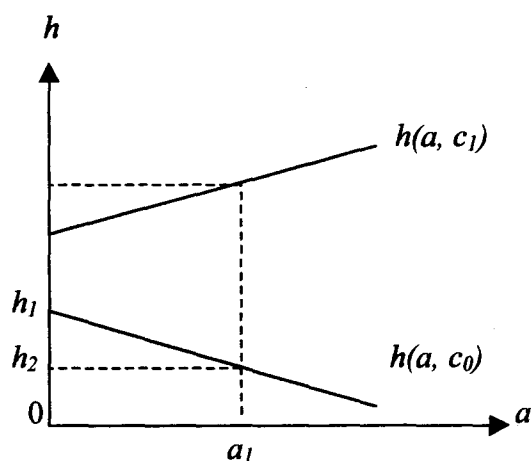
+ + -

We assume that the donor's utility is increasing in the amount of aid granted if the recipient complies with the conditions. So if the conditions are not implemented, the donor believes it is a waste giving aid because macroeconomic disruption would cause the aid to have no effect. Then the donor prefers not to give the aid. However, if aid is still given in this situation, the donor has a decreasing utility in the amount disbursed because giving more aid means losing more funds. Consistent with the idea of conditionality, this means that, *ceteris paribus*: (1) It is rational for a donor to grant aid to the recipient if it implements the conditions, and (2) It is rational not to grant aid if the conditions are not implemented.

The idea of conditionality can then be captured in the donor's utility function, D , which, for the sake of simplicity, is assumed to be differentiable: Define the aid conditionality function $h(a, c)$ and let D depend on h in that $\partial D / \partial h > 0$, where h is increasing in a if $c = c_1$, and decreasing if $c = c_0$. Since the donor believes that implementation of the conditions yields the best policies for the recipient, the utility of the donor is increased if the recipient were to implement the conditions even in the absence of aid (i.e. $h(a, c_0) < h(a, c_1)$). The donor's preferences with regard to conditionality can be illustrated in the following figure:

⁷⁰Empirical studies support our assumption that donors impose conditionality on unwilling recipients (Mosley et al. 1995, Kanbur 2000), and this lies at the heart of conditionality: If the recipient agreed on implementing the conditions, there would be no need for the donor to condition aid on their implementation. The recipient would simply implement the policies irrespective of the aid. Mosley et al. (1995) argue that the recipient will resist any attempt of influence through conditionality that does not harmonise with its own political priorities or economic analysis. Kanbur (2000) also notes that "Conditionality is no doubt "imposed" on unwilling recipients at the time of signing the document...", and Summers and Pritchett (1993) argue that stabilising policies will change relative prices in disfavor of concentrated and visible groups in the recipient country.

Figure 4. The donor's motive for conditionality (the donor's utility increases in h : $\partial D/\partial h > 0$)



Take any given amount of aid, for example a_1 . Note that according to the partial aid conditionality function, the donor would be worse off if it must disburse aid when the conditions are not implemented (h_2), compared to not giving aid in that situation (h_1). In addition, the donor is interested in having as much of the company's activity located in its own country as possible. Hence, the company's scale of business in the donor's country, s , is also included in the donor's utility function, D , which we can state as

$$(3) \quad D = D(h(a, c), s)$$

The donor's preferences in this model, as stated in (3), then reflect the empirical findings that both self-interest and altruistic motives play a role for the donors (Trumbull and Wall 1994, Alesina and Dollar 2000)^{71 72}.

⁷¹ Trumbull and Wall (1994) suggest that among other unobserved motives for giving aid, is "their [the recipients] strategic value to the donors". Alesina and Dollar (2000) find that the direction of foreign aid disbursement is determined as much by political and strategic considerations as by poverty and policy performance of the recipients.

⁷² The well-known institution of tied aid, where donors link their funds to procurement of investment goods from companies in the donor country, is also supportive of the assumption that consequences for domestic industry are taken into account in foreign aid policy.

4.2 Specific payoffs⁷³

To keep the analysis as simple as possible, and to highlight the endogeneity of the implementation of the conditions, assume that the parameter values a_0 , a_1 , m_0 , m_1 , s^u and s^* are exogenously determined.⁷⁴ Moreover, assume that the donor and the recipient have signed a contract ex ante, which guarantees a certain amount of aid a_1 to the recipient if the recipient implements some conditions c_1 . The contract also states that if the recipient does not implement the conditions, then there will be no aid disbursement, and let “no aid” be denoted $a_0 = 0$.

Initially, we assume that the recipient prefers to fulfil the conditions and get the aid, compared to refraining from the aid/conditionality package: $R(m, a_1, c_1) > R(m, a_0, c_0)$. The recipient’s utility is determined by whether or not the road is built, whether or not aid is granted and whether or not conditions are implemented:

- (4) $R_a = R(m_1, a_1, c_0)$ buy road, get aid, not implement conditions
- (5) $R_b = R(m_1, a_1, c_1)$ buy road, get aid, implement conditions
- (6) $R_c = R(m_1, a_0, c_0)$ buy road, no aid, not implement conditions
- (7) $R_g = R(m_0, a_0, c_0)$ no road, no aid, not implement conditions

From the assumptions of the recipient’s utility function, note that $R_a > R_b > R_c > R_g$.⁷⁵

The company’s payoff depends on whether or not it is granted the road-contract and whether or not it locates its new activity in the donor country:

- (8) $C_a = C(m_1, s^*)$ road is built and location in the donor’s country
- (9) $C_b = C(m_1, s_u)$ road is built and location in another country (abroad)
- (10) $C_c = C(m_0, s^*)$ road is not built and location in the donor’s country

Recall the assumption that if the road contract is not tied to the company’s location decision, then the company would always choose to locate at home. Note also that usually, the

⁷³ It could be more confusing than clarifying to display all possible payoffs for all players in these games, so only the payoffs necessary to illustrate the important equilibria of the games are described.

⁷⁴ The amount of bilateral aid that is to be granted to a particular recipient can also be determined outside the donor agency, for instance in a parliamentary committee. This is only a simplifying assumption that does not influence the results.

⁷⁵ Note also that we let the subscripts of the utilities of each player follow the alphabetical order to indicate the ranking of that player’s utility.

infrastructure projects must be of a substantial dimension to attract multinational companies. Thus, we assume that it is a large road project to be built and that the contract is of great value to the company. In this setting, then, it seems most realistic to assume that the value to the company of the road contract is larger than the cost of locating the new activity abroad. Hence, let the company always choose to “build the road and locate abroad” instead of “not build the road and locate the new activity in the donor’s country” if it must choose between the two:

$$(11) \quad C_b > C_c$$

By assumption, then, $C_a > C_b > C_c$.

As stated above, the recipient intends to withhold the contract from the company unless the company locates the new activities abroad in case no aid is granted. Thus, the donor’s choice of giving aid or not in a situation where the recipient has not implemented the conditions may be determined by which of the states yield the highest utility for the donor: Either to achieve

$$(12) \quad D_l = D(h(a_0, c_0), s_u)$$

by not granting the aid (and hence maintaining conditionality) and losing the company’s new activities to a another country, or to achieve

$$(13) \quad D_c = D(h(a_1, c_0), s^*)$$

by giving aid and having the new activity located in the donor country.

We assume that the donor is more concerned about the activities in its own country than the potential waste that could occur in the aid-conditionality scheme. So losing the new activity to another country is considered a substantial loss for the donor, while the waste of granting the aid when the conditions are not implemented is considered to be less severe. Hence, we assume

$$(14) \quad D_c > D_l.$$

Note also that the donor achieves its highest feasible payoff in this game if aid is disbursed when the recipient has implemented the conditions and the company locates in the donor country. This case is defined by

$$(15) \quad D_a = D(h(a_1, c_1), s^*).$$

Before turning to the triadic game, we explore the outcome of the game if the players interact in a pairwise manner.

4.3 The dyadic outcome

Assume for now that the three players are restricted to only interact pair-wise, that is, we impose traditional dyadic relations in the game. Since this assumes that it is not possible for the donor to take account of the recipient's relationship with the company when interacting with either the company or the recipient, the dyadic donor-recipient game is restricted to the two first stages of the stage game in figure 2. Then we can see from the backward induction solution in the game tree in figure 2 that conditionality is successful because the recipient will always implement the conditions to get the aid. Hence, the outcome will be (*implement conditions, give aid*).

In the interaction between the company and the recipient regarding the road-contract, we have by assumption that they have found a price that is acceptable to both. Hence, the outcome will be (*buy road*). Similarly, for the interaction between the company and the donor, we have assumed that the optimal location for the company is in the donor country, and this is also the best result for the donor. Therefore, the outcome will be (*locate at home*). From these actions, it is evident from (5), (8) and (15) that the payoffs to the recipient, the company and the donor will be R_b , C_a and D_a , respectively.

It is essential to notice that the donor achieves its best feasible payoff if we have dyadic interactions. However, it is evident that there is a gain for the recipient if it is able to get aid without implementing the conditions, but this would induce a loss for the donor. So in order to capture this gain, the recipient can go into an alliance with the company. This three-party structure requires a triadic framework to be fully analysed.

4.4 The failure of conditionality in the triadic structure

From the game tree in figure 3, the backward induction outcome of the triadic stage game reveals that the recipient's threat is not credible because it is in the recipient's own interest to

grant the road contract to the company at stage four. So the subgame perfect equilibrium path of the stage game follows the sequence that the recipient implements the conditions, the donor disburses the aid, the company locates in the donor country and the recipient grants the road-contract: *(implement, aid, home, m_1)*.⁷⁶ Thus, compared to the payoff in subgame perfect equilibrium of the stage game, there would be a gain to the recipient if it could manage to get aid without implementing conditions.

Since the company is sure to have the road contract in this game, the recipient needs another “carrot” to make the company willing to punish the donor, because locating abroad imposes a cost on the company. In other words, if the donor does not disburse aid, then the recipient must compensate the company for taking these costs. The repeated nature of the failure of aid conditionality leads us to investigate the game in infinitely repeated interactions when such a compensation is offered.

We show here that by repeating the stage game infinitely, the recipient’s threat may become credible if it shares some of the gain by offering a road contract on better terms than the original contract m_1 . Hence, a subgame perfect equilibrium where the donor must grant the aid without the conditions being implemented can be sustained.⁷⁷ Two differences need to be highlighted. First, we assume now that the company is able to switch parts of its tax base between its branch in the donor’s country and a branch in another country, and this decision replaces the company’s decision of location at stage three. To follow the specified payoff function of the company (section 4.1), assume that the tax system in the donor’s country is slightly more preferable to the company than the tax system in the other country. So an optimal tax decision in isolation from other concerns would be to render the full tax base to the donor country’s tax authorities.

The second modification of the game is more important. Assume that the recipient may offer the company a strictly more favorable contract, m_f , compared to the contract described in section 4.1, so $m_f > m_1$.⁷⁸ Then let the game tree in figure 2 describe the players’

⁷⁶ The bold lines in figure 2 show the optimal choice for each agent at each stage, so the subgame perfect equilibrium path of the stage game is easily traced.

⁷⁷ Such a result might also be maintained in more short-term relationships. An example of how allowing for a simultaneous coordination game with one good and one bad equilibrium to be played between the recipient and the company after the fourth stage in the original stage game can yield a credible threat is available from the author upon request.

