

Wiig, Henrik

Working Paper

The productivity of social capital: An econometric analysis of 49 Peruvian highland communities

Memorandum, No. 2003,27

Provided in Cooperation with:

Department of Economics, University of Oslo

Suggested Citation: Wiig, Henrik (2003) : The productivity of social capital: An econometric analysis of 49 Peruvian highland communities, Memorandum, No. 2003,27, University of Oslo, Department of Economics, Oslo

This Version is available at:

<https://hdl.handle.net/10419/63144>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

MEMORANDUM

No 27/2003

**The Productivity of Social Capital - An Econometric
Analysis of 49 Peruvian Highland Communities**

Henrik Wiig

ISSN: 0801-1117

Department of Economics
University of Oslo



This series is published by the
University of Oslo
Department of Economics

P. O.Box 1095 Blindern
N-0317 OSLO Norway
Telephone: + 47 22855127
Fax: + 47 22855035
Internet: <http://www.oekonomi.uio.no/>
e-mail: econdep@econ.uio.no

In co-operation with
**The Frisch Centre for Economic
Research**

Gaustadalleén 21
N-0371 OSLO Norway
Telephone: +47 22 95 88 20
Fax: +47 22 95 88 25
Internet: <http://www.frisch.uio.no/>
e-mail: frisch@frisch.uio.no

List of the last 10 Memoranda:

No 26	Tao Zhang Identifying treatment effects of active labour market programmes for Norwegian adults. 45 pp.
No 25	Tao Zhang A Monte Carlo study on non-parametric estimation of duration models with unobserved heterogeneity. 89 pp.
No 24	Karine Nyborg and Kjetil Telle The Role of Warnings in Regulation: Keeping Control with Less Punishment. 31 pp.
No 23	Maria Kalvaraskaia Savings behaviour when households have access to occupational pensions. 50 pp.
No 22	Rolf Golombek and Michael Hoel Climate Policy under Technology Spillovers. 37 pp.
No 21	Jo Thori Lind Fractionalization and the size of government. 50 pp.
No 20	Michael Hoel, Tor Iversen, Tore Nilssen and Jon Vislie Genetic testing and repulsion from chance. 20pp.
No 19	Jon Vislie Domestic Environmental Policy under Asymmetric Information: The role of foreign ownership, outside options and market power 34 pp.
No 18	Karl Ove Moene and Michael Wallerstein Income Inequality and Welfare spending: A disaggregated Analysis. 53 pp.
No 17	Siwan Anderson, Jean-Marie Baland and Karl Ove Moene Sustainability and organizational design in informal groups, with some evidence from Kenyan Roscas. 49 pp.

A complete list of this memo-series is available in a PDF® format at:
<http://www.oekonomi.uio.no/memo/>

The Productivity of Social Capital

An Econometric Analysis of 49 Peruvian Highland Communities

By Henrik Wiig

Ph.D. graduate student in Development Economics

Department of Economics, University of Oslo

PO Box 1095 Blindern, N-0317 Oslo, Norway

E-mail: henrik.wiig@econ.uio.no

Memorandum 31. August, 2003

Department of Economics, University of Oslo

Abstract: Many empirical studies find a partial negative effect of market integration on cooperation in traditional poor small-scale farmer communities in developing countries, blaming an erosion of collective action enhancing norms (Social Capital). This paper takes the empirical analysis one step further by estimating the effect on income. A survey on cooperation, institutions and income level was conducted by the author in 49 Peruvian highland communities in order to estimate a production function including Social Capital. None of the variables representing customary cooperation were significant in an econometric regression analysis, but various aspects of integration that can be interpreted to facilitate more modern forms of cooperation had a significant positive income effect. Communities resettling after the civil war draw on common organizational experience and emigrants represent a network to the modern society. The positive effect of the latter was significantly lower in communities with individual property rights to land. One possible explanation is the increasing tensions between emigrants and people in their communities of origin as the governmental land entitlement program proceeds. Communities with common property rights are not affected by the program and solve land disputes themselves in local assemblies.

Code-words: Social capital, collective action, institutions, poverty, market integration, survey, Peru

JEL-code: C21, D7, O13, Z13

Acknowledgements: I am grateful to Steinar Holden, Karl Ove Moene, Ole Christian Moen and Eivind Bernhardsen for good advice and suggestions, as well as for comments and discussions made by seminar participants at the University of Oslo. A special thanks to my fieldwork assistant Edwing Huicho Quispe and the Institute of Peruvian Studies for offering office facilities in Lima

1 Introduction

The transition in developing countries from traditional self-subsistence agriculture to a modern economy based on market transactions causes fundamental changes in the small communities where the majority of poor people actually live. Small-scale farmers might choose to grow a different combination of plants in order to sell to the market, monetary income opens for new agricultural techniques like the use of fertilizers and machinery, etc. People change their ways of working, they are exposed to new ideas through interaction with the larger society, etc. The internal life of earlier relatively isolated rural communities are up for large changes. The pessimists in development research predict a breakdown in the "social fabric" of the community. Their main thesis is that more individualism reduces cooperation, which will entail less production, internal conflicts, more individual risks as traditional insurance systems weather, etc. The optimists emphasize higher income potential through specialization and trade. Learning through increased contact with the modern society will make the poor farmers more productive and welfare increases as the material living standard rises.

Most papers in the extensive Social Capital (SC) literature focus on negative effects of market integration. A prominent line of thought is as follows: Contacts outside reduce the effect of internal sanctions, and an increasing number of defectors in "social dilemma" situations will imply a collapse in cooperation. One example is Bardhan (2000) that finds the functioning of the irrigation systems in a cross-section of Indian communities to be worse, the higher their trade volume compared to total income and the shorter physical distance to urban areas. To know the effect on the cooperation level is interesting in itself, but can only be given a similar economic interpretation if one assumes cooperation is technically efficient and/or that the collective action inducing phenomena does not affect income negatively through other channels. This paper hence distinguishes between the partial and reduced form effect of integration on income.

