

Catching up in distant trade - The effects of trust and telephone for Peruvian peasants

By Henrik Wiig

Abstract: Liberalized agricultural markets and more roads in remote areas of the developing world have led to a transition from self-subsistence agriculture to specialization and trade. However, seemingly similar peasants often choose different marketing strategies. This puzzle is investigated by using a panel household level survey of small-scale potato farmers in combination with a community level survey on social capital conducted by the author in a Peruvian highland district. Access to public telephone service seems to facilitate sales in distant markets, while households in communities with high internal trust levels are more disposed to sell in markets close by. However, both effects have become weaker over time, while total production volume has become more important. This indicates that fundamental production conditions matter more as markets mature and that peasants will learn how to surpass initial information and cultural drawbacks.

Code-words: Social capital, Information, Transaction costs, Market integration, Potato trade, Peru

JEL-code: C21, D7, O15, Z13

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1 Introduction

There is a common view that peasant-trader relationship in developing countries is based on exploitation. Urban intermediaries arrive in the fields, pay miserably in order to enrich themselves and then leave the farmers behind hungry. This simple stereotype is complicated by the fact that peasants often have different options, e.g. trading or relying on self-subsistence production. Furthermore, peasants from the same geographical area, who are seemingly of equal background, often choose rather different marketing strategies. Some sell their products to traders who appear in the field, and some bring their products to the local market, while others prefer distant markets and might even end up in the capital itself. This paper investigates the choice of trading options empirically in a rural district of Peru.

The argument is that the price is higher in more central areas, and the peasants will hence earn more by bringing their products themselves. This view conceals travel and marketing cost and ignores the risks involved in trading in distant markets. State agencies, local and international non-governmental organizations (NGO) and development agencies intervene in the market-based solutions with good intentions of "helping" the peasants; examples, unfortunately mostly unsuccessful ones, are easy to find in Peru where the empirical data for this article was collected. FONCODES (2002)¹ describes a project of coordinating potato sales for peasants in the highland district of Tambo. The participating peasants were told to plant a given area with potatoes. Then they were supposed to harvest at a given time and a truck were supposed to collect sacks of potatoes in order to bring the product to Lima for sale. In the end, people harvested at separate days, the truck did not show up as agreed, each peasant mixed products of good and bad quality. This led the intended industrial purchaser to refuse to accept the goods and the representatives wasted by gas driving around for several days trying to find a buyer, in the end achieving only the minimum price at the major spot market in Lima. The peasants involved later told me they had lost faith in market cooperation of any sorts, and would only trust themselves from now on. This illustrates how the failures of initiatives from above might choke peasant initiatives of collective action to achieve economies of scale in marketing and sales².

¹The Fund for National Compensation and Social Development (FONCODES) is the main rural government development agency. The motive behind the project is stated in the given report: "The common problem in these communities is the presence of the intermediaries, who limit the marginal utility of the peasants using their well known methodology". No further description of a "well known methodology" is given.

²I conducted a questionnaire survey in this district, which consists of 49 traditional communities where people sell a surprisingly high share of their production. The results given in Wiig (2005b) show high levels of trust and

What will happen if the peasants are left for themselves without well-intentioned interventions? The possibility of actually bringing the products themselves to the large markets in regional centers and the capital, hereafter denoted distant markets, is of rather recent date. We hence expect that the peasants are still in the middle of a learning process. The first peasants who first started selling to distant markets might have done so out of pure coincidence, e.g. they happened to know someone in the regional center or they live in a community that is more outward oriented for some historical reason. Such "coincidental" circumstances might be decisive for the choice of market in the beginning. Meanwhile, we would expect that fundamental economic conditions will determine the individual choices by each peasant in the longer run as markets mature and the knowledge of how it works becomes common knowledge.

The empirical analysis in this paper indicates a considerable change in marketing behaviour over a four-year period in the Peruvian highland district of Pazos³. The data set contains information on household sales volumes and the price the peasants received for their product in different places: in the field, in the local, district and regional markets, as well as in the capital. The information was gathered in two household surveys from 1997 and 2001 respectively. This was combined with a data set of community characteristics from a community level survey I carried out in Pazos myself in 2003, which makes it possible to estimate the effects of community institutions and infrastructure on the households' integration with distant markets.