⁷⁸ See Hatlebakk 2002 for the idea of offering a favorable contract in the triadic structure. See the appendix for the differences between the two theoretical solutions.

feasible actions each year. Together with the payoff functions in section 4.1 and the restrictions in section 4.2, this game tree describes the stage game that is repeated infinitely. Here we provide the intuitive explanation for the existence of a subgame perfect equilibrium where aid is disbursed when conditions are not implemented, and describe its 4 necessary conditions. For the mathematical representation of the conditions and the proof of the equilibrium, see the appendix.

Assume that the recipient applies a trigger strategy where it announces that it will only offer the favorable contract each year as long as the company complies with the recipient and influences the donor to keep the aid flowing even if the conditions are not implemented. Then, from the recipient's perspective, the company complies as long as it locates abroad if aid is not disbursed, but also if it locates at home when aid is granted. If the company does not comply in a particular year, the recipient will play according to the subgame perfect equilibrium of the stage game and hence offer the regular contract, m_1 , forever after. In that case, the company loses the opportunity to earn the extra profit from the favorable contract in the future, and that serves as the recipient's punishment of the company for not complying.

Assume further that the company also applies a trigger strategy, where it will only punish the donor for not giving aid as long as the recipient has offered the favorable contract in the previous years. Should the ordinary contract be offered, then this triggers the company to play according to the subgame perfect equilibrium of the stage game for ever. Thus, offering an ordinary contract implies that the company will never punish the donor in the future, which in turn removes the recipient's opportunity to get aid without implementing the conditions forever after.

The recipient and the company's trigger strategies are crucial in this game, but in order to explain the necessary conditions for the equilibrium of interest, we need to specify the full set of the players' strategies. So let one element in the players' strategy profile be to play according to the sequence (*not implement, aid, home, m_f*), the equilibrium path, as long as no player deviates from this path.⁷⁹ Assume further that the other part of the players strategy profile is that any deviation from the equilibrium path by any player leads to one of the two following paths: The first is (*not implement, no aid, abroad, m_f*). This path can be termed "the donor-specific punishment path" because it is followed once only for the situation where the donor does not give aid and the company complies with the recipient and punishes the

⁷⁹ See Abreu (1988) for the specification of strategies in terms of *paths*

donor by locating abroad. In case this deviation from the equilibrium path occurs, the players revert to the equilibrium path in the next stage game. The second is the path that may be triggered by the recipient or the company from the trigger strategy specified above: If the company does not comply, that is if it locates at home in a situation where no aid is given, or if the recipient does not offer a favorable contract, then this triggers the subgame perfect equilibrium of the stage game forever: (*implement, aid, home, m_1*). This can be termed “the company-specific punishment path”. Moreover, this path is triggered by any other deviation from the equilibrium path than the donor specific punishment path, and hence, both the recipient’s and the company’s trigger strategies described above are contained in this strategy profile.

Now turn to the necessary conditions for these strategies to yield an subgame perfect equilibrium where the recipient succeed in having aid without implementing the conditions. It is straightforward to see that if maintaining conditionality is very important for the donor while the company’s location is not, then aid may not be disbursed if the conditions are not implemented even if the company should punish the donor for not giving aid. In this case, there is no scope for the recipient to use the company to influence the donor. Hence, the first necessary condition is that if the conditions are not implemented, then the donor must be better off to disburse aid and have the location to its own country, compared to not giving aid and losing the location abroad.⁸⁰ The assumption that donor self interests may overshadow other goals in foreign aid policy seems to be well documented for several large contributors of foreign assistance, as noted above.

The second condition is that the company must be willing to take the cost of rendering its tax base to another country in case the donor does not disburse aid. If the company is not willing, then the recipient has no means of influencing the donor. So assume that the recipient has not implemented the conditions and the donor has rejected to disburse aid. Then two important scenarios can be depicted.⁸¹

In the first scenario, the company chooses not to comply with the recipient, and hence continue to render its tax base to the donor’s country. Then the company can secure itself the payoff from the subgame perfect equilibrium of the stage game each year, because non-cooperation triggers this outcome forever.

⁸⁰ See (14) in the appendix.

⁸¹ Several scenarios can be depicted, but for rational players maximising their payoff, these two are the scenarios of interest. For the exact specification, see the appendix.

In the second scenario, the company complies with the recipient and punishes the donor. Hence, the company follows the donor specific punishment path and incurs the cost that particular year when locating abroad. This secures the company m_f in that stage game, since the recipient's strategy is to offer a favorable contract as long as the company complies. Then, according to the strategy profile, all will play according to the equilibrium path forever after which results in the highest feasible yearly payoff to the company.

So if the recipient is to get aid without implementing the conditions, then the company must be better off in the latter scenario. If this is the case, then the company would actually carry out the punishment of the donor in case no aid is given. Hence, the second condition implies that the company must be sufficiently patient to await the future reward of cooperating: The discounted payoff from following the subgame perfect equilibrium of the stage game must be lower than the total discounted payoff from punishing the donor once for not giving aid and then "being rewarded" with the favorable contract (and locate at home) forever after. In other words, the second necessary condition implies that the company's extra profit from the favorable contract must be sufficiently large to allow for punishment, given the company's discount factor. The intuition is that the company will maintain cooperation with the recipient and punish the donor once if warranted in order to continue to get a share of the recipient's gain from having aid without implementation.

Now turn to the third necessary condition. Assume that all behave according to the recipient's intentions and follow the equilibrium path, which implies that the recipient has not implemented the conditions, the donor has given aid in fear of being punished and the company has located at home. In this case, the recipient can grab a rent by offering an ordinary contract, m_1 . Hence, by walking away from the stated promise of offering a favorable contract, the recipient can achieve both the gains from having aid without implementing the conditions and save itself the costs of offering the company a favorable contract. However, this triggers the subgame perfect equilibrium of the stage game forever after, because the company requires the favorable contract to cooperate. Hence, the third condition is that the favorable contract must not be so costly for the recipient that it is worthwhile to grab the rent by offering an ordinary contract when the other players follow the equilibrium path and then having the outcome of the subgame perfect equilibrium forever after, compared to not deviating from the equilibrium path every year.⁸² Note that a "costly

⁸² See condition (18) in the appendix.

contract” in this setting could imply a high value of the favorable contract in terms of money, but also that the recipient is impatient.

The same reasoning can be used to see that the recipient must also be better off to follow the donor specific punishment path in case the conditions are not implemented, aid is not given and the company complies and locates abroad. This fourth conditions arise from a similar situation as described in the previous paragraph: The recipient can grab a one period surplus by offering m_1 , instead of following the donor specific punishment path and offer m_f . The former offer triggers the subgame perfect equilibrium of the stage game forever, while the latter results in the equilibrium path being played forever. Hence, the final conditions is that offering m_f must yield a higher total discounted payoff to the recipient than offering m_1 in a situation where the company has punished the donor for not giving aid.⁸³ This may not very different from the third condition, and we show in the appendix that these conditions become identical if the recipient’s utility loss of offering a favorable contract compared to an ordinary is constant.

So if these conditions are satisfied, the recipient starts out by declining to implement the conditions. Then the donor gives the aid, the company does not alter its optimal location of tax base, and the company is granted the favorable contract. Hence, in our subgame perfect equilibrium, the yearly payoff to the recipient, the donor and the company will be $R(m_f, a_1, c_0)$, $D(h(a_1, c_0)s^*)$, $C(m_f, s^*)$, respectively. If the donor were to deviate from the equilibrium path and refuse to disburse the aid in a given year, the company will punish the donor that year by shifting its tax base to another country. Then the players, in accordance with their equilibrium strategies, revert to the equilibrium path the following year.

This result sheds light on what may happen in these relations over time. The recipient ensures that the company puts pressure on the donor by offering a share of the gain attained by getting aid without implementing conditions. Note also that the utility of the donor if it did not involve itself in giving aid would have been

$$(16) \quad D_j = D(h(a_0, c_0), s^*) > D(h(a_1, c_0), s^*).$$

Hence, the donor would in fact be better off if it had never entered the arena of aid at all. This is due to the fact that the donor believes it is a waste of money to give aid when the conditions

⁸³ See condition (17) in the appendix.

are not implemented, but is forced to disburse the aid because of the fear of losing some tax income abroad.

5. Aid institutions for preventing strategic behavior

Despite the abstraction from a number of issues relevant for the interaction between donors, recipients and private firms at the development scene, our model offers new insight into the failure of aid conditionality. When building aid institutions, an important question to the donor is how to make the recipient implement controversial conditions when there is scope for strategic behavior. Three suggestions emerge from the above analysis and are only briefly noted here: Delegation of the disbursement decision, governmental guarantee schemes and cooperation between the donor and the company.

Delegation to an agent with different objectives is often used as a means to avoiding commitment problems. Svensson (2000c) shows that delegating responsibility to a donor agency with less aversion to poverty than the donor can be optimal when the donor is unable to commit itself. In our model, however, it is only required that the agency to which the responsibility is delegated does not have interests competing with the concern for the aid/conditionality decision. It follows from the structure of the infinitely repeated game that as long as the agency is indifferent with respect to the company's tax-base decision, there is no scope for the recipient's strategic behavior.

Another opportunity for the donor to enforce conditionality, is to offer a governmental guarantee that the company shall not become worse off from engaging in the recipient's country than the equilibrium payoff.⁸⁴ Take the infinitely repeated game first. Once the company has been chosen as the constructor of the road, the donor can guarantee compensation equal to the company's loss if it is denied the favorable contract. Such a scheme is credible without a contract as long as the donor is better off redeeming the guarantee than being forced to give aid without the conditions implemented. On the margin, the donor would set the monetary value of the guarantee, denoted G , equal to the monetary loss for the company if the recipient carries out its threat and punishes the company. Hence, in the infinitely repeated game, the company must at least be guaranteed a compensation for the favorable contract, so $G \geq m_f - m_1$ must be satisfied every year. Then, if paying G to the company is better for the donor than to take the loss of giving aid without conditions

implemented, which is $D_a - D_c$, the guarantee scheme is credible. In addition, if the donor and the company are from the same country, this could be set up in an enforceable contract and, hence, the guarantee would be credible without the donor's condition for a credible scheme to be satisfied. Either using a guarantee or a contract secures that the recipient's threat to influence the company would not have a bite.

The last suggestion on mitigating the problem of a strategic recipient could be for the company and the donor to agree on speaking with one voice on issues involving the recipient. It is straightforward to show that there will be no scope for strategic behavior in such a setting as long as a joint body between the donor and the company attaches sufficiently low weight to the company interests. Keeping in mind the close ties between many of the large northern private firms with interests in developing countries and their governments as exemplified by tied aid, such a constellation does not seem too unrealistic.

6. Concluding remarks

While earlier work has pointed towards time inconsistencies of altruistic donors as an explanation for the failure of aid conditionality, this paper sheds light on failure arising from company influence on the disbursement decision. Supported by the institutional setting in which the donor–recipient relationship is embedded, our model suggests that recipients can influence the decision of granting aid through introducing commercial interests into the game. Such strategic behavior can enable a recipient to avoid implementing the conditions attached to the aid.