There are three important reasons to consider the traditional collective action analysis to be less relevant if the aim is to explain monetary income¹. (i) More individualistic norms might be devastating to cooperation, but at the same time nourish individual progress with a counteracting effect on the income level. (ii) Market integration can reduce the ability to sanction defectors, but at the same time increase the payoff from cooperation through the introduction of complex market transactions. (iii) Cooperation can actually be unproductive, but still maintained due to some social payoff or people have not yet understood the optimal way to exercising a new technique or approach markets. The fundamental question is hence to assess the productivity of cooperation, both in a partial technical perspective and the reduced form reflecting the processes which leads to the changes in the cooperation level, before we conclude anything about the desirability of collective action and SC.

This paper estimates the income productivity effect of cooperation for the group that is thought to be most vulnerable for market integration and modernization in developing countries: The traditional

¹This paper does not consider welfare in general as utility from non-material consumption is hard to measure.

small-scale farming communities in previously isolated areas. A survey on the cooperation level, institutional organization and income level were conducted in 49 communities in the Andean highlands of Peru. A cross-section econometric analysis using the community as the statistical unit, surprisingly finds customary cooperation such as work-exchange, community assembly, communal work on infrastructure, membership of voluntary groups etc. to have no significant effect on the average income level of the community.

Meanwhile, variables representing integration phenomena that is thought to be relevant for modern forms of cooperation through SC, turns out to be econometrically significant. (i) More long distant emigrants - who can support their friends and relatives back home with remittances, information and contacts - entail a higher income level in their community of origin. (ii) This emigration effect is stronger in communities with common property rights to land compared to communities with individually owned plots - probably due to emerging conflicts between emigrants and the community members as the land entitlement program is initiated. (iii) Resettlement communities - where members have a historic experience of close cooperation in organizing the return and reconstruction - have larger income than the communities that were never abandoned during the civil war. Hence, preserving traditional forms of cooperation does not necessarily imply higher income, but integration can give rise to different kinds of cooperation with positive income effects in a modern society and economy.

The success of the concept Social Capital in social research and politics has made the assessment of its importance and productivity a pressing issue². It has now become legitimate to use development aid on social activities with the expectation that improving the "social fabric" will have productive implications at a later stage. The district capital in the Peruvian highland where the fieldwork of this paper took place is an example. The main "plaza" was converted from a rustic common room with lots of different uses to a recreational park including fountains and statues using municipal funds. Vegetable markets and other outdoor economic activity is restricted to the back streets, while the "arena" is left for military parades and Sunday strolls by the new village (state and NGO employed) middle-class.

2 Market integration and the Social Capital concept

The success of SC in development economics is partly due to the unsatisfactory low explanatory power of econometric specifications modelling income as dependent only on traditional inputs. Labor, real capital, infrastructure and later human capital did simply not tell the whole story. In the beginning of the 90'ies variables reflecting central institutions were added, and now finally SC. Of what this capital actually consists, whether the capital concept is correct, etc. has been the characteristic of much of the discussion. The obscurity of the concept is also reflected in the many definitions given in the literature. Ostrom (1995)

²The concept "negative SC" in the research literature is restricted to mafia, racism, etc. where members in one group cooperates in exploiting and repressing outsiders.

p. 125 defines SC as "...the arrangement of human resources to improve flows of future income", while La Ferrara (2000), p. 1, narrows SC down to "...the stock of norms, trust and civic networks that characterize a society". The seminal work of Putnam et al. (1993) applies a more restrictive concept which is closer to the capital allegory by using indicators of associational activity like voter turnout, newspaper readership, membership in choral societies, football clubs, etc.

The theoretical discussion in this paper is close Ostrom's notion of overcoming "social dilemmas", i.e. situations where people are tempted by short term profits to defect from cooperation but are willing to subordinate in order to achieve long term gains (e.g. repeated prisoners dilemma). The ability to overcome such coordination failures increases with the stock of Social Capital, and concepts from behavioral economics are then relevant. This paper suggests to summarize the reasons for human action into the following five distinctive categories: (1) immediate hedonic utility maximization, (2) hedonic utility maximization when the agents take the payoff from external institutions into consideration, (3) hedonic utility maximization when the agents take the payoff from external norms and fellow citizens into consideration, (4) own preferences regarding non-hedonic factors like internalized norms, moral, feelings, etc., and finally (5) an heuristic approach to action, i.e. people do not analyze the situation but act according to what have given good results in the past. The latter can actually represent a delusion of the results from the four proceeding categories based on analytical reasoning.

It seems proper to split the SC-concept in two if "trust" and "trustworthiness" is to be used as proxies. Torsvik (2000) introduces the term "Institutional SC" for systems which induce trust that are imposed from the outside in some manner, e.g. laws that are enforced by a functioning police and judiciary system³, i.e. category (2). "Civic SC" on the other hand are factors which improves the community's ability to cooperate in "social dilemmas" that are independent of external systems and hence more in accordance with the phrase Social Capital as used in the economic literature today, i.e. category (3), (4) and (5).

The relative importance of each category is discussed in the literature. Elster (2002) questions the importance of sanctions in non-formalized cooperation situations, as for example put forward in the seminal work on long distance trading communities by Greif (1993), since this often implies a cost to the punisher too. Such rumor-based systems would hence depend on meta-punishment, i.e. willingness to punish the non-punisher, punish the non-non-punisher, etc. and this rapidly approaches zero. Instead, Elster emphasizes how people normally internalize a norm as own preferences. The negative feeling of "guilt" can more than compensate the hedonic utility from material gains, which renders even unnoticed

³A shop-owner lets you into his store since he does not expect to be robbed, as for most people the utility from stealing will be negative with a high probability of being caught, judged and punished. Institutional SC hence makes people trustable and the social dilemma situation of having open stores is overcome. In some cases Institutional and Civic SC are directly opposing. People in the communist republic of East Germany before the unification in 1990 were trustworthy because the state registered most actions by its citizens and also punished defectors. But horizontal trust in non-legal agreements hardly existed since anyone could be an informer for the secret police STASI (even your spouse).

defection in "social dilemmas" cooperation unoptimal. Many theories within social psychology underline the dynamic and endogenous aspect of individual preferences, for example the theory of cognitive dissonance in Festinger (1957) which assumes people will tend to change preferences in order to minimize the difference between the actions they do and feelings about what they are doing⁴. Political changes can hence have a rather strong social engineering effect. If market economies induce and reward individual actions, then people will start perceiving individual actions as more morally defensible even if this reduces the degree of collective actions. This implies a spillover effect from (1), (2) and (3) to (4). How important and how long time it takes, is often decided by (5). If people do not calculate rationally the effects of every actions they take, but acts according to some perceived expected outcome based on historical experiences, peoples actions and hence their feelings about their own actions (preferences, internalized norms, etc.) will change slowly over time. How cooperation minded people are according to reasons for action in (3), (4) and (5) is hence assumed to be the stock of (civic) Social Capital given in a certain moment in time.