The main hypothesis is that fundamental economic conditions should become more important and "coincidental" conditions less important over time; this is confirmed in the analysis. The access to public telephone service is taken as an indicator of the ease to obtain market information. It had a significantly strong positive effect on the decision to enter distant markets in 1997, but the effect is gone by 2001. This may indicate that potential distant markets participants, living in communities without telephone service, have learned how to surpass the disadvantage of not having direct access to this source of information. They might now use the telephone in their neighbouring communities or they might have found other ways to get market information and communicate with potential buyers. Since public transport has become

coordinated actions when it comes to traditional tasks like work exchange, infrastructure construction, irrigation system maintenance, etc. On the other hand, there is hardly any cooperation when it comes to modern tasks with potential gains from cooperation. Only two of the 49 communities reported any self-initiated marketing cooperation and then only for a minor share of about 10 percent of the total sales volume. The cooperation was further restricted to only include common contracting of transport vehicle. All proprietaries went along with the truck to the regional market four hour drive away. Then they separated their individual cargo and each had to find a purchaser on their own.

³I do not know of any top-down marketing cooperation projects in Pazos. The dynamic changes in this district should hence reflect the natural process of market integration.

cheaper, the peasants can either travel themselves or use friends and relatives who intended to go anyway as middlemen. The vanishing effect of direct access to public telephone service for participation in distant markets is an example of how all farmers are put at the same level over time.

Social capital, measured as trust between members of a given community, is interpreted as another coincidental variable. Ideally, the ability to cooperate increases with trust. The peasants who trust each other should be more able to coordinate sales and marketing operations, share information, etc., which should entail a higher degree of integration with distant markets. High trust on the other hand, signals that the community is more traditional and less integrated with the modern world. Social ostracizing, as a form of punishment for breaking common norms of behaviour, is more powerful in isolated communities. The estimated reduced form coefficient for trust is significantly negative, as well as at the same level, in both years. However, the peasants that sold to distant markets actually traded a larger share of their total sales figures there. Taking advantage of the possibility of analyzing the panel structure for a sub-sample of the households, I find support that households living in high trust communities had a positive shift in sales to distant markets. This indicates that being traditional and coming from a close-knit community has become less of a disadvantage for the peasants that have surpassed the barriers of entry to distant markets.

A possible policy conclusion is that well-intentioned organizations should hence be more patient and not necessarily interfere if they observe that small-scale peasants are not able to reap the potential profits from sales to distant markets. The "slow-starters" will gradually learn how to surpass initial drawbacks and be equally able to sell their products to distant markets in the same way as "early-starters" do. In the long run, production volume and other fundamental economic conditions determine the profitability of bringing the products to distant markets and hence which households will settle for this marketing option.

2 Literature

A separation between traditional and modern tasks can explain why high levels of trust will not necessarily be an advantage in the marketing and sales process. The anthropological literature stresses the deep roots of reciprocity in the Indian communities of the Andes, see Mayer (2002), but the peasants tend to separate between tasks and apply different norms. Mayer (2002) and Blum (1995), amongst others, describe a sharp distinction between traditional and modern tasks

in the Peruvian highland as well as between production for self-consumption and for sales in the markets, etc. This would indicate that high trust levels within traditional tasks does not necessarily imply that they will trust each other to bring products to the markets. Stealing directly in the potato field is harshly punished in the communities in the Peruvian highland, while the community at large normally turns a blind eye to the fact that someone for example cheated a fellow community member on the price in a trading operation. The study of Duflo and Udry (2004) is an example within the development economics literature that finds different sources of income to constitute different budgets in the households in an empirical study of households in Ghana.

If there is monopoly or collusive behaviour between intermediaries who trade in the rural areas, then the gains from bringing the products to more central markets is potentially high. However, there are surprisingly few large-scale empirical studies trying to explore whether there is competition between the traders in the rural areas of developing countries. Most practitioners, as in the projects described above, have to rely on anecdotal evidence or subjective opinions of the involved peasants themselves. The classical study of Scott (1985) on the potato marketing chain in Peru finds no decisive evidence of excessive market power in any parts of the marketing chain from the most distant plot to the central market of Lima.