It is also found that a donor subjected to credible threats could in fact be better off by never involving itself in the aid-relationship. When donors perceive that giving aid when the conditions are not implemented is equivalent to wasting the money, they would rather withdraw over time when forced by private companies to give aid when the conditions are not implemented. Even if players' preferences are constant in game-theoretic models, we believe that donors might be less eager to give aid over time if they are subjected to the type of strategic behavior modeled here. Then the trend of reducing the level of aid (World Bank 1998a) over the last decade is not surprising in light of our model.

These problems of strategic behavior arise because of the recipient taking advantage of the donor's many competing interests, and the model offers some theoretical solutions. One

⁸⁴ One empirical example of governmental guarantees for national companies that engage in poor countries can be found in the Norwegian Guarantee Institute.

possible solution to this problem is to give governmental guarantees to companies that involve themselves in the recipient country. Another way to deal with this particular strategic behavior, would be to delegate the disbursement decisions to an agent who is confined to maintaining the prevailing disbursement policy. Finally, by creating a joint body for donor and company interests towards the recipient one would also be able to maintain conditionality.

Appendix: The subgame perfect equilibrium in infinitely repeated games and the proof.

1. The required assumptions

Four assumptions are necessary for there to be a subgame perfect equilibrium in the infinitely repeated game described in section 4.4:

1. If the recipient has not implemented the conditions, the donor must be better off to disburse the aid in the case where the company locates at home, compared to not giving aid in a situation where the company locates abroad:

$$(14) \quad D(h(a_1, c_0), s^*) > D(h(a_0, c_0), s^u).$$

2. The company must be better off to locate abroad and have the favorable contract once, and then locate at home and have the favorable contract forever, compared to playing according to the subgame perfect equilibrium of the stage game in every period:

$$(16) \quad \frac{1}{1-\delta^C} C(m_1, s^*) < C(m_f, s^u) + \frac{\delta^C}{1-\delta^C} C(m_f, s^*)$$

$$\Rightarrow m_1 + s^* < (1-\delta^C)(m_f + s^u) + \delta^C(m_f + s^*)$$

$$\Rightarrow s^* - s^u < \left(\frac{1}{1-\delta^C}\right)(m_f - m_1)$$

where δ^C is the company's discount factor. This condition implies that the adjusted profit from the favorable contract must be sufficiently large to allow for punishment once. Moreover, the contract must be of such a value that $\delta^C > \hat{\delta}^C$ where

$$(16b) \quad \hat{\delta}^C = \frac{m_f - m_1 - s^* + s^u}{s^* - s^u}$$

is the critical discount factor from (16).

3. The recipient must be better off to give the favorable contract in a situation where the company has punished the donor for not giving aid , and then play according to the equilibrium path, compared to giving an ordinary contract after the company has punished the donor for not giving aid and then play according to the subgame perfect equilibrium of the stage game:

$$(17) \quad R(m_f, a_0, c_0) + \frac{\delta^R}{1 - \delta^R} R(m_f, a_1, c_0) > R(m_1, a_0, c_0) + \frac{\delta^R}{1 - \delta^R} R(m_1, a_1, c_1)$$

where δ^R is the recipient's discount factor. $\delta^R \in \langle 0, 1 \rangle$, which implies that δ^R must satisfy $\delta^R > \hat{\delta}^R$ where

$$(17b) \quad \hat{\delta}^R = \frac{R(m_1, a_0, c_0) - R(m_f, a_0, c_0)}{R(m_1, a_0, c_0) - R(m_f, a_0, c_0) + R(m_f, a_1, c_0) - R(m_1, a_1, c_1)}$$

is the critical discount factor from (17).

4. The favorable contract must not be so costly for the recipient that it is not worthwhile to offer this contract to get aid without implementing the conditions in every period, compared to deviate from the equilibrium path by giving an ordinary contract and then have the subgame perfect equilibrium of the stage game forever:

$$(18) \quad \frac{1}{1 - \delta^R} R(m_f, a_1, c_0) > R(m_1, a_1, c_0) + \frac{\delta^R}{1 - \delta^R} R(m_1, a_1, c_1)$$

$$\Rightarrow \hat{\delta}^R = \frac{R(m_f, a_1, c_0) - R(m_1, a_1, c_0)}{R(m_1, a_1, c_1) - R(m_1, a_1, c_0)} \quad \text{where } \delta^R \in \langle 0, 1 \rangle$$

which implies that δ^R must satisfy $\delta^R > \hat{\delta}^R$.

2. The strategy profile

Suppose that (14) is satisfied and that $\delta^R > \hat{\delta}^R$, $\hat{\delta}^R$ and $\delta^C > \hat{\delta}^C$. Then the following complete strategy profile constitutes a subgame perfect Nash equilibrium:

Equilibrium path:

The players' sequence of actions is, at stages one to four, respectively: not implement conditions, give aid, locate in donor country, offer favorable contract; (c_0, a_1, s^*, m_f) .

Any deviation from the equilibrium path implies that one of the following punishment paths are followed:

-If the *donor deviates* from the equilibrium path and plays "no aid" after the recipient has played "not implement conditions": Play (s^u, m_f) , hence the donor specific punishment path (c_0, a_0, s^u, m_f) is played once. Then return to the equilibrium path.

-Any other deviation, by any player, from the equilibrium path or the donor specific punishment path: All agents play according to the stage game outcome (c_1, a_1, s^*, m_1) forever.

3. The proof

No player will deviate from the subgame perfect equilibrium of the stage game once triggered. Thus, neither the donor nor the company will deviate from the company specific punishment path if triggered.

The donor will never deviate from the equilibrium outcome if the payoff when being punished once for not giving aid when conditions are not implemented, $D(h(a_0, c_0), s^u)$, leaves the donor worse off than giving aid without the conditions being implemented and thereby avoiding punishment, $D(h(a_1, c_0), s^*)$. This follows directly from the assumption in (14).

The company will never deviate from the

-donor specific punishment path as long as $\delta^C > \hat{\delta}^C$ is assumed. Assume that the donor plays (no aid), which, according to the strategy profile, implies that the donor specific punishment path is played once. If the company deviates from this path and locates at home, it will achieve a total profit of $\frac{1}{1-\delta^C}C(m_1, s^*)$ because this triggers the subgame perfect equilibrium of the stage game forever (according to the strategy profile). However, to follow the donor specific punishment path after (no aid) is observed yields $C(m_f, s^u) + \frac{\delta^C}{1-\delta^C}C(m_f, s^*)$. Since $\delta^C > \hat{\delta}^C$ implies that (16)

$$\frac{1}{1-\delta}C(m_1, s^*) < C(m_f, s^u) + \frac{\delta}{1-\delta}C(m_f, s^*)$$

is satisfied, the company will never deviate from the donor specific punishment path.

-equilibrium path, both because it is strictly better off when having m_f when the equilibrium path is followed, compared to m_l in the subgame perfect equilibrium of the stage game, and because there is a cost for the company of locating abroad. Moreover, the company achieves its highest feasible profit in this game when the equilibrium path is played, so there exists no gain to the company of any deviation from the equilibrium path.

The recipient will never deviate from the

-equilibrium path at stage four as long as the total payoff from following this sequence infinitely, $\frac{1}{1-\delta^R}R(m_f, a_1, c_0)$, is larger than the payoff from deviating by offering the company an ordinary contract. This deviation from the equilibrium path yields $R(m_1, a_1, c_0)$ in the deviation year, and $R(m_1, a_1, c_0)$ forever after because the strategy profile implies that the subgame perfect equilibrium of the stage game is triggered. Since $\delta^R > \hat{\delta}^R$ satisfies (18)

$$\frac{1}{1-\delta^R}R(m_f, a_1, c_0) > R(m_1, a_1, c_0) + \frac{\delta^R}{1-\delta^R}R(m_1, a_1, c_1)$$

the recipient will never deviate from the equilibrium path at stage four.

-*equilibrium path at stage one* by implementing the conditions because, according to the strategy profile, this triggers the stage game forever. To deviate from the equilibrium path at stage one is worse for the recipient than not to deviate: $R(m_f, a_1, c_0) > R(m_1, a_1, c_1)$, from (18).

-*donor specific punishment path* as long as $\delta^R > \hat{\delta}^R$. Assume that (*not implement, no aid, abroad*) has been played, which implies that the recipient should offer m_f according to the donor specific punishment path. However, assume that the recipient deviates from this path and offers an ordinary contract, m_1 . According to the strategy profile, this triggers the stage game equilibrium forever, and the total payoff to the recipient is thus

$R(m_1, a_0, c_0) + \frac{\delta^R}{1 - \delta^R} R(m_1, a_1, c_1)$. If the recipient does not deviate from the donor specific punishment path, it would have $R(m_f, a_0, c_0) + \frac{\delta^R}{1 - \delta^R} R(m_f, a_1, c_0)$ instead because offering a favorable contract implies that the company and the recipient continues to cooperate (according to the strategy profile). Since $\delta^R > \hat{\delta}^R$ satisfies

$$(17) \quad R(m_f, a_0, c_0) + \frac{\delta^R}{1 - \delta^R} R(m_f, a_1, c_0) > R(m_1, a_0, c_0) + \frac{\delta^R}{1 - \delta^R} R(m_1, a_1, c_1),$$

the recipient will never deviate from the donor specific punishment path. Note that the donor specific punishment path is followed once (*no aid*) is observed at stage two, so it is not a feasible action for the recipient to deviate from the donor specific punishment path at stage one.

q.e.d.

4. On the recipient's discount factor, and the cooperation

Since both (17) and (18) specify a lower bound for the recipient's discount factor, we know that the recipient's time preferences must satisfy the largest of the two factors in order for the recipient to be willing to carry out the specified actions in the strategies. Thus, for the equilibrium to exist where the recipient get aid without implementing the conditions, the recipient's discount factor must be larger than (17) and (18). Unfortunately, we are unable to find an analytical solution to which factor is the largest. However, a straightforward solution is within reach if we assume that the cost of offering the favorable contract compared to the

ordinary contract has the same impact on the recipient's utility irrespective of the value of the other variables.

So assume that, *ceteris paribus*, $R(m_1, a, c) - R(m_f, a, c) = x$. In that case, we can see that (17) and (18) represents the same condition:

$$(17a) \quad \hat{\delta}^R = \frac{-x}{R(m_1, a_1, c_1) - R(m_1, a_1, c_0)} = \frac{-x}{R(m_1, a_1, c_1) - x - R(m_f, a_1, c_0)}$$

$$(18a) \quad \hat{\delta}^R = \frac{x}{R(m_1, a_0, c_0) - R(m_f, a_0, c_0) + R(m_f, a_1, c_0) - R(m_1, a_1, c_1)}$$

$$= \frac{-x}{R(m_1, a_1, c_1) + R(m_f, a_0, c_0) - R(m_f, a_1, c_0) - R(m_1, a_0, c_0)}$$

$$= \frac{-x}{R(m_1, a_1, c_1) - x - R(m_f, a_1, c_0)}$$

$$\Rightarrow \hat{\delta}^R = \hat{\delta}^R$$

However, as shown in the proof, it is not necessary to restrict the recipient's utility function for our equilibrium to exist.