There is a reverse of the SC-medal with negative impacts from an economic development point of view. Cooperation friendly preferences and norms can have a devastating effect on individual development⁵, impeding growth as developing countries are exposed to the market economy were individual actions becomes relatively more important than collective actions⁶. An isolated analysis of how integration affects cooperation is hence just a part of the whole development picture. But even assessing the productivity of this partial effect is rather difficult. Activities can be split into situations were it is technically efficient to cooperate and others that are not. A society with strong cooperation-inducing norms (much SC)

⁴There are several explanations to how the introduction of markets can affect the economic outcome through (1)-(5). Bowles (1998) mentions how the anonymity of the market makes (3) less important since a cooperation situation between the same individuals are more seldom repeated. The utility from a consumption basket is also dependent on the process that made it available. The commodification process, which is associated with the market economy, tends to reduce the "intrinsic" rewards in favor of the "extrinsic" since less is known about the process. Moral and preferences in (4) hence play a smaller part as causes for action, e.g. you will not know whether a hand knit carpet imported from distant countries is made by children or adults. The production and learning process is split in modern market economies, and this also tends to segregate the moral and cultural training from real life. Ostrom (2003) emphasizes how people choose between different reciprocity rules in a heuristic approach. The set of approaches within a group entails equilibrium that can be characterized by the SC-level. If a sufficient number choose "cooperate, if others cooperate first", then no cooperation is the result, while "cooperate until proven unprofitable" will entail high levels of cooperation even if some always choose to free-ride. A change in the reciprocity rule by just a few, for example due to trading activities, can hence tilt the equilibrium from cooperation to non-cooperation.

⁵The famous (conformity) Law of Jante in Sandemose (1962) facilitated cooperation between traditional fishermen on the coast of Denmark, but blocked individual initiatives to improve their own livelihood through education, new business ideas, etc. Strong British labor unions made coordinated strikes to improve the general working conditions and income for all possible, but group pressure at the same time undermined individual progress through education and career.

⁶A interesting, but not entirely correct parallel, is how private initiative were perceived as both juridical and morally illegitimate when the communist regime broke down in the old Soviet Union and new rules allowing individual initiative were more or less imposed overnight. Most of the economy was hence taken over by people who did not share the collectivistic norms and had no inhibitions to grab the assets of value.

might end up cooperating in situations when it is not technically efficient, for example due to wrong perceptions as the circumstances change rapidly (slow learners), conformity pressure, etc. On the other hand, communities with weak cooperation-inducing norms (little SC) might end up solving situations individually where cooperation would have been better. It is hence not given what norms lead to the largest overall technical efficiency in a given situation.

Most people perceive norms that induce individual contributions rather than cooperation to be more important in modern market economies than in traditional societies. Even if this is not necessarily true in absolute terms, we would expect that individualism becomes relatively more important since the market economy tends to open for new business opportunities, trades and occupations of mostly non-cooperative nature.

3 Empirical study

3.1 Measuring SC and its productivity

Much of the empirical SC-literature focuses on norms and preferences (3,4) and proxy this by some kind of perceived level of trust and trustworthiness in a given society. Putnam et al. (1993) argue that civic activity, i.e. being members of organizations, reading newspapers etc., make people more empathic and hence more willing to cooperate in "social dilemmas" which then constitutes an indirect measure of SC⁷. Other authors have later preferred to measure the level of trust and trustworthiness directly. Either by experimental games, i.e. Glaeser et al. (2000), or by survey questionnaires, like Knack and Keefer (1997) using the World Value Survey where people were asked if "...most people can be trusted?" for cross-section analysis on country level. A similar approach can be used on all empirical levels, like Narayan and Princhett (1999) who carried through a household questionnaire survey for 1376 households in 87 rural Tanzanian villages mixing the two approaches. Each family was asked about membership in groups and its characteristics, and then about their subjective level of trust in others and perceptions of social cohesion in the village. Most studies hence actually try to measure the underlying variable for norms directly to apply these in econometric work, and not the actions resulting thereof that will be the approach of this study.

Unfortunately, due to the partiality as discussed in the previous sections, most of the empirical literature use their SC-proxies to find a relation with some kind of "social dilemma" where cooperation is further perceived to have a positive effect on income. Proceeding the SC-literature, Ostrom (1990) studied how local societies organize the exploitation of common pool resources (CPR) as a problem of "collective action". She finds different variables like homogeneity of the society to have a significant impact on the cooperation level, arguing that the effects work through cooperation inducing norms like "trust", "cultural identity" and the equilibrium combinations of reciprocal action rules chosen by the population

⁷They found a positive effect on the efficiency of governmental institution in their famous study of Italy.

as discussed in Ostrom (2003), i.e. what we would call SC in this paper. The CPR-literature use variables that are thought to work through the SC-effect in the econometric models to explain the cooperation level. The negative impact of integration on cooperation in the set of Indian irrigation communities found in Bardhan (2000) is meant to be interpreted this way. Similarly does the Dayton-Johnson (2000) study of irrigation communities in Mexico⁸ find homogeneity within the community to have a positive impact on cooperation. None of these studies actually go beyond estimating the partial effect on cooperation in exemplified "social dilemmas" in order to measure some total productivity effect, nor do they measure the impact on income of this partial cooperation effect.

Narayan and Princhett (1999) is one of the few studies that try to estimate the productivity effect of SC. Income of the individual households is found to be positively correlated with proxies for "trust" measured as explained above. The average number of organizational membership in the village had a significant positive impact on income level, while the households had no positive effect of belonging to more organizations themselves. SC is hence more a public than a private good⁹. But group membership can depend on the income level as some kind of consumption good, and the authors hence use "trust in strangers" and "trust in government" as instrument variables which renders significant results. These instruments are not valid in the opinion of Durlauf (2002). They are incorrectly excluded from the original econometric model since it is rather noncontroversial that societies with higher generalized trust also achieve more economic progress. Knack and Keefer (1997) do a similar exercise on a cross-country level and find the World Value Survey question of "...most people can be trusted" to be positively correlated with the average income level, but the endogeneity problem is expected to be just as important at this aggregation level.