In theory, economies of scale can open for unreasonable high trader profits. With a high entry barrier for small-scale traders, few large-scale traders might be tempted to collude. Fafchamps et al. (2005) use data from agricultural traders in Africa to estimate potential economies of scale in volume, distance and personal travel, in addition to the potential economy of scope across marketing tasks. They only find increasing returns in personal travel cost but conclude that these "nevertheless remain too small to generate noticeable increasing returns to scale". On the other side, there is probably an economies of scale effect in networks. Fafchamps and Minten (2001) show that agricultural traders in Africa who know more and have closer contact with other traders have a higher output. This is due to reduced transaction cost since rural agricultural markets in developing countries are normally thin with incomplete information. Knowing more peasants, the trader is able to buy products in the cheapest way, for example by turning to those who, by luck, had a bumper harvest and have a pressing need to sell. The trader who knows more purchasers will have a higher probability of reaching a potential client who is short of goods and hence willing to pay a high price. Thin markets also widen the spectrum of expected prices, increasing the importance of negotiations and hence leading to more wasted time, by lacking institutional protection in each sales operation, most exchanges are, for example, based on oral

deals making repeated interaction important to achieve trust between the partners. Otherwise, none of them would have anything to loose by cheating.

The same need for networks also applies for the peasants. Information through networks is important to find traders who are willing to pay a good price. The household datasets used in the empirical analysis of this paper were collected to estimate the different components of the transaction costs in Escobal (2000). Using a novel econometric approach in the 1997 survey, he estimates that transaction costs constitute 50-60 percent of the sales price. This paper will instead concentrate on the dynamic aspects of change in trading behaviour by using a more easily interpretable measure of market integration, i.e. the share sold to distant markets of total sales by the households is estimated in econometric models using both household and community level explanatory variables.

3 Empirical study

3.1 Highland region

The location of this study is the district of Pazos in the department Huancavelica in Peru. This is a typical highland mountain area where most of the agricultural activity takes place in the rather steep valley sides between the altitudes of 2,500 and 3,500 meter above sea level. The soil is well suited for potato production. The connections to other parts of the country are rather good. Huancayo - the main city of the central highland region with about 800,000 inhabitants - is about a four-hour drive away and the capital Lima about another six-hour drive crossing the central Andes mountain range on asphalt paved road.

The good connection routes have led to a high degree of specialization in potato production in the district of this study compared to other geographically and agriculturally comparable regions in the country. However, nearly all farmers are small-scale peasants using traditional technology. The hillsides are too steep for mechanized agriculture and even draught oxen are seldom useful. The traditional hand plow, the "Chaquitaccla", a stock with a small spade in the end, is then the only suitable equipment. One man, or several men simultaneously, use it to loosen a piece of soil, while one man at the same time pulls the soil around by hand. However, the use of fertilizers and other agrochemicals has become common among most peasants and some are now able to harvest up to three times a year. There are some rustic irrigation systems, but most plots are purely rain fed.

3.2 Data sets

A random stratified sample of households are drawn for each of the surveys that constitute the data sets for 1997 and 2001 respectively⁴. The aim of the surveys was to estimate transaction costs in potato trade. They hence used the Agricultural Census conducted by the Statistical Office of Peru (INEI) in 1994 to identify households who said market sales were an important activity. Among these, 1396 households farm in comparable agro-ecological zones. A representative sample of 190 households in 1997 was drawn, and then a new and independent drawing of 244 households was conducted four years later. The researchers never intended to use this material as a panel data set, but rather wanted to extend the survey by including new questions to cover new needs. However, both surveys include volume and price by markets, hence a dynamic analysis makes sense. I was able to identify 74 households that appeared in both surveys by comparing the name and age of all household members. For these households it is possible to calculate both changes in sales volume and obtained prices.

The household surveys mainly covered characteristics of the given trading operations. I hence extended the data set by including aspects of community level institutions, infrastructure or social functioning. The district is the lowest level of state organization, but each community in fact represents both a social and an institutional unit. The state for example uses the community as the natural unit for primary school, food distribution, organizing self defense groups, etc. There is further a prevailing notion of "fair" distribution of infrastructure projects between communities over time, which has become an official part of the new state fund distribution system⁵. The community further elects an assembly that is given power to represent them in interactions with state authorities and further exercises important power to make people behave according to the existing norms of the community. This is especially important when it comes to collective action and cooperation, see Wiig (2005a) and Wiig (2005b) for analysis of norms and cooperation in a similar highland district of Peru. Some communities work well, while other does not. Such differences between communities also apply to marketing and trade.