Let us contrast the proof with Hatlebakk (2002). There are two important differences. First, we let the third party keep the favorable contract when cooperating, which seems more realistic than giving an ordinary contract in the donor specific punishment path. Second, we specify the condition that the first mover (in our model - the recipient) must not be better off by offering an ordinary contract once the equilibrium path is started, see (17). As we have shown in section 4.4, it is not sufficient to assume that the player that offers the favorable contract does not offer so favorable terms that this player loses the whole surplus from making the threat credible (i.e. making the third party comply). The equilibrium also requires the restriction that this player does not grab the rent from offering an ordinary contract once the equilibrium path is started.

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Essay 3

Company interests and foreign aid policy*

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Abstract

Disbursement of foreign aid is often made contingent upon the recipient's implementation of certain conditions. Despite the importance attached to conditionality by the donor community, and the fact that aid is a crucial income source for the recipient, it is found that conditionality fails. One explanation for this failure could be that an eventual halt in aid could trigger the recipient to cancel contracts with companies from donor countries. This could induce the companies to put pressure on the donor to grant the aid, and that could result in disbursement even when the conditions are not implemented. We use a multi-agent triadic model of the relationship between a recipient and two donors and two companies to illustrate that this mechanism can explain the failure of aid conditionality when companies can influence donors. We show that relaxing the standard assumption of only one third party in triadic models implies that there exists a subgame perfect equilibrium in the stage game where threats are credible. Moreover, we show that assuming traditional dyadic relations is insufficient to explain the failure of conditionality in this model.

Keywords: Triadic; Conditionality, Foreign aid; Foreign assistance, Fungibility

JEL classification: E61; F35

1. Introduction

“... as the representative of the World Bank on the ground, I came under pressure from several sources, some of them quite surprising, to release the tranche [loan] with minimal attention to conditionality. There was a steady stream of private sector representatives, domestic and foreign, arguing for the release of the tranche ... because some of them had specific contracts with the government which were unlikely to be paid on time if the government did not get the money from the World Bank and other donors.” (Kanbur, 2000)

Can companies play a role when donors make their aid disbursement decision, and can recipients of foreign assistance make use of such a link? Ravi Kanbur's (2000) experience from Ghana, where the loan tranche was in fact released, indicates that the pressure created by companies towards disbursement may be decisive. Even so, the literature on foreign aid has ignored these forces, and formal modeling of aid conditionality has almost been absent (Drazen, 2000). We develop a model that not only focuses on how companies can influence the donors, but also on how strategic recipients can use this interdependence to withhold contracts to companies to create such company-pressure on conditionality.

Foreign aid has been a major income source for the developing countries, and a typical low-income country now receives around 7-8 % of their GNP in aid (World Bank 1998). Large parts of this assistance are made contingent upon the poor country implementing certain conditions like macroeconomic stabilizing policies. However, even though conditionality is viewed as a necessary instrument for the donor community to achieve the goals of aid (Summers and Pritchett 1993, Kanbur 2000), the empirical evidence indicates that conditionality fails (Sachs 1989, World Bank 1992, Mosley et al. 1995, Collier 1997, Dollar and Svensson 2000). When foreign aid is so important to the recipient, why does the recipient not comply with the donor in the face of a cut-off of these recourses? And why does the donor disburse the funds to recipients that do not implement the conditions when conditionality is vital to the donor's goals? This is the puzzle that Kanbur (2000) termed “the weakness of strength”: Why are the perceived mighty donors not able to force the perceived weak recipients to implement the conditions?

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The limited literature that utilizes formal models to explain the failure of aid conditionality offers some insight into this puzzle.⁸⁵ Svensson's (2000) principal-agent model illustrates how altruistic donors end up in the Samaritan's dilemma because the recipient has no incentives to implement conditions to reduce poverty when the amount of aid is determined by the level of poverty. A different approach is taken by Mosley et al. (1995) in which the relationship between the donor and recipient is modeled as a bargaining game. One of their findings is that there will always be some slippage on the conditions, even if the recipient has agreed to their implementation in the first round.

This paper provides a complementary explanation for the failure of conditionality by developing a game-theoretic multi-agent model with a recipient, two donors and two companies, where the influence of private business interests on the donor-recipient relationship can be crucial to the donors' disbursement decision. Most models of foreign aid are dyadic, which means that all the agents interact pairwise. Our model is triadic, which implies that an agent i (the recipient) does not only take account of his relationship with agent j (one donor), but also of his own and agent j 's relationship with a third agent k (one company).⁸⁶ We find that one possible explanation for the "weakness of strength" is that recipients may be able to play different donors out against each other by granting contracts to companies from those donor countries that do not enforce conditionality. This creates incentives for the companies to put pressure on the donor to disburse aid, even when the conditions are not implemented. We show that if it is more important for the donor to maintain a good relationship with the domestic company than to maintain conditionality, the recipient need not implement the conditions to receive aid, and conditionality fails.

The failure of conditionality can only be sustained in our model when we assume triadic interactions. Restricting the agents to traditional pairwise interaction removes the recipient's ability to use the company to put pressure on the donor. We show that this restriction yields the opposite result, namely that conditionality becomes successful because the recipient must implement the conditions to get aid.

Several studies argue that there are asymmetric preferences between the donor and the recipient with regard to the attractiveness of the policy conditions (Mosley et al. 1995, Collier

⁸⁵ See Drazen (2000) for a survey of the political economy of foreign aid. Principal-agent models that discuss foreign aid include Pedersen (1996) on why it is crucial for the donor to have the first mover advantage if aid is to increase investment, and Pedersen (2002) for an illustration of how adverse incentive effects of aid can cause poverty to increase due to a Samaritan's dilemma problem. Another problem that is often mistakenly taken to be the failure of conditionality, is that aid can be fungible. For fungibility, see for instance Feyzioglu et al. (1996).

⁸⁶ See Basu (2000) for a discussion of dyads and triads.

et al. 1997, Dollar and Svensson 2000, Kanbur 2000)⁸⁷. This divergence of opinion lies at the heart of conditionality. If there were no disagreement between the donor and the recipient on implementation, there would be no need for the donor to threaten to cut off the aid if the recipient did not fulfil the obligations.⁸⁸ Hence, conditionality would be unnecessary because the recipient would implement the conditions anyway. We incorporate conditionality into the model as a way for donors to buy reform or new policies that the recipient would not adhere to in the absence of aid, and let the recipient's implementation be endogenously determined.

One important motive for giving foreign assistance has been to increase economic growth in the recipient country. However, there is some evidence that foreign aid has not contributed to growth (Boone 1996), and that sound macroeconomic policies are necessary for aid to increase growth (Burnside and Dollar 2000).⁸⁹ Hence, as emphasized by World Bank (1998), conditioning aid on sound policies is vital for the goals of the donor community because aid may be wasted if the right policies are not in place.

The altruistic "conditionality contributes to growth" argument seems to be the most important motive for contemporary donors setting the recipient's implementation of sound macroeconomic policies as a necessary condition for foreign aid (Summers and Pritchett 1993, Collier et al. 1997).⁹⁰ Hence, we incorporate this motive for donors to maintain conditionality. However, the empirical literature of the determinants of aid points out that many donors also let economic self-interests influence aid disbursement, for instance through tying aid to contracts with companies from the donor country.⁹¹ So we incorporate both the altruistic conditionality motive and a concern for domestic company interests in the donor's preferences. The latter motive is similar to that for tying aid in that the donor cares about the

⁸⁷ The controversy over the policy conditions can arise from the potential redistribution from politically important domestic groups that may follow from the implementation of the conditions (Summers and Pritchett, 1993, Mosley et al. 1995)⁸⁷, or more generally from the cost of exerting effort when implementing the conditions. (Svensson 2000).

⁸⁸ Note that new positions from a donor on conditionality may reflect nothing else than rhetoric if the donor's preferences are not changed. The World Bank's new initiative of making recipients partners in the development strategy is just another emperor without clothes if the bank continues to condition aid on the same policies as before.

⁸⁹ See Hansen and Tarp (2001) for empirical results that indicate that aid increases growth unconditional of "sound" policy.

⁹⁰ Collier et al. (1997) also discuss the other motives for conditionality.

⁹¹ On the donors taking into account their self-interests when acting on the aid scene, see the empirical work of Alesina and Dollar (2000), Burnside and Dollar (2000) and Trumbull and Wall (1994). For a model where a selfish donor uses aid to lower trade tariffs, see Lahiri et al. (2002).

domestic economic activities in its own country. Even though we assume that donors have an altruistic motive for giving aid, it is necessary to underline that we do not use a Samaritan's dilemma argument for the failure of conditionality.

This paper is organized as follows. The empirical background is presented in section 2, and the model of an extended triadic structure involving one recipient, two donors and two northern companies is presented in section 3. A few tentative policy implications are discussed in section 4, and section 5 provides some concluding remarks.

2. Empirical background of triads

Ravi Kanbur's (2000) experience of a third party (a company) influencing the relationship between two agents (the donor and the recipient) is a typical example of a triadic relationship, and is a similar structure of influence to what others have found. It is evident, as Basu (2000) notes, that triadic relations occur in interactions at the international level, especially in situations where sanctioning is an issue. Basu illustrates the necessity of using the triadic structure to analyze such sanctions by the US Helms-Burton Act of 1996. The US is not only penalizing Cuba by a trade embargo in an usual dyadic relationship, but the intent of the Helms-Burton Act is also to penalize any third party, company or country, that does business with Cuba.

Another example of how three-party relationships develop on the international arena can be traced to the previous struggle between communism and capitalism. During the cold war, it was evident that recipients of foreign aid used this political rivalry between the ideologies to play the great powers out against each other in order to extract maximum benefits from the two main rivals. It was common knowledge that if the necessary amounts of aid were not provided from one of the sides, the recipient could turn to the other side, and hence, adhere to the opposite ideology. In US's own words regarding African countries:

"U.S. policymakers focused on strengthening African ties to the West and on providing sufficient U.S. aid to the countries of Africa so that the alternative of turning to the Soviet bloc would seem less attractive."⁹²

⁹² US Department of State Publication (1999).

Such turnover may have induced a loss for the power that lost its supporter because of the importance of retaining the spread of the other power's ideology. If this was the case, then the recipient could have employed a strategy where it asked one power for more aid and at the same time "accidentally" revealed an interest in the other power's ideology. This could have induced the first power to grant more aid in order to keep the recipient on their side in the "battle".

An interesting example of a triadic relationship is given by an earlier loan officer in an American bank (Gwynne, 1983). The loan officer participated in the process of giving a ten million dollars loan to a Philippine construction company, which was technically bankrupt. The company had a leverage ratio of seven to one, so the debt was so large compared to the equity that no bank would normally grant a loan. Despite its knowledge of the huge leverage ratio, the bank granted the loan. The reason was that the loan was to be used to purchase equipment from an American company, which was also a long-standing client of the bank. The American company put pressure on the loan officer to grant the loan so they could get the contract with the Philippine company. The bank gave in to the pressure due to the fact that the American company had large demand deposits and pension funds deposited in the bank. The relations were so important that even the president of the bank intervened to get the loan disbursed. Hence, the loan was granted because of the American company's influence on what was supposed to be an ordinary dyadic relationship between the bank and the Philippine company.