This paper will to some degree follow the approach in Narayan and Princhett (1999) by estimating the productivity of Social Capital (SC) using controls for production inputs and other aspects of productivity.

3.2 Peruvian highland communities

3.2.1 Fieldwork survey

The statistics used in this analysis are mostly taken from a sample that encompasses all 49 communities in the district *Tambo*¹⁰ in the Peruvian highlands with about 16.000 inhabitants. The division into communities in the statistical material follows the lines of the municipal authorities in COZODES, i.e. units

⁸These resemble the communities of the Peruvian highland of this study both in natural conditions, infrastructure and culture.

⁹The effect is surprisingly strong. Increasing average membership in groups by one standard deviation increases expected incomes by 20-50%. A similar increase in schooling entails just a 3 to 5% increase in income, while non-farm physical assets is associated with 19-22% more income.

¹⁰Province *La Mar*, Department *Ayacucho*

which were made responsible for organizing the Defense Committees during the civil war initiated by the Shining Path guerrilla, Municipality (2002). Meanwhile, their division is nearly always in accordance with the traditional organization into separate communities, each with a formal assembly electing community leader, state representative and defense group leader. Important decisions concerning all inhabitants of the community are made by majority decision in the general assemblies. The size of the communities differs between 12 and 180 households, of which most are dependent on agriculture and animal husbandry as the main source of income and consumption. The district capital is excluded from this analysis since cooperation and Social Capital take other forms in urban areas.

The statistical source is the answers on a questionnaire collected through interviews made by this author during fieldwork spring 2002. The focus was to find the degree of cooperation within each community, how the community institutions were modelled and the economic integration with the rest of the economy. The respondents were normally one or more elected representatives for the communities ("an authority") who would assess production, sales, average days of work exchange and other cooperation variables and institutional aspects of the community.

3.2.2 Econometric model

Agriculture is the dominant economic activity in the Peruvian highland. The division into four separate sources of income are: (i) agricultural production measured at farm-gate sales prices¹¹, (ii) annual animal production¹², (iii) other products like handicrafts, woods, processed foods, etc. normally for sale and (iv) off-farm labor income¹³. Transfers (e.g. from emigrated family members), production of public goods (e.g. schools, roads) and private investment (e.g. housing) are not included. The calculated total income of the community in the local currency *nuevos soles* is translated into *US dollars* using the currency conversion rate since the financial markets are liberalized, and then divided by 360 days and the numbers of persons (including children) who are perceived as members of the community. The low mean income of 0.37 usd/pp/day reflects the general backwardness of the Peruvian highland region. Meanwhile, the rather large dispersion between communities and the standard deviation of 0.23 usd/pp/day illustrates the success of some communities and the failure of others.

Labor and physical capital was left out of the survey since getting good answers would be too time

¹¹Production volume and sales prices for the four crops with most sales in the community were registered in the questionnaire. These were normally also the products most consumed. Some production is hence left out, but this is expected to be marginal compared to large volumes produced of the main staples and trading crops. The resulting bias in the estimated coefficients is further reduced since this method was applied on all communities. The survey also makes it possible to subtract production in the community by outsiders, and add production by the community members on plots that administratively belongs to other communities.

¹²The stock registered in the questionnaire is divided by the assumed raising time, in order to reach yearly production volume.

¹³Either paid labor done for neighbors or in communities close by, or on coffee, sugar (and coca leaf) plantations in the Apurimac river jungle about a day's journey from Tambo.

consuming and was further not expected to differ much. Most people are poor and hence spend most of their days working even though their marginal productivity differs. There are neither tractors nor other machinery in this area, and the *Chaquitaclia* (hand plow) is the predominant tool since oxen are less useful in steep terrain and on the rather small plots. One important production input variable that is included is the access to a reliable source of water. Rain can be plentiful, but unpredictable. Irrigation systems hence secure water in the crucial phases of the plants growth cycle. The included variable is hectares of good irrigated land equivalents per person (*Irrigation*) and this is constructed on basis of total irrigated area and the rate of water flow in the canals. The communities have land in different ecological zones and the applied measure for agricultural productive land equivalents (*Land*) is hence a weighted average depending on the three main ecological zones (valley bottom, slopes and highland plains).

Road access (*Road*) in the community is included as production related public infrastructure. Escobal (2001) finds road connection to improve household income in a poor rural district in the Peruvian highlands which is comparable to the district in this study. The effect is not just through reduced time and money spent on product transport, but improved information also reduces transactions costs and opens for more off-farm employment.

Several variables for explicit cooperation in different arenas are included in the regression model to reflect separate effects on household income. "Trust" (or SC) in one arena does not necessary give cooperation in another. Wade (1988) finds actually the opposite in his study of Indian rural communities that had rather sophisticated institutions for irrigation management. In order to avoid negative spillover from potential distributional conflicts that might arise if they undertook the responsibility of distributing food rations on behalf of the state or other organizations, they would say no and prefer risk being bypassed.

Work exchange between individuals in small groups of just a few persons or larger groups is measured in man-days per year per household (*C – Work*). The tradition of community assemblies goes back to ancient times of the pre-colonial society. All communities have some kind of assemblies where decisions concerning the whole community are taken, but their importance varies. The communities' ability to cooperate and coordinate actions, for example in order to obtain funding from both governmental and non-governmental agencies, is hence measured as the average share of the households turning up for such meetings (*C – Assembly*). The inhabitants often join in communal work on infrastructure maintenance and construction, either at the community's own initiative or as a contribution put as a requisite to obtain funding for a given project. This is measured in average days of work contributed per household (*C – Infrastructure*) in the preceding year (2001). Membership in many voluntary organizations is so prevalent that the "voluntary" aspect can be questioned. For example, every community must in practice have a Self-defense Committee even after the guerrilla war ended. A Mother's Club is also a prerequisite to obtain the rather important food aid for children (and in practice also adults) from the government.