I hence conducted a community level questionnaire in the spring of 2003 to cover community characteristics missing in the household surveys. One or more "authorities", i.e. council mem-

⁴The questionnaire surveys were conducted by a team from the independent research institute Group for Analysis of Development (GRADE) in Lima led by Ph. D. Javier Escobal, who most kindly gave me access to their data sets. Their data collection was sponsored by the International Development Research Center in Canada and the Canadian International Development Agency.

⁵People vote between explicit projects, but there are complicated rules for assigning weights to secure distributinal justice over time.

bers, teachers, defense group leaders, etc., were interviewed in a questionnaire survey on various aspects of community life. This survey covered 12 communities out of the 14 included in the 1997 survey, as well as the 18 included in the slightly larger 2001 survey. The excluded communities belong to the neighbour district of Huaribamba. These communities use a different road access route, which makes it difficult to compare the market choices made by the households in the two different districts. The final datasets used in the analysis consists of 158 observations in cross section for 1997, 226 observations in cross section for 2001 and 74 households in the balanced panel analysis.

3.3 Potato trade pattern

Most farmers are small-scale peasants in the district of Pazos and hence representative for most of the rural areas in Peru. They are independent and control their own plots of land, but there are defacto restrictions on the sale of land. This "land owner" pattern is partly due to the land reform of the 1970's. Land belonging to large land owners was confiscated by the state and redistributed to the employees working on the farm, returning emigrants tempted by the promise of access to land, or independent small-scale peasants living in nearby communities⁶. The community assembly has rather strong institutional power in land use matters and can in the end decide how and who should use it⁷. The initial egalitarian distribution and the defacto restrictions on land sales have led to further land fragmentation. So most agricultural production is now made by small-scale traditional farmers. Each household has on average 4.1 hectares of cultivable land distributed on 6.4 different plots in the 1997 survey. The plots are often spread geographically over different agro-ecological zones to reduce risk. However, the peasants of this district were highly integrated to the markets in 1994 since the production on 49.3 percent of the plots with potato were mainly destined for market sales according to INEI (1994). To compare, the national average for all plots (independent of crop) was 23 percent.

Most peasants sell some of their potato production, but the degree of market involvement differs a lot between the households in Pazos. The mean sales volume was 23 tons in 1997 and 27 tons in 2001, while the standard deviation was 29 tons in both years. There is also a considerable difference between the households when it comes to choice of market place. The

⁶Deininger (2003) estimates that 28 percent of all agricultural land was redistributed during the Peruvian land reform in the benefit of about 31 percent of all rural households.

⁷The juridical status is either common property rights in registered peasant communities or individual property rights. However, entitlement papers seldom exist and the isolation implies that people depend on being included and accepted by the other community members.

difference between the peasants becomes even more striking when it comes to choice of market place. The five possible markets are:

- Field: The peasants sell to intermediaries directly in the field (who on their side hence have to pay for the transport). The sale between the intermediary and the peasant might have been agreed upon on beforehand. This is facilitated by good contacts based on stable relationships. Another possibility is that the purchasers more or less show up in the field around harvest time and then negotiate a spot transaction.
- Local: There is a market once a week in nearly all communities of a certain size, especially those with road access. The peasants bring the products on horseback or llama to the market, where most are sold to intermediaries who transport the products to more central markets. The maximum transport distance is about four hours ride by animal to such local markets.
- District: The largest market within a relatively short distance is the district capital Pazos. Then peasants either bring the products on horseback or they pay for motorized transport. The maximum driving distance is about two hours from the most distant local market.
- Region: The regional center in central Peru is the city of Huancayo. It takes about three hours drive to get there from Pazos and to pay for motorized transport is the only real alternative for the peasants.
- Capital: Lima is another five hours drive further by crossing the mountain range. Motorized transport is the only viable option here.

There is a categorical difference between the near markets consisting of field, local and district on the one hand, and distant markets, consisting of region and capital, on the other hand. In 1997, 60 percent of the farmers only operated in the near markets, while 40 percent sold in both types of markets. Four years later, less than 50 percent sold only in the near markets, 40 percent operated in both types while 10 percent now only sold in distant markets. Thus, more peasants now prefer to bring their products closer to the consumers themselves, bypassing one or more levels of intermediaries. Such change is supposed to increase profitability since the peasants receive a considerable higher price in distant markets. This data set is not suitable to estimate the degree of competition in any reasonable way, but anecdotal evidence indicates the price differential is due to the lack of competition between the intermediaries in the near

markets⁸.