The principle behind a strategy of making a company influence one's business partner can be useful for a recipient in contemporary aid relations. Kanbur's (2000) experience from Ghana indicate that the pressure from companies on the donor can be crucial in explaining the failure of conditionality. We know from the literature on tied aid that there exist strong relationships between bilateral donors and companies from the donor countries. Hence, we restrict our analysis to bilateral donors because we believe that the largest opportunities for company influence can be found in these relations. The multi-agent triadic model in the next section formalizes these relations.

Section 3 starts by explaining the main argument in a simple 3-player context, and goes on to specify the payoff functions (section 3.1) in order to analyze the game when more donors and companies are included (section 3.2). To show that the triadic structure is crucial for these results, we make a comparison with the dyadic modeling of the same relationships (section 3.3), before turning to a discussion of the properties of the contract underlying the analysis (sections 3.4 and 3.5).

3. The model

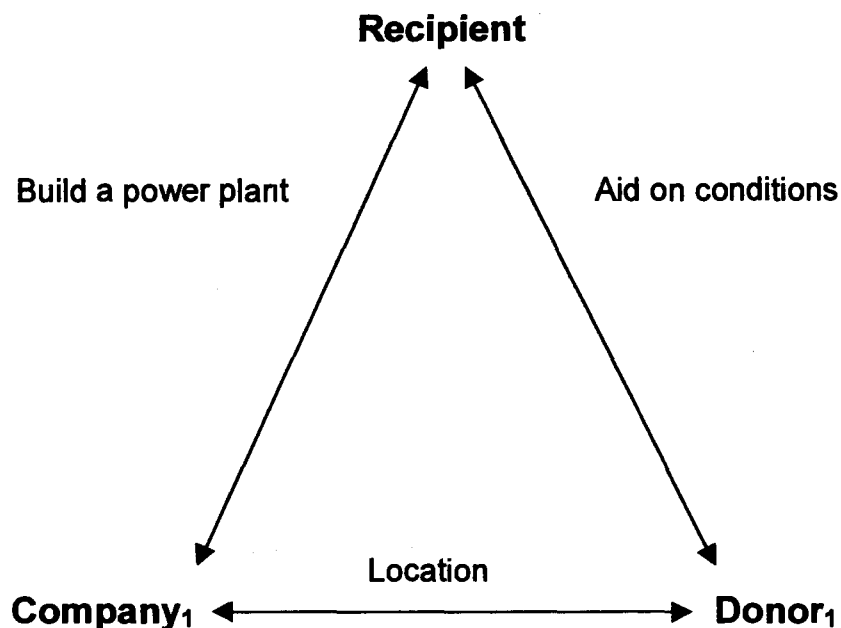
Consider a model with one recipient and N donor-company pairs where each company has its headquarters in one of the donor countries. Let Donor_i and Company_i denote the donor and the company in country i . We assume that each donor adheres to conditionality, so they specify some conditions that the recipient must implement initially in order to be entitled to receive aid. Then, in line with the empirical findings on the disagreement on the conditions, we have a strategic, maximizing recipient who is not in favor of these conditions and who would thus try to get the aid without implementing the conditions.

In this model, the recipient is going to build a power plant. Let the size of this investment be exogenously given and denoted I . All the companies are interested in having this project, and the recipient must decide to which company it will give the contract.

As we know from the literature on tied aid, each company has a close relationship with the government in the country where the particular company's headquarters are located. Due to the non-transparency of such relationships, we could treat the company-donor relationship as a black box and just assume that the company is able to influence its donor. However, to visualize the influence, we assume that the company must decide on locating some new activities, and can either locate them in the country where it has its headquarters, or abroad. Company_i 's location decision is important for Donor_i 's domestic interests, and assumed to be independent of whether or not Company_i gets a share of the power plant contract.

All players realize that there is an opportunity for the recipient to utilize the companies' influence over the donors to get aid without implementing the conditions. To illustrate this argument, assume first that $N = 1$. The relationships are illustrated in figure 1:

Fig. 1. The triadic relationship when $N = 1$.



Let the recipient be indifferent to whether Company₁ or some other company builds the plant, and assume that this “other company” does not have any relations with the other agents. Assume further that the recipient acts according to the following “weak reciprocity” rule:

The recipient will give the construction-assignment to some other company if Company₁ does not locate abroad in a situation where Donor₁ does not disburse aid. Otherwise, Company₁ gets the contract.

We term this rule “weak reciprocity” because it specifies that if the recipient is indifferent between two actions, it will choose the action with the worst result for the company if the company does not comply with the recipient’s aim of punishing the donor for not giving aid. We will return to this rule and its empirical foundations, but first we illustrate how the recipient can use the contract allocation to secure aid without implementing the conditions.

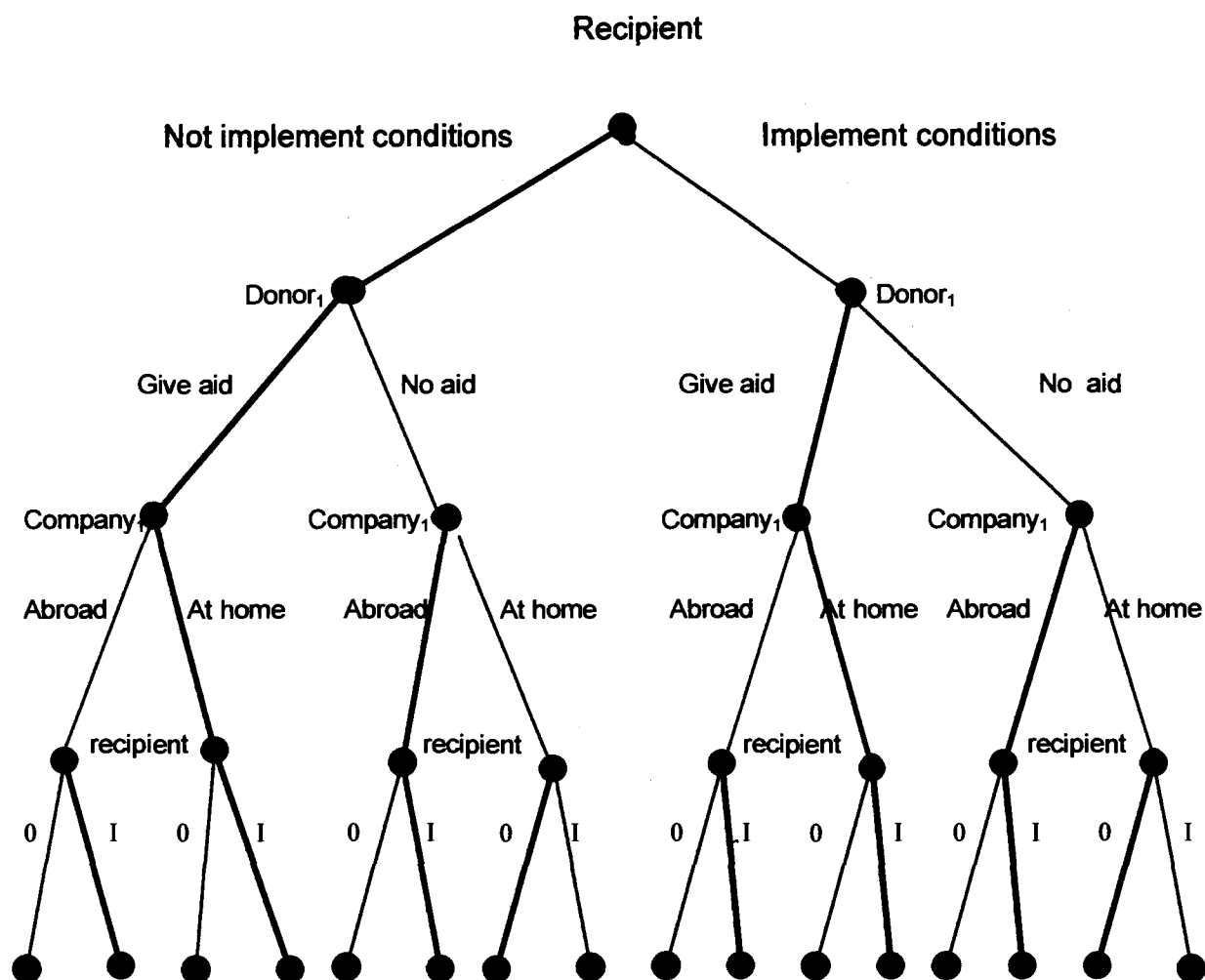
Take as a starting point that the recipient does not implement the conditions. If Donor₁ maintains conditionality and hence does not give aid, then the recipient’s contract-rule creates incentives for Company₁ to locate abroad. This illustrates our main point: Company₁ has

incentives to influence Donor₁ to disburse aid when the conditions are not implemented. Further, make the following two assumptions which are necessary for the recipient to be able to get aid without implementing the conditions in this setting. First, the contract is worth more to Company₁ than locating abroad, i.e. the company will actually locate abroad to secure the contract if the donor does not disburse aid. Second, the concern for domestic business is more important than conditionality for the donor, i.e. if the donor must choose between maintaining conditionality and losing some valuable activities to another country, then aid will be disbursed.

The interaction between these agents is typically sequential. In line with the principle of conditionality in the donor-recipient relationship, we assume that the recipient has the first-mover advantage.⁹³ So, at stage one, the recipient decides whether or not to implement the pre-determined conditions specified by Donor₁. At stage two, Donor₁ decides to disburse the aid or not, and, at stage three, Company₁ decides on location. Finally, at stage four, the recipient decides whether to give the contract to Company₁ or to some other company. By backward induction in a game with this structure played once, it is straightforward to show that the recipient refuses to implement the conditions and that Donor₁ disburses aid, given the two conditions from the previous paragraph and the recipient's weak reciprocity rule. Figure 2 displays the game tree.

⁹³ Conditionality as practiced in contemporary donor policy implies that the donor awaits the recipient's implementation before taking the disbursement decision, the so-called performance-based aid. As the history of conditionality shows, the recipient would never implement controversial conditions if the donor was to take this decision before the recipient's eventual implementation (Collier et al. 1997). Hence, recipients are usually modeled as Stackelberger leaders, see for instance Pedersen (1996), Svensson (2000) and Hagen (2001).

Figure 2: The game-tree for the triadic game for $N = 1$.



The result is dependent on the recipient adhering to its own rule of giving the contract to another company if Company₁ does not locate abroad if Donor₁ rejects disbursement of aid, even if the recipient is indifferent to who builds the plant. Under our assumptions, the contract-allotting rule secures that Company₁ will punish Donor₁ by locating abroad in case

aid is not disbursed. This is because Company₁ will lose the contract if it does not punish the donor.

This assumption of weak reciprocity is anchored in an increasing empirical literature on the importance attached to the process that generates economic results. In experimental economics, one frequent finding is that people are inclined to punish those who do not cooperate, even if this punishment does not imply higher payoff in subsequent periods (as with trigger strategies in repeated games). Moreover, experiments indicate that many individuals are willing to take on a cost in order to punish non-cooperators, even if this does not lead to a higher payoff in subsequent periods (Fehr and Gächter 2000, Ostrom, Walker and Gardener 1992).