Nearly all communities were able to put up such organizations, so I have instead used the existence of dance and music groups as a dummy variable (*C – Associations*) reflecting the degree of associational activity in the community. For all types of cooperation, defectors could be sanctioned in different ways (oral warnings, monetary fines and serious actions like confiscation of property). This study just includes sanctions against people who do not show up at assemblies, introducing a dummy for the ability to issue and collect monetary fines (*Sanctions*)¹⁴.

Several variables that reflect experiences and phenomena giving rise to other forms of cooperation that could be considered to be more modern are further included. The exposure to violence on community level during the civil war was probably independent of the inhabitant's economic success. The variable measuring the share of emigrants to distant and more advanced economic places compared to the population today (*Emigration*) is hence more exogenous than normally assumed in the emigration literature. Kinship or community acquaintances in the cities can facilitate trade by reducing information cost, give tips about posts of temporal wage employment, send remittances back home that can be used for buying production inputs like fertilizers, etc.

60 percent of the communities were completely abandoned for longer or shorter periods during the civil war. Many people were grouped in some central communities that were easier to defend (and control) by the military or themselves. Abandoned communities that have been repopulated after the war are separated from the communities which were never abandoned by a dummy variable (*Resettlement*). This war experience can have influenced the SC-stock in the communities. The resettlement itself was often some kind of collective action. Individuals took initiative to gather the original community members who lived in different places by using an extensive network, they cooperated in achieving financial support from the state or NGOs, etc. If trust is transferable between situations, this episode of successful collective action by the returnees should facilitate trust in other arenas later, an experience which is lacking in the communities that were never abandoned.

The state and the municipality have little influence over the actual decisions in each community. The authority is in the hands of community assemblies, but their power varies from community to community. One reason is different legal organizational status. In legally registered farmer communities the land is common property, while land in the other communities are individually owned even if no legal papers exist. The organizational dummy variable (*Juridical status*) reflects the latter system. In practice all land is divided into plots farmed separately by households with historical and inheritance rights. We still expect the assembly in the former to exercise more power, as the individual rights can be contested, e.g. if land is not in use. Their historical experience, for example through applying for the legal status in the early 1970'ies, can further give rise to more cooperation inducing norms.

¹⁴Cooperation on irrigation canals were included in the survey, but are left out as a separate variable since the conditions for such system was not present in some communities. Anyhow, the effect is included indirectly since well-organized irrigation communities will have more irrigated land per inhabitant.

3.3 Estimation results

The communities are traditionally based on subsistence agricultural production of maize, potato, beans, etc. were the combination depend on the ecological zone. Crop production is the most important source of income and this source constitutes on average 49 percent of total income in this survey of the communities in Tambo (see appendix 5.1). This income source is also probably more accurately measured than the others and hence a good basis for making analysis¹⁵. The results from an OLS regression model explaining agricultural income is as follows:

	Coef.	Std.err.	t	P> t
<i>Constant</i>	-0.1472	0.1425	-1.03	0.308
<i>Irrigation</i>	0.6145	0.1552	3.96	0.000
<i>Land</i>	0.0680	0.0405	1.68	0.102
<i>Road</i>	0.1097	0.0458	2.39	0.022
<i>C-Work</i>	0.0003	0.0003	0.82	0.416
<i>C-Assembly</i>	-0.0373	0.1140	-0.33	0.745
<i>C-Infrastructure</i>	-0.0018	0.0013	-1.41	0.168
<i>C-Associations</i>	0.0257	0.0511	0.50	0.618
<i>Sanctions</i>	0.1120	0.0529	2.12	0.041
<i>Resettlement</i>	0.1240	0.0470	2.64	0.012
<i>Emigration</i>	0.1983	0.0772	2.57	0.014
<i>Juridical status</i>	0.0985	0.0560	1.76	0.087
<i>Emigr_ Juridical</i>	-0.3155	0.0952	-3.31	0.002

Table 1: Agricultural income estimated by a OLS regression model, n=49 communities; $R^2=0.58$; Adj- $R^2=0.45$

The economic analysis gives three striking results: (i) insignificant cooperation coefficients, (ii) the significance of several integration variables and (iii) two conflicting effects, one direct and one indirect, of the communities' legal institutional status.

No customary cooperation variables turns out to be significant. Work exchange, etc., is still a living tradition even though the region now is integrated into the market economy and modern society. Meanwhile, the regression coefficients encompass some effects that render their interpretation to be something in between partial (technical) productivity and reduced form of the underlying change in norms. If the cooperation inducing norms actually hinder individual development as discussed in chapter 2, the negative correlation between cooperation and the individual abilities like education, contacts, language knowledge, etc. that are not included in the regression model, will give rise to a downward bias in the

¹⁵Animal husbandry is associated with a higher degree of insecurity since the annual income is estimated on the basis of the size of the herd. Animals are further the responsibility of the women, and since the survey respondents were only men who probably know less about this source of income. The quality of both other products and wage income is probably better, making the analysis on total income to come later still valuable.

estimated coefficient¹⁶, i.e. $E(\hat{\beta}_{coop}) < \beta_{coop}$. Whether the initial problem of negative correlation between cooperation and individual ability caused by a change in the same latent norm from integration for the district of Tambo is further questionable. In the following I will hence interpret the cooperation coefficients to represent the partial productivity effect of cooperation, *ceteris paribus*.

Work-exchange is a cultural feature of these traditional societies. According to social anthropologists like Mayer (2002) The Andes region is "the heartland of reciprocity". This is more tit-for-tat reciprocity than a generalized reciprocity norm, and can be interpreted more as a pure exchange system than any norm or moral induced action. The farmers often keep a detailed account of days and hours to secure a balanced exchange between the individuals. This could have been achieved using money as the mean of exchange, but the non-monetary exchange has not lost its popularity¹⁷. On average does each household in Tambo work 90 days under such exchange agreements, but there are large differences between the communities (see appendix 5.1). A possible explanation for the missing productivity effect can be that time spent working together can be regarded as an (inferior) consumption good. Low-income earners must socialize during work in order to have some human interactions, while high-income earners can afford to take time off in order to socialize. This endogeneity effect will give rise to a negative bias in the estimated coefficient for the productivity of work-exchange¹⁸. One obvious explanation would be differences in climate, etc. that makes work-exchange more productive in some communities than in others. This problem should be minimal as the regression model contains various variables which reflect important agricultural conditions, the district of Tambo is a rather small and homogenous area and the inclusion of more natural variables like climate, etc. does not alter the economic results in a significant manner.