Trade has to some degree always been a part of life in Pazos. In the days of the Incan empire, communities in different altitudes were integrated as one organizational unit and they exchanged goods from different agro-ecological zones. Potatoes and other highland products were brought to the lowlands and maize, fruits and other lowland products sent in return. However, the units existed in parallel with minimal interaction between them and the exchange hence could be compared to bilateral trade agreements between specific countries today. Moving to modern days, trade has to a large degree been controlled by the state through purchaser rights and fixed prices from the 1950's. All markets were suddenly liberalized in the early 1990's as president Fujimori came to power with a liberal agenda. Rural roads and footpath systems have also been considerably extended and improved due to large national and international infrastructure programs. A functioning integrated market is hence a rather new phenomenon. The peasants are probably in the middle a learning process and will only gradually adjust their behaviour.

3.4 Empirical evidence

A key question is whether the determinants of peasants' choice of sales have changed over time. To explore this question, we allow for time dependent effects of the explanatory variables in equation (1) below:

$$X_{it}^D = \alpha_{0t} + \alpha_{Xt}X_{it} + \alpha_{It}I_i + \alpha_{St}S_i + \alpha_{Rt}R_i + \alpha_{PDt}P_{it}^D + \epsilon_{it} \quad (1)$$

The explained variable X_{it}^D is the share of total sales that is traded in distant markets by household i in year t , i.e. kilos to distant markets divided by kilos sold totally.

The explanatory variable X is total sales volume, denoted in tons per year. A combination of several aspects suggests that the effects are positive. If prices vary in each market, risk averse peasants will prefer to divide the sales on different markets in order reduce the variance in sales price. If there is a fixed cost element in transportation and market information, this will imply that a peasant will prefer to enter more markets the higher total production volume. The origin of fixed entry costs can for example be that it takes time to find customers and therefore a higher risk of not being able to sell or having to sell at dumping prices at the start when the

⁸Especially peasants living close to the road said there had been a pronounced shift after the last households survey in my data set was conducted. "We have now learned that it pays off to sell to Huancayo and Lima ourselves rather than accept the prices offered by the intermediaries here" was the typical refrain indicating unfair price setting in near markets.

peasant does not know how the given market works. This implies that peasants will be willing to exchange reduced income security by entering fewer markets to save fixed costs when the total sales volume is low⁹. Since I expect the effect to change over time as markets mature, the coefficients α_{Xt} will also change over time.

There is a considerable risk associated with entering distant markets. First of all, you have to pay for the transport in advance since few peasants possess a motorized vehicle of their own. The few who do regard themselves as transporters and traders and demand payment for bringing products belonging to fellow community members. Furthermore, if the price is low, it might be better to sell in near markets or store the potatoes near home until the market price improves. Peasants who are better informed about the actual market prices in the distant market will therefore perceive a lower risk of entering this market. The telephone is a useful tool to achieve such information. Furthermore, it facilitates repeated interactions with traders. So even if the trade contracts are seldom concluded beforehand at a distance, both parts know more about what to expect of volume and prices hence reducing the cost of the trading operation. Thus, I include a dummy I_i for the existence of public telephone service in the community. The variable is constant over time since the existing telephone services in 2001 was also in place four years earlier¹⁰.

The social capital indicator S_i is a combination of several aspects of trust between people who live in a given community. The four questions in the community survey are in line with the standardized questions formulated in World Bank surveys given in WB (2002) on attitudes between members of a given community. (i) Is there confidence in general? (ii) Do you have to be alert in order not to be exploited? (iii) Are most people disposed to help in case you need it? (iv) Do you lend and borrow money? The scale is from 1 to 4, a higher number indicate more trust. The constructed applied indicator is the average value where each question is given an equal weight. The mean S_i value is 2.3 for all households and the standard deviation is 0.5.