In particular, experiments with “ultimatum games”⁹⁴ reveal that substantial positive offers are turned down. Proposals of less than 20% in these games are often rejected (Güth and Tietz 1990, Roth, Prasnikar, Okuno-Fujiwara and Zamir 1991, Camerer and Thaler 1995, Henrich 2000), which implies that people are willing to lose 20% of the money in the game as long as the player that proposed the “unfair” share gets nothing.⁹⁵ Bowles and Gintis (2000) interpret these results as reflecting “strong reciprocity”: a behavioral rule to reward cooperators and punish those who deviate from norms of acceptable behavior. Our assumption of weak reciprocity does not go as far as implying that one is willing to incur a net cost of punishing. Rather, weak reciprocity merely implies that a player who is indifferent between two actions chooses the action that gives the worst outcome for the deviator and best outcome for the cooperator.

Before we set up the formal conditions for the subgame perfect equilibrium of the more general game in section 3.2, it is necessary to specify the payoff functions for the agents.

3.1 Payoff functions

Donor_{*i*} is interested in granting the recipient conditional aid of size a_i . Assume that the parliament in the donor country determines the aid budget so that $a_i > 0$ is exogenously given. Let a be the vector that represents all the donors’ different amounts of aid; $a = (a_1, a_2, \dots, a_N)$.

The superscript of a indicates whether or not aid is disbursed, so let a_i^{gra} and a_i^{not} denote that

⁹⁴ In an ultimatum game, two players (usually unknown to each other) decide on how to share an amount of money between them. One is chosen to propose a share, the “proposer”, and the other one, the “responder” decides on whether or not to accept that share. If accepted, the proposed share is allotted to the responder while the proposer will have the remainder. But if the offer is rejected, neither of the players get anything.

⁹⁵ Low offers are often perceived as “unfair” by both the proposer and the responder, see for example Henrich’s (2000) interviews of the players in Los Angeles and Machiguenga, Peru.

Donor_{*i*} grants or does not grant aid, respectively, and a^{gra} and a^{not} that every donor's aid is disbursed or not disbursed. Donor_{*i*} adheres to conditionality, and thus operates with some pre-specified conditions, c_i . Let c be the vector of conditions for all donors; $c = (c_1, c_2, \dots, c_N)$. Then c_i^{imp} denotes the event that the recipient implements Donor_{*i*}'s conditions, and c_i^{not} the opposite. Finally, let c^{imp} and c^{not} denote that every donor's conditions are implemented or not implemented, respectively. For simplicity, and to facilitate the comparison between the dyadic and the triadic equilibrium below, assume that c_i is different from c_j so that each donor has its own conditions.⁹⁶ For example, one donor conditions aid on trade liberalization, one on fiscal deficit, one on military expenditures, one on health expenditures and so on. Assume also that each donor's conditions are not conflicting with any of the other donors' conditions.

The close relationship between the company and the donor within the same country, that is, between Donor_{*i*} and Company_{*i*}, can also be specified. The important assumption is that Company_{*i*} can make decisions that are important to Donor_{*i*}. For illustrative purposes, however, assume that Company_{*i*} is willing to use location of some new activities as a potential means to influence Donor_{*i*}. If s_i denotes Company_{*i*}'s size of activities in Donor_{*i*}'s country, then let s_i^* be the optimal size, and let $s_i^u < s_i^*$ denote the size of Company_{*i*}'s activities if it does not locate the new activities to country i . Let I_i denote Company_{*i*}'s share of the construction contract I . Thus, if I is divided equally among the N companies, then $I_i = \frac{I}{N}$.

Then if Company_{*i*} does not get a share of the contract, $I_i = 0$.

The recipient's utility function can be expressed as

$$(1) \quad R = R(I, c, a)$$

where the recipient's utility is an increasing function in the amount of aid. The recipient also derives a positive utility of having the plant built, but is indifferent as to which company gets what share of the contract. However, the recipient must decide to which company the contract is to be assigned. Since the recipient is trying to avoid implementing the conditions, it will apply the following rule:

⁹⁶ It is evident from the analysis below that the results do not depend on whether or not the donors have overlapping conditions.

(2) If $M < N$ donor-company pair chooses (no aid, home): divide the contract among the other companies.

For all other histories: divide the contract equally among all companies.

Since conditionality implies that aid is used to buy policy reform, we assume, ceteris paribus, that the recipient requires a certain amount of aid to be willing to implement the conditions c_i , and that a_i is larger than this amount.⁹⁷ Hence,

$$(3) \quad R(I, c_i^{imp}, c_{-i}^t, a_i^{gra}, a_{-i}^p) > R(I, c_i^{not}, c_{-i}^t, a_i^{not}, a_{-i}^p) \quad , \quad t = imp, not, \quad p = gra, not, \quad \forall i$$

where c_{-i}^t and a_{-i}^p denotes the conditions and aid, respectively, for other donors than Donor_{*i*}.

$$(4) \quad D_i = D_i(a_i, c_i, s_i)$$

where, for the sake of simplicity, we assume that D_i is a differentiable function in a_i . We assume that Donor_{*i*} has an increasing utility of granting aid if the recipient has implemented c_i , that is, Donor_{*i*}'s own conditions. To simplify the disposition, it is assumed that Donor_{*i*} is indifferent to other donors' grants as well as to whether or not the recipient implements the other donors' conditions. Incorporating Burnside and Dollar's (2000) findings that giving aid is a waste if the conditions are not implemented, Donor_{*i*} is assumed to have a decreasing utility of granting aid if the recipient has abstained from implementation. In sum

$$(5) \quad \frac{\partial D_i}{\partial a_i} \begin{cases} > 0 & \text{if } c_i = c_i^{imp} \\ < 0 & \text{if } c_i = c_i^{not} \end{cases}$$

Donor_{*i*} is also better off when the recipient implements c_i , everything else equal, hence

$$(6) \quad D_i(a_i, c_i^{imp}, s_i) > D_i(a_i, c_i^{not}, s_i) \quad , \quad \forall i$$

⁹⁷ For empirical evidence on conditionality being imposed on unwilling recipients, see Mosley et al (1995) and Kanbur (2000). There are several reasons for such a disagreement, but the most cited is that implementation of the conditions would harm politically important groups in the recipient country, for instance through a change in relative prices as noted in Summers and Pritchett (1993).

Then (5) and (6) formalize conditionality, and implies that the donor would, *ceteris paribus*, only give aid to a recipient that has implemented this donor's conditions. We also assume that Donor_{*i*}'s utility increases with Company_{*i*}'s activity in country *i*, and is also more concerned about this domestic activity of Company_{*i*} than about maintaining conditionality. Therefore, in a situation where the conditions are not implemented, Donor_{*i*} would grant the aid to the recipient if the consequence of not disbursing the aid would be to lose the new activity ($s^* - s^u$) to another country. Thus, we assume that

$$(7) \quad D_i(a_i^{gra}, c_i^{not}, s_i^*) > D_i(a_i^{not}, c_i^{not}, s_i^u) \quad , \quad \forall i$$

If C_i denotes Company_{*i*}'s profit, then

$$(8) \quad C_i = C_i(I_i, s_i)$$

We assume that each company maximizes profit, is risk neutral and has an increasing profit in the size of its share of the contract. Thus, the larger the number of companies which are to divide the contract, the lower the profit to Company_{*i*}:

$$(9) \quad \frac{\partial C_i(I_i, s_i)}{\partial I_i} > 0 \quad , \quad \forall i$$

Note that, by definition, $C_i(I/N, s_i^*) > C_i(I/N, s_i^u)$. Assume now that N^{max} is the number of companies for which Company_{*i*} is indifferent between making a location decision that is not optimal if, as a result, it receives $\frac{1}{N^{max}}$ of the contract, rather than choosing an optimal location and be disqualified from any participation in the project. . Hence, N^{max} is defined by

$$(10) \quad C_i\left(\frac{I}{N^{max}}, s^u\right) = C_i(0, s^*) \quad , \quad \forall i$$

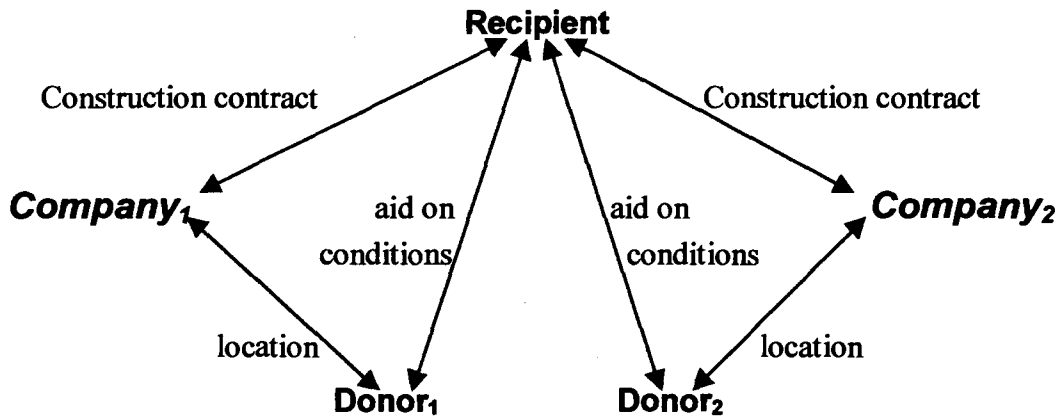
Finally, assume that the company would rather locate abroad to secure the entire contract compared to locating at home and having $\frac{1}{N}$ of the contract:

$$(11) \quad C_i\left(\frac{I}{N}, s^*\right) < C_i(I, s^u) \quad , \quad \forall i, \quad N \geq 2$$

3.2 Subgame perfect equilibria in triadic relations

Assume now that $N = 2$ and that $N^{\max} > 2$, which gives the potential interactions among the agents as depicted in figure 3 below (see the appendix for the general case).

Fig. 3: Structure of the potential interaction among the players for $N = 2$.



Now, let $Company_i$ said to be cooperating with the recipient if it locates abroad in the case that $Donor_i$ does not give aid, and not to be cooperating if it locates at home in this situation. From the recipient's contract-allotting rule (2), all players know that the company that cooperates with the recipient will secure at least half of the contract. Moreover, the company that cooperates will have the entire contract if the other company does not cooperate. So if both donors refuse to give aid, we have a "prisoner's dilemma" between the two companies where each company has incentives to cooperate with the recipient irrespective of whether or not the other company cooperates. To see that these incentives induce the donors to disburse aid even if the conditions are not implemented, we solve the game by backward induction following the specified sequence of the game.

Stage 4

From (2), the recipient will choose to give the entire contract to Company₁ (Company₂) if Donor₂ (Donor₁) has refused to give aid at stage 2 and Company₂ (Company₁) has not located abroad, as long as Company₁ (Company₂) and Donor₁ (Donor₂) has not chosen the same actions: (no aid, home). All other histories in this game will imply that each company will have $\frac{I}{2}$ of the contract.

Stage 3

Contingent upon the actions at stage 2, the following games represent the companies' interaction at stage 3:

A) Both donors have refused to give aid at stage 2.