Attendance to community assemblies (*C – Assembly*) has no significant effect on income. One of the main reasons can be that this number does not necessarily reflect the functioning of the assembly. People can stay away due to productive reasons, e.g. migrant workers, preferring to pay the usual fine

¹⁶Some of this latent variable bias is probably already corrected since the variable for road connection (*Road*) might incorporate some of the individual ability. Such communities are better able to exploit the new economic possibilities given by exogenously given roads.

¹⁷Missing markets is an explanation for cooperation in traditional societies often given by the farmers themselves and other social scientists since "People in poorer and less market integrated communities do not have money to hire day-workers (peón) and are hence forced to exchange work". With a one-to-one exchange relation, this should not prevent functioning monetary labor markets but just imply lower equilibrium wages. The real explanation can be some kind of moral hazard problem in renting labor that is harder to overcome by poor/traditional than by the richer/modern farmers and communities. There might further be some sort of insurance built into the working exchange system that is more important in poorer societies. Fluctuating monetary income in combination with scarcity of saving opportunities for the poor will further lead to a fluctuating "shadow-price" on money. Other means of exchange then reduce this insecurity.

¹⁸A 3SLS regression which estimate simultaneously an equation of income and one equation of work-exchange will correct for this bias. The work exchange coefficient then becomes significantly positive, but the relevance is questionable as there is no significant effect of income in the work-exchange demand equation. (see results in appendix 5.2)

of a working day's salary¹⁹. The estimated coefficient for days worked per household on communal infrastructure (*C – Infrastructure*) is also insignificant, and it has even a negative sign. An evident explanation is that people are more willing to do communal work with lots of spare time, or they are willing to give up valuable production time if there is a critical need for infrastructure, for example in the restructuring process after the war. The dummy variable for existence of dance and music group in the community (*C – associations*) that is closer to the Putnam-tradition was not significant either²⁰.

The ability to sanction defectors in "social dilemmas" is assumed to be a necessary condition in order to make hedonic utility maximizing individuals comply instead of opting for free riding. In Tambo there was a clear distinction between the communities that were able to issue monetary fines and the ones that just relied on oral warnings and slander²¹. The dummy variable for the communities that were able to issue and collect monetary fines for not meeting at assemblies (*Sanctions*) turned out to be significantly positive.

The previous mentioned types of cooperation do not cover all arenas in daily life. Different aspects of the integration processes are included in the model as separate variables and are meant to reflect distinct cooperation phenomena. The dummy for resettlement communities (*Resettlement*) is highly significant. People in these communities chose to flee in order not to be caught in the middle in the conflict between the Maoist guerrilla Shining Path and the military forces, or they were forced to move by the military that wished to prevent their potential conversion to guerrilla support bases. The return was most often organized by themselves and they coordinated transport so that all could move home more or less on the same truck platform-load. Then it was easier to avoid free-riding in the reconstruction work, and there were further protection-in-numbers against potential assaults by the remaining Shining Path cells, thieves and cocaine smugglers. This experience of common interest and coherent actions can have made the people of these communities more united with a positive spillover effect on other forms of cooperation as a result, e.g. insurance systems, monetary lending, political clout, coordination to lobby help from the outside, etc.²². People had fled to different places during the war time and this has created a common pool

¹⁹ Assembly turn up is significant for some other income categories like animal husbandry. The reason is probably that there are more latent conflicts on the use of common pastures and mixing of herds. Well functioning communities avoid problems and hence have higher income, or the contrary causal explanation is that people from more animal dependent communities sees a greater need to turn up at the assemblies.

²⁰ Finally, irrigation cooperation that was a mayor part of the survey is not directly included in the regression model since natural conditions were not present in all the communities of this survey. Meanwhile, this effect is included indirectly as better coordinated irrigation communities will have more irrigated land equivalents (*Irrigation*). Some of the explanation power of the other cooperation variables can be lost to the irrigation cooperation component hidden in this variable.

²¹ Some communities would even use harder punishment as confiscating and/or selling property if people do not comply with the monetary fine. There can be contradictory interpretations of the reasons behind this, either is the willingness to cooperate so low that hard measures are necessary or good organized communities are able to make harsh sanction work.

²² World War II had a similar effect on a national scale in Norway. The 30'ies were charactized by the class conflict, while the common fight against the aggressor opened for the Social Democracy experiment after the war, i.e. the centralized labor union restricted wild wage demands by the individual members, while capitalists who were allowed to keep their fortunes

of knowledge and contacts that is useful to exploit the economic markets of the modern society. We would also expect some traces of this effect in the "resistant" communities since many individuals left during the war and then came back afterward. But the total SC effect here is expected to be lower or even negative. They are probably more divided since there is a mayor difference in experiences between the people who stay and the ones who left and came back, as the social anthropologist Fumerton (2002) reports from this district. These communities had further received many refugees from the surrounding area, and their later departure created further upheaval within the community. There are also other more prosaic reasons for the significant income difference. People in resettlement communities are probably a more homogenous group of work capable people since war-widows and other less productive individuals often lacked the money and initiative to go back. The most capable and successful on the other hand seldom return. Governmental and NGO financial help were unequally distributed between the communities in favor of the resettlement communities, which if used directly or indirectly for productive investments, rises income. The resettlement might actually depend on the income potential of the community, but this endogeneity problem is supposed to be rather small, as people now have returned to nearly all previously existing communities. Furthermore, the violence which led people to flee in the first place, struck both rich and poor communities. There is hence no reason to expect a serious endogeneity bias²³.

Many people fled during the war to distant places like the district capital Ayacucho, Lima or the jungle. The contact between these constitutes an important asset for the people who remain in the emigrants native community. Emigrants can facilitate long distance trade by giving information on prices and sales opportunities, receive cargoes, intermediate with buyers, etc. which most farmers are reluctant to entrust strangers. They can further help out in finding short-term employment. Remittances to families by emigrants are in most traditional societies an important monetary income source. This money can be used to buy fertilizers, pesticides and other inputs increasing the productivity. Remittances can also be seen as the emigrants' part of some cooperation schemes, while the people in the community contribute labor. In return they get some of the product or some kind of favor like looking after their elders, children, herds, etc. The included variable is the number of long distant emigrants compared to the number of people living in the community today (*Emigration*) and has a highly significant positive coefficient value.