The trust variable is expected to correlate with both norms and networks. We would expect that people who trust each other have better access to information and cheaper marketing costs

⁹Hence volume is first of all important for the decision to pay the sunk investment cost of entering distant market. Once there, total sales volume is probably less important to explain the share sold to distant markets, i.e. it seems reasonable to include volume in the participation decision of the Heckman model but leave it out of the actual OLS model for households that do participate in distant trade, as discussed later.

¹⁰The establishment of satellite phones in the connected communities was part of a privatization deal with the Peruvian government. These are heavily subsidized and hence represent a truly exogenous variable independent of income level.

as they can entrust representatives to take the products to the distant markets. The economies of scale in common transport and marketing is probably large compared to the situation where each has to bring small amounts of products to market themselves.

But why do people in some communities trust each other more than they do in other communities? One aspect is the ability of the community to punish defectors from common norms. Many communities have explicit punishments by giving fines or even putting people into local prisons. However, social ostracizing is the most normal form of punishment. The effect is stronger, the less outside opportunities people have. For example Bardhan (2000) finds irrigation systems in South India, where the maintenance is based on collective action, to be in worse conditions the closer they are to large towns and the higher share of production is actually traded on the market. The existence of access to road in a community is a plausible indicator of integration to the larger society since people then will depend less on their fellow community members. The simple correlation between road access and trust, -0.43 , is constant with this effect¹¹. Being more isolated both geographically and culturally implies lower market integration. The variable S_i is measured in 2003, but I assume it is a good proxy for the trust level in both earlier years. Norms are inflexible and are typically more persistent than both institutions and markets. As an example of this Williamson (2000) takes a hierarchical approach when he assumes it takes 100 years to change norms, 10 years to change institutions and 1 year to change the functioning of markets¹².

Even socially isolated people will sooner or later learn how markets work and integrate if there is a large premium of specialization and trade compared to self-subsistence agriculture. The same applies to bringing the products to more profitable distant markets rather than selling them for low prices in near markets. We would hence expect a positive shift in the coefficient for the social capital indicator over time as the negative effect is reduced. The reduced form coefficient might hence be negative, but expected to be less so in 2001 than 1997. I further expect a similar decrease in importance for the access to telephone. The more isolated people will also learn how to use the telephone over time in order to integrate to the distant markets, for example when they are visiting communities with telephone service and then possibly spreading the word on prices and sales opportunities at home.

¹¹However, the correlation is not too large in the sense of a serious multicollinearity problem when both variables are included in the regression models.

¹²However, the process can be quite speedy when norms do change, e.g. "women liberalization" in the 1960's and 70's. However, in the context of market integration in developing countries do I consider variables collected in 2003 to roughly reflect similar measurements six years earlier.

The final community characteristic to be included is a dummy R_i for having access to roads. Access to road facilitates transport and it makes it possible to do the whole marketing operation in distant markets in one day, leaving in the morning and coming back in the evening. The possibility of meeting transporters to negotiate and coordinate transport before any products are actually moved will normally lead to lower transport prices and facilitate the whole sales process. In contrast, the additional hours of taking the product from isolated communities to the road will imply that sales to distant markets will become a two day project which further implies extra costs like accommodation, meals, etc.

The variable reflecting the relative price level of potatoes sold to distant markets P_{it}^D will influence the market choice by the peasants. The interpretation of prices in the reduced form model of equation (1) is however ambiguous since price and quality reflect the equilibrium between supply and demand curves. *Ceteris paribus*, the peasants will be willing to sell a larger share to distant markets, the higher prices they achieve compared to the price in near markets. On their side, the purchasers will be willing to buy larger quantities the lower the prices, reflecting a downward sloping demand curve. A negative relation in reduced form might hence reflect a strong bulk discount effect¹³.

3.5 Results

3.5.1 Cross-section

The share of total sales volume that was traded in distant markets increased from 37 percent to 53 percent over the four-year period. The regional center Huancayo has especially become more important and is now the major trading market with 40 percent of total volume sold, see Table 1 below.

¹³Another possible explanation for the potential negative relationship between price and volume is quality differences. Native potatoes are produced and sold in small quantities at high prices, industrial potatoes are produced and sold in large quantities at low prices. Since specialization is plausible, the relationship between price and volume will be negative. The dataset contains quality information covering 92 percent of the total sales volume in 2001. Then native potatoes constitute only the minor share of 15 percent of total sales. The share further decreases the more advanced the markets become. It constitutes 