Then Company_{*i*} will have half of the contract if it takes on the cost of locating abroad and the other company does the same. In that case both will get $C_i(I/2, s^u)$. If one company locates abroad and the other does not, then the one that cooperates with the recipient will get the whole contract and thus have $C_i(I, s^u)$, while the other's payoff will be $C_i(0, s^*)$. If both companies refuse to cooperate with the recipient and locate at home, then the recipient divides the contract between them yielding $I/2$ to each. Formally:

		Company 2	
		Abroad	Home
Company 1	Abroad	$C_1(I/2, s^u), C_2(I/2, s^u)$	$C_1(I, s^u), C_2(0, s^*)$
	Home	$C_1(0, s^*), C_2(I, s^u)$	$C_1(I/2, s^*), C_2(I/2, s^*)$

From (9), (10) and the fact that $N^{\max} > 2$, we know that $C_i(\frac{I}{2}, s^u) > C_i(0, s^*)$, and from

(11) that $C_i(I, s^u) > C_i(\frac{I}{2}, s^*)$. Thus, if both donors have rejected disbursement of aid,

then the companies play (at stage 3) a variant of the “prisoner’s dilemma” game with one unique Nash equilibrium where both companies choose to locate abroad and thus cooperate with the recipient.

B) Only one donor has refused to give aid at stage 2.

Assume now that Donor₁ has rejected disbursement of aid at stage 2, and that Donor₂ has disbursed aid. According to (2), the recipient will give the entire contract to Company₂ if Company₁ locates at home in this situation, which would yield $C_1(0, s^*)$ to Company₁ and $C_2(I, s^*)$ to Company₂ if it locates at home and $C_2(I, s^u)$ if it locates abroad. Note also that the recipient divides the contract equally between them if both locate abroad. The companies hence play the following game:

		Company 2	
		Abroad	Home
Company 1	Abroad	$C_1(I/2, s^u) , C_2(I/2, s^u)$	$C_1(I/2, s^u) , C_2(I/2, s^*)$
	Home	$C_1(0, s^*) , C_2(I, s^u)$	$C_1(0, s^*) , C_2(I, s^*)$

In the unique Nash equilibrium of this game, Company₁ locates abroad to secure half of the contract (and Company₂ locates at home). Thus, Donor₁ is punished for not giving aid. Note also that symmetry implies that if Donor₁ gives aid while Donor₂ does not, then we will have that Company₂ punishes Donor₂ in the Nash equilibrium.

C) Both donors give aid

In this case, both companies will get half of the contract each, irrespective of their choices (from (2)). Thus, the following game is played in this situation:

		Company 2	
		Abroad	Home
Company 1	Abroad	$C_1(I/2, s^u), C_2(I/2, s^u)$	$C_1(I/2, s^u), C_2(I/2, s^*)$
	Home	$C_1(I/2, s^*) , C_2(I/2, s^u)$	$C_1(I/2, s^*) , C_2(I/2, s^*)$

In this case both companies choose to locate at home.

In sum, we know from the analysis of stage 3 that donors not disbursing aid will be punished. Thus, each donor's best response at stage 2 is to give aid (see (7)), no matter what the other donor does and irrespective of the recipient's implementation record at stage 1. Then it follows that the recipient will not implement any conditions at stage 1, and still be sure of having the aid from both donors.

From this elaboration, we have that if the players have the following strategies:

- the recipient's strategy* is to play "not implement" at stage 1, and follow the weak reciprocity rule when giving the contract(s) at stage 4.
- Donor_i's strategy* is to always play "give aid" at stage 2.
- Company_i's strategy* is to play, at stage 3, "at home" if the donor gives aid, and "abroad" if the donor plays "no aid"

then these strategies yield a subgame perfect equilibrium under our assumptions.

It is evident that any deviation from any single agent from its strategy would lead to a worse outcome for the deviating agent. Hence, conditionality fails in the subgame perfect equilibrium, and the recipient is able to get the aid without implementing the conditions by making the companies put pressure on the donors towards disbursement. Note that the result can be maintained even if we assume a larger number of donor-company pairs, see the appendix for a discussion.

3.3 The dyadic outcome

To see that the triadic structure is crucial in this explanation for the failure of conditionality, assume that the players only are allowed to interact pair-wise. Hence, we remove the “weak reciprocity” assumption in (2) since this rule is triadic by definition. Recall that conditionality should be maintained from Donor_{*i*}’s point of view. Thus, from (5) and (6) we know that aid is only disbursed in an isolated recipient-donor interaction as long as the conditions are implemented. Then from (3) we know that the recipient will implement the conditions to get aid in such a two-party relationship.

However, we must also take account of the recipient’s relationship with the company. Since the recipient does not let the donor-company relationships affect its decisions in dyadic relations, the recipient is indifferent to any division of the contract among the companies. The contract can thus be seen as randomly allotted. Then there will be no gain for Company_{*i*} from influencing Donor_{*i*}, and Company_{*i*} locates at home. Thus, the recipient’s relationship with the company will not influence the interaction between the recipient and the donor, so the recipient implements the conditions c_i to get aid a_i , for all i .

It is evident that conditionality becomes successful in the dyadic game. Compared to the triadic equilibrium, the donors are better off because conditionality works as intended, which in turn implies that the recipient is worse off. Donor_{*i*} achieves $D(a_i^{gra}, c_i^{imp}, s_i^*)$ in the dyadic equilibrium, which is clearly better than receiving $D(a_i^{gra}, c_i^{not}, s_i^*)$ from the triadic outcome. Since the donor believes that giving aid when the conditions are not implemented is a waste, the donor is actually taking a loss in the triadic equilibrium compared to the situation where the recipient is not able to use the companies in a strategic manner. The donor is forced to take this loss because not giving aid causes a larger loss when the company punishes the donor in order to secure a share of the construction contract. The recipient will have $R(I, c^{imp}, \alpha^{gra})$ in the dyadic game, but is better off in the triadic equilibrium because it avoids implementing the conditions: $R(I, c^{not}, \alpha^{gra})$. The payoff to the companies depends on the allocation of the contract and the difference between the dyadic and triadic company-payoff is therefore undetermined.

Since the opportunity to divide the contract between the companies plays an important role in these games, it is necessary to raise the issue of the nature of the marginal costs of splitting a contract among different entrepreneurs. In the analysis in the previous sections, we have assumed that there are no costs for the recipient of letting more companies share the contract. As there could be both decreasing and increasing costs for the recipient, dependent

on the type of project that is contracted, this assumption needs to be explored further. This is the topic of the next two sections.

3.4 Increasing costs of splitting the contract

When various tasks within a construction project are complicated to coordinate, or for capital investments with large start-up costs, there may be increasing costs of granting different parts of the project to several different entrepreneurs. The more coordination needed between the different parties (or the larger the start-up costs) that would have been avoided if a single entrepreneur were given the entire enterprise, the larger the costs for the recipient of letting more companies have a share of the contract. To analyze the implication for the triadic equilibrium, suppose that we change the triadic game in sections 3.1 and 3.2 so that the costs are increasing in the number of companies that get a share of the contract.

It is evident that increasing costs in the number of entrepreneurs that undertake the project make it optimal for the recipient to give the entire contract to one single company. In the situation with N company-donor pairs, assume then that the recipient's contract allotting rule is changed to

(12) *If $M < N$ donor-company pair choose (no aid, home): assign the contract randomly to one of the other companies.*

For all other histories: assign the contract randomly to one of the N companies.

Hence, the recipient still adheres to a weak reciprocity rule in that it will punish the companies that do not cooperate if it can do this at no cost.⁹⁸ The main difference from the elaboration in section 3.2 lies in the uncertainty with regard to the reward to the company for punishing the donor. If Donor _{i} does not disburse aid, then Company _{i} is not certain of being paid for locating abroad. Company _{i} will only be entitled to the possibility of being allotted the contract if it cooperates with the recipient. Working backwards for $N=2$ gives the following result:

⁹⁸ Recall that Company _{i} is not cooperating if it does not locate abroad if Donor _{i} does not give aid, and cooperating in all other circumstances.

Stage 4

From (12), the recipient will give the contract to Company_j if Donor_i has refused to give aid at stage 2 and Company_i has located at home, as long as Company_j and Donor_j did not choose equal actions; (*no aid, home*). All other histories in this game will imply that each company has a fifty percent chance of winning the contract.

Stage 3

Contingent upon the actions at stage 2, the following games represent the companies' interaction at stage 3:

A) Both donors have refused to give aid at stage 2.

Then Company_i will have a fifty percent chance of having the contract if it takes on the cost of locating abroad in a situation where the other company does the same. In that case, both will get an expected payoff of $E[C_i^b] = \frac{1}{2}C_i(I, s^u) + \frac{1}{2}C_i(0, s^u)$. If one company locates abroad and the other does not, then the one that cooperates with the recipient will get the whole contract and thus achieve $C_i(I, s^u)$, while the other will get $C_i(0, s^*)$. If both companies refuse to cooperate with the recipient and locate at home, then the recipient grants the contract randomly, which yields an expected payoff $E[C_i^a] = \frac{1}{2}C_i(I, s^*) + \frac{1}{2}C_i(0, s^*)$ to each. Formally:

		Company 2	
		Abroad	Home
Company 1	Abroad	$E[C_1^b], E[C_2^b]$	$C_1(I, s^u), C_2(0, s^*)$
	Home	$C_1(0, s^*) , C_2(I, s^u)$	$E[C_1^a], E[C_2^a]$

Then we impose this section's parallel to condition (10) in section 3.1. Each company's expected payoff from moving abroad and having a ticket to the contract lottery must be higher than the payoff of locating at home and be certain of not having the contract. Thus,

$$(13) \quad E[C_i^b] > C_i(0, s^*)$$

Further, if both companies choose to ignore the recipient's demands and locate at home, then both will have a fifty percent chance of having the contract. However, if one of the companies locates abroad while the other does not, then the former company will have the contract with certainty. Hence, if

$$(14) \quad E[C_i^a] < C_i(I, s^*)$$

is satisfied, then we have the same type of prisoner's dilemma game as in section 3.2. Thus, assume that both (13) and (14) are satisfied and let them replace (10) and (11). Then both companies locate abroad if both donors reject disbursement of aid.

B) Only one donor has refused to give aid at stage 2.

Assume now that Donor₁ has rejected disbursement of aid at stage 2, and that Donor₂ has granted aid. According to (12), the recipient will give the contract to Company₂ if Company₁ locates at home in this situation, which would yield $C_1(0, s^*)$ to Company₁ and $C_2(I_2, s^*)$ to Company₂ if it locates at home and $C_2(I_2, s^*)$ if it locates abroad. Note also that each company has a fifty percent chance of having the contract if both locate abroad. The companies hence play the following game:

		Company 2	
		Abroad	Home
Company 1	Abroad	$E[C_1^b], E[C_2^b]$	$E[C_1^b], E[C_2^a]$
	Home	$C_1(0, s^*), C_2(I_2, s^a)$	$C_1(0, s^*), C_2(I_2, s^*)$

Since (12) is assumed, Company₁ locates abroad to secure the possibility of having the contract. Company₂'s best response is to locate at home, and hence, both have a fifty per cent chance of having the contract. Then Donor₁ is punished for not giving aid, while Donor₂ is rewarded for giving aid by having the location to its own country. Note also that symmetry implies that if Donor₂ does not give aid while Donor₁ does, then we will have that Company₂ punishes Donor₂.