Communities with individual property rights to land are represented by a dummy variable (*Juridical status*) and they have a significant higher agricultural income compared to legally registered farmer

had to secure full employment and comply to labor standards in return.

²³Simple correlation between resettlement and the customary cooperation variables give a complex picture of how this experience affects various forms of SC. Work exchange and attendance to assemblies are hardly affected, while people spend a lot more time together on infrastructure. They are on the other hand less interested (less time) in voluntary organizations but also less able to punish people who do not turn up for assemblies. The latter can actually be a smaller problem if attendance is less pressing. A positive correlation with canal maintenance in the irrigation communities shows how the resettlement communities can be more able to coordinate customary cooperation. A more complete econometric analysis of this interesting phenomena will be treated in a separate article.

communities with common property rights. The user-right to land is in practice individual in both systems, and we do not expect any effect on sanctions or customary cooperation. Individual ownership and not just user rights can still give higher security and hence tempt the farmers to invest more. More interesting for the analysis is the significant negative coefficient for variable of interaction between emigration and juridical status of the community (*Emigr – Juridical*). This implies that communities with legally registered common property rights to land profit more from the contact with emigrants than communities with individual ownership. Casual information from Tambo implies this might be due to the forthcoming land entitlement program that is under preparation. This is a major program based on the ideas of de Soto (2001) to empower the poor farmers by making land useful as collateral in order to obtain loans. The immediate effect seems to be an increased level of conflict between the emigrants and their relatives and other community members back home as property rights have to be defined. This conflict has led emigrants to be less helpful to their relatives back home, and often all contact has broken down. Legally registered farming communities are not included in the land entitlement program as the property rights is already juridical registered on the whole community as the legal subject. If conflicts over user rights to land arise, the community assembly normally solves the problem. This is hence a striking example of the possible negative effects of replacing traditional decentralized juridical structures with a centralized authority. Since the latter have less detailed information in each case, it opens for more civil disputes as people will be tempted to make unfounded claims to see if they can get away with it. This illustrates how interventions from the outside can erode the stock of SC in traditional units of cooperation.

Applying the same econometric model on total income does not alter the significant results in an important way (see appendix 5.3). The mayor differences are that *land* becomes significant which reflects the importance of grassing for animal herding and the private land ownership dummy *juridical status* is not significant at a 10 percent level any longer. The latter probably reflects the importance of coordination ability of the community for the other income sources. The results of the original OLS model on agricultural income also hold if just variables that are significant at a 10 percent level are included, since there are no large changes in any estimated coefficient values (see appendix 5.4).

4 Conclusions and further research

The regressions results of the survey conducted among Peruvian highland communities of small-scale farmers fail to show any significant connection between traditional cooperation and agricultural income. This is a surprising result since the tradition of collective action is still strong after a period of several decades of integration to the market economy and modern society. This questions the productivity of Social Capital, making the standard approach of how integration affects customary cooperation a rather partial analysis of less importance from a development point of view. Integration can on the contrary facilitate modern forms of cooperation, e.g. emigrants can be part of long distance trade operations.

Interestingly, this effect is stronger in communities with collective rather than individual property rights to land. Further can the dividing effect of civil war be turned into Social Capital at a later stage. The resettlement communities that coordinated the return and reconstruction of their abandoned homes, had significantly higher income than the communities that were never abandoned in the first place.

The empirical material is based on field survey data gathered by interviewing representative authorities in 49 communities. I will in the future match this cooperation and institutional survey at the community level with the agriculture census, INEI (1993), and housing and population census, INEI (1994), from the Peruvian statistical office. The sample size then increases to about 1500 household observations which makes detailed analysis as in Narayan and Princhett (1999) possible. All sorts of control variable at the household will then also be available and it is easier to separate the Social Capital effects in an econometric analysis.

References

- Bardhan, P. (2000). "Irrigation and cooperation: An empirical analysis of 48 irrigation communities in South India." *Economic Development and Cultural Change*, 48(4), 847–864.
- Bowles, S. (1998). "Endogenous preferences: The cultural consequences of markets and other economic institutions." *Journal of Economic Literature*, 36, 75–111.
- Dayton-Johnson, J. (2000). "Determinants of collective action on the local commons: A model with evidence from Mexico." *Journal of Development Economics*, 62, 181–208.
- de Soto, H. (2001). *The mystery of capital*. Bantam Press, London.
- Durlauf, S. N. (2002). "On the empirics of social capital." *The Economic Journal*, 112, F459–F479.
- Elster, J. (2002). "Emotions and economic theory." *Journal of Economic Literature*, 36, 47–74.
- Escobal, J. (2001). "The benefits of rural roads: Enhancing income opportunities for the rural poor." *World Development*, 29(3), 497–508.
- Festinger, L. (1957). *A theory of cognitive dissonance*. Stanford University Press, Stanford, CA.
- Fumerton, M. (2002). *From victims to heroes: Peasant counter-rebellion and civil war in Ayacucho, Peru, 1980-2000*. Rozenberg, Utrechts.
- Glaeser, E. L., D. I. Laibson, J. A. Scheinkman, and C. L. Soutter (2000). "Measuring trust." *Quarterly Journal of Economics*, 115(3), 811–846.
- Greif, A. (1993). "The Maghiribi traders' coalition." *American Economic Review*, 83(3), 525–548.
- INEI (1993). "Censo de población y vivienda 1993 (Population and housing census 1993)." Tech. rep., INEI.
- INEI (1994). "Censo agrario 1994 (Agricultural census 1994)." Tech. rep., INEI.
- Knack, S. and P. Keefer (1997). "Does social capital have an economic payoff? A cross-country investigation." *Quarterly Journal of Economics*, 1251–1288.
- La Ferrara, E. (2000). "Inequality and group participation: Theory and evidence from rural Tanzania."
- Mayer, E. (2002). *The articulated peasant: Household economies in the Andes*. Westview Press, Boulder.
- Municipality, T. (2002). "Zonificación de los cozodes."
- Narayan, D. and L. Princhett (1999). "Cents and sociability: Household income and social capital in rural Tanzania." *Economic Development and Cultural Change*, 47(4), 871–897.
- Ostrom, E. (1990). *Governing the commons: The evolution of institutions for collective action*. Cambridge University Press, Cambridge MA.