C) Both donors give aid

In this case, both companies have fifty percent chance of having the contract irrespective of their choices (from (12)). Thus, we know from section 3.2 that both companies choose to locate at home.

The crucial point in the analysis is that Company_i will locate abroad if Donor_i does not disburse aid. Thus, the remaining stages of this game are identical to section 3.2, so both donors will give aid even if the recipient does not implement any conditions. The equilibrium path is then that the recipient start out by not implementing the conditions at stage 1, both donors give aid at stage 2, both companies locate at home at stage 3, and the contract is randomly assigned to one of the companies at stage 4.

3.5 Decreasing costs of splitting the contract

Some types of construction work can be more effectively accomplished by dividing the work among different companies, at least up to a certain number of entrepreneurs. Assume now that

there are decreasing costs of dividing the contract among the companies. In this situation, it is optimal for the recipient at stage 4 to grant an equal share of the project $\frac{1}{N}$ to each of the companies. This can be interpreted as there being a cost for the recipient of denying one company a share of the contract. Hence, at stage 4, the recipient will choose to divide the construction project equally among the companies to minimize the costs, irrespective of previous actions of any other player. Then no company will profit from putting pressure on the donor, and Company_{*i*} will always choose to locate in country *i*. Since there is no pressure towards disbursement, we know from section 3.3 that Donor_{*i*} will grant aid at stage 2 only if the recipient has implemented the conditions c_i . The recipient will therefore implement the conditions at the first stage to secure aid. Declining costs in the number of entrepreneurs that undertake the project imply that the recipient is not able to influence the companies to put pressure on the donors towards disbursement. Hence, conditionality becomes successful.⁹⁹

4. Discussion

Several studies have found that bilateral donors frequently direct aid to particular countries based on strategic considerations. Examples of such donor-recipient bindings can be French support to the earlier French colonies, US assistance to Egypt and Israel and Japan's favoring of countries that have the same UN voting pattern as themselves. Such bindings have received criticism, mainly because there are no incentives for the poor country to reform when aid keeps flowing irrespective of the recipient's policies (Alesina and Dollar, 2000, Collier and Dollar 2002). It is argued that one should have no pre-determined recipients of aid, and identify the reformers *ex ante*, so that aid can be granted based on earlier achievements.

There are several reasons for these bindings, and Alesina and Dollar (2000) suggest that the most important one seems to be strategic interests in foreign policy, colonial past and commitment to help the poorest countries. However, our model offers a different interpretation for the rationale of these bindings. In some cases it would be in the donor's own interest to keep aid flowing to a poor country because of the potential loss that may arise if domestic companies are disqualified from contracts with the recipient. In this situation the

⁹⁹ However, we know from Villanger (2002) that for $N=1$ the recipient is able to get aid without implementing the conditions when there are costs of punishing the company if we allow the game to be repeated in infinitely and if the recipient offers a favorable contract. In our game, when $N=2$, the recipient could offer both the companies a contract that is better than the market based contract only if they put pressure on the donor in the donor specific punishment path, and the ordinary contract if they do not. Due to the usual constraints, however, elaboration on this idea must be left for future research.

standard recommendations of channeling aid towards good reformists (see Burnside and Dollar 2000, Alesina and Dollar 2000, Collier and Dollar 2002) would not be desirable from the *donor's* point of view: The donor is locked into the triadic relationship with this particular recipient, not because of characteristics of the recipient, but because of the important role of the companies. Selectivity, or switching aid towards other recipients based on their policy record, can be interpreted in our model as the donor refusing to disburse aid. Hence, in our model selectivity does not make a difference because the donor's problem remains the same.

Our model is consistent both with regard to the evidence that aid is granted independently of implementation record of the recipients (failure of conditionality), and to the findings that particular donor countries support particular recipients. Note however, that any deeper study of the empirical basis for our model needs to take into consideration the strained relationships between the donor and recipients if such triadic pressure is employed. The difference between this kind of triadic extortion and blackmail seems not very clear, so careful qualitative empirical work seems warranted.

Other work on foreign aid has argued that one solution to the failure of conditionality is to introduce recipient tournaments (Svensson 2003). Tournaments would imply that the recipient that goes the furthest in implementing the conditions would get most aid. Following this line of thinking we could introduce a second recipient with the same interests, investment project and relationship to the other parties as the original recipient, and assume that each donor is free to choose any allocation of its aid budget between the two recipients. In our framework, this may result in a tug of war between the recipient and the donor that might be studied in a bargaining model. This line of reasoning, however, must be left to future research.

5. Conclusion

This paper has examined how recipients can influence companies to put pressure on donors to disburse foreign assistance without implementing the conditions usually set for the grant. Others have explained the failure of aid conditionality by showing how time-inconsistencies in foreign aid make commitment to conditionality impossible for altruistic donors. Our analysis suggests that conditionality may also fail when recipients strategically allocate contracts only to companies from countries that disburse aid. In order to secure contracts with the recipient, the companies will then use their power to create a pressure on the donors towards disbursement. If the donor is more concerned with its domestic industries (i.e. the

consequences of not giving aid in this environment) than conditionality, then the recipient's strategic selection of companies to undertake projects may cause the donor to give assistance even if the recipient does not implement the conditions. In contrast to earlier work, this is a time-consistent explanation for the failure, and does not depend on the altruism of donors.

Since donors believe it is a waste to give aid when the conditions attached to this assistance are not implemented, we find that the donor is forced to take a loss when subjected to this type of strategic behavior. Hence, the donor would be better off never to involve itself in the aid-relationship, and one would expect that real-life donors would withdraw from the aid scene, at least over time. Donors subjected to such strategic behavior may change their preferences and be less interested in the recipient's country, and this is consistent with the trend of reductions in the aggregate amount of foreign aid.

Appendix A: Equilibrium when $N > 2$

The backward induction for $N \in \langle 2, N^{\max} \rangle$, is as follows:

Stage 4

From (2), for any i , the recipient will not give any share of the contract to Company $_i$ if Donor $_i$ has refused to give aid at stage 2 and Company $_i$ has located at home, as long as at least one other donor-company pair has taken other actions than (*no aid, home*). All other histories in this game will imply that the contract will be divided among N companies, which implies that

Company $_i$ will have $\frac{I}{N}$ of the contract.

Stage 3

Contingent upon the actions at stage 2, the following games represent the companies' interaction at stage 3:

(A) All donors have refused to give aid at stage 2.

To consider Company $_i$'s choice, assume that $M \in \langle 0, N-1 \rangle$ companies locate abroad. Then

joining the M companies and locating abroad results in $C_i(\frac{I}{M+1}, s^u)$ to Company $_i$, while

locating at home yields $C_i(0, s^*)$. From (10) we have that $C_i(\frac{I}{M+1}, s^u) > C_i(0, s^*)$ since

$M \leq N-1 < N^{\max}$, so Company $_i$ locates abroad. To see that this is also the case when all companies has located at home, assume that $M=0$. Then Company $_i$ will have the entire contract by locating abroad, which results in $C_i(I, s^u)$. By locating at home in this situation,

all companies will share the contract, which yields $C_i(\frac{I}{N}, s^*)$. From (11),

$C_i(I, s^u) > C_i(\frac{I}{N}, s^*)$, which implies that Company $_i$ locates abroad even if all other

companies has located at home. Thus, we have a prisoner's dilemma structure where it is

always better for Company_{*i*} to locate abroad if all donors have refused to disburse aid, irrespective of the other companies' choices.

(B) If $M \leq N - 1$ donors have refused to give aid at stage 2.

Scenario 1: Donor_{*i*} is among the M donors that have rejected disbursement of aid.

Assume that $\hat{M} \in [0, M - 1]$ companies from the countries that refused to give aid locate at home. Then the recipient will give the contract to the other companies. Thus, Company_{*i*} will have $C_i(0, s^*)$ by locating at home, for all \hat{M} . On the other hand, if Company_{*i*} locates abroad in line with the $M - \hat{M}$ other companies from the M donors that rejected disbursement, then the contract is shared with all companies that complies; $N - \hat{M}$. Thus, Company_{*i*} will have $C_i(\frac{I}{N - \hat{M}}, s^u)$ and locates abroad in this situation since $C_i(\frac{I}{N - \hat{M}}, s^u) > C_i(0, s^*)$ from (10). Hence, all M companies will locate abroad.

Scenario 2: Donor_{*i*} is among the $N - M$ donors that granted aid.

In this case it is always Company_{*i*}'s best response to locate at home because locating abroad never has any purpose when Donor_{*i*} has granted the aid.

So if Donor_{*i*} has granted (not granted) aid, Company_{*i*}'s best response is to locate at home (abroad). Thus, the donors that do not disburse aid will be punished.

(C) All donors give aid

In this case, all companies will get $\frac{I}{N}$ irrespective of their choices, so every company locates at home.

Then it follows from the results in section 3.2 that the recipient will not implement any conditions because all donors will grant aid irrespective of the recipient's implementation record.

Note that the larger the number of companies competing for a share of the contract, the less is the chance that each particular company will see it as worthwhile to put pressure on the donor. So if $N > N^{max}$ does no longer hold, there would be no scope for the recipient to

make the companies put pressure on the donor, and then we know from section 3.3 that conditionality will work.

Appendix B: Increasing costs of dividing the contract when $N > 2$

Assume first that (12) describes the recipient's decision rule, and that all donors have refused to give aid. To be willing to punish in this situation, Company_{*i*} must have a higher expected payoff from locating abroad and having the entire contract with probability $\frac{1}{N-M}$ if $M \in [0, N-1]$ donor-company pairs chooses (no aid, home), compared to locating at home and be disqualified from the contract assignment with certainty. Formally, this condition can be stated as

(15)

$$\frac{1}{N-M} [C_i(I, s^u)] + (1 - \frac{1}{N-M}) [C_i(0, s^u)] > C_i(0, s^*) \quad , \forall i, \quad M \in [0, N-1], \quad N < N^{\max}$$

and assume that it is satisfied.

Also, it must be in Company_{*i*}'s interest to punish Donor_{*i*} if every donor refuses to disburse aid, even if all the other companies does not punish. Assume then that all donors have refused to disburse aid and that the companies have agreed that all should locate at home at stage 3. In this case, Company_{*i*} would have the entire contract if it locates abroad. Then assume that the payoff to Company_{*i*} of locating abroad in this situation is higher than to follow the agreement;

$$(16) \quad \frac{1}{N} [C_i(I, s^*)] + (1 - \frac{1}{N}) [C_i(0, s^*)] < C_i(I, s^u) \quad , \forall i, \quad N < N^{\max}$$

Since every company would think in the same vain, the companies find themselves in a prisoner's dilemma. Thus, the agreement of locating at home is not credible, and all

companies would locate abroad if all donors did not disburse aid. This implies that the probability for each company of having the contract is $\frac{1}{N}$ in this situation.

If (12), (15) and (16) replace (2), (10) and (11), then all donors know that if they do not give aid, they will be punished even when there are increasing costs of dividing the contract. Hence, if the model in section 3.1-3.2 is modified by the assumptions in this section, there exists a subgame perfect equilibrium in this adjusted model where the recipient can neglect the conditions and still have aid.

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