- Ostrom, E. (1995). *Constructing social capital and collective action*. SAGE Publications.
- Ostrom, E. (2003). "Towards a behavioral theory linking trust, reciprocity, and reputation." In E. Ostrom and J. Walker (Eds.), "Trust and Reciprocity: Interdisciplinary Lessons from Experimental Research," 19–79. Russel Sage fundation, New York.
- Putnam, R., R. Lonardi, and R. Y. Nanetti (1993). *Making democracy work: Civic traditions in modern Italy*. Princeton University Press, Cambridge, MA.
- Sandemose, A. (1962). *En flyktning krysser sitt spor : Espen Arnakkes kommentarer til Janteloven (A fugitive crosses his own footprints: The comments of Espen Arnakkes on the Law of Jante)*. Aschehoug, Oslo.
- Torsvik, G. (2000). "Social capital and economic development - A plea for the mechanisms." *Rationality and Society*, 12(4), 451–471.
- Wade, R. (1988). *Village republics: Economic conditions for collective actions in South India*. Cambridge University Press, Cambridge, UK.

5 Appendix

5.1 Variable values*

	Mean	Std.dev.	Min.	Max.	%
<i>Total income</i>	0.366	0.229	0.04	1.22	100
<i>Agriculture</i>	0.178	0.166	0.01	0.78	49
<i>-basic</i>	0.175	0.182	0.00	0.81	48
<i>-outside</i>	-0.027	0.037	-0.19	0.00	-7
<i>-outsiders</i>	0.030	0.042	0.00	0.21	8
<i>Husbandry</i>	0.134	0.104	0.00	0.60	37
<i>Other products</i>	0.027	0.050	0.00	0.31	7
<i>Wage labor</i>	0.204	0.040	0.00	0.22	7
<i>Total sales</i>	0.075	0.146	0.01	0.72	
<i>Irrigation</i>	0.075	0.135	0.00	0.77	
<i>Land</i>	0.55	0.622	0.01	2.67	
<i>Road</i>	0.490	0.505	0	1	
<i>C-Work</i>	90	79	0	300	
<i>C-Assembly</i>	0.834	0.182	0.20	1.00	
<i>C-Infrastructure</i>	25	23	0	75	
<i>C-Associations</i>	0.224	0.422	0.00	1.00	
<i>Sanctions</i>	0.795	0.407	0	1	
<i>Resettlement</i>	0.633	0.487	0	1	
<i>Emigration</i>	0.282	0.395	0.00	2.00	
<i>Juridical status</i>	0.633	0.487	0	1	
<i>Ecology</i>	1.710	0.625	0.00	3.00	
<i>Inequality</i>	0.353	0.181	0.18	0.67	

*Given in units according to description in chapter 3

5.2 3SLS on agriculture income

	Coef.	Std. Err.	z	p> z
<i>Constant</i>	-0.117	0.176	-0.66	0.507
<i>Irrigation</i>	0.695	0.205	3.40	0.001
<i>Land</i>	0.116	0.075	1.55	0.121
<i>Road</i>	0.058	0.069	0.83	0.404
<i>C-Work</i>	0.003	0.001	1.99	0.046
<i>C-Assembly</i>	-0.186	0.180	-1.03	0.303
<i>C-Infrastructure</i>	-0.005	0.003	-1.45	0.148
<i>C-Associations</i>	0.071	0.077	0.93	0.352
<i>Sanctions</i>	0.069	0.066	1.05	0.293
<i>Resettlement</i>	0.134	0.073	1.85	0.064
<i>Emigration</i>	0.076	0.129	0.59	0.554
<i>Juridical status</i>	0.095	0.071	1.33	0.182
<i>Emigr-Juridical</i>	-0.297	0.119	-2.49	0.013
<i>Constant</i>	155	46	3.37	0.001
<i>Agri income</i>	30	394	0.08	0.938
<i>Agri income²</i>	105	530	0.20	0.842
<i>Ecology</i>	-37	16	-2.29	0.022
<i>Land gini</i>	-35	55	-0.65	0.519

$\chi^2=30.1$ (P=0.0023) in income regression

$\chi^2=5.7$ (P=0.1776) in work cooperation regression

5.3 OLS on total income

	Coef.	Std. Err.	z	p> z
<i>Constant</i>	-0.1472	0.1831	-0.80	0.427
<i>Irrigation</i>	0.7434	0.1994	3.73	0.001
<i>Land</i>	0.1516	0.0520	2.91	0.006
<i>Road</i>	0.1189	0.0589	2.02	0.051
<i>C-Work</i>	-0.0003	0.0004	-0.62	0.539
<i>C-Assembly</i>	0.1374	0.1465	0.94	0.355
<i>C-Infrastructure</i>	-0.0004	0.0016	-0.27	0.789
<i>C-Associations</i>	0.0335	0.0656	0.51	0.613
<i>Sanctions</i>	0.0182	0.0681	1.20	0.237
<i>Resettlement</i>	0.1802	0.0605	2.98	0.005
<i>Emigration</i>	0.1691	0.0992	1.70	0.097
<i>Juridical status</i>	0.0852	0.0719	1.19	0.244
<i>Emigr-Juridical</i>	-0.3040	0.1224	-2.48	0.018

n=49 communities; $R^2=0.64$; Adj- $R^2=0.52$

5.4 OLS with just significant variables

	Coef.	t	P> t
<i>Constant</i>	-0.2067	-2.55	0.015
<i>Irrigation</i>	0.6546	4.92	0.000
<i>Land</i>			
<i>Road</i>	0.1450	3.58	0.001
<i>C-Work</i>			
<i>C-Assembly</i>			
<i>C-Infrastructure</i>			
<i>C-Associations</i>			
<i>Sanctions</i>	0.1202	2.59	0.013
<i>Resettlement</i>	0.1105	2.55	0.015
<i>Emigration</i>	0.2700	4.23	0.000
<i>Juridical status</i>	0.1097	2.34	0.024
<i>Emigr_Juridical</i>	-0.2942	-3.29	0.002

The original OLS regression model of agricultural income when just variables that are significant at 10% level are included in a stepwise exclusion STATA procedure. $R^2=0.54$; Adj- $R^2=0.47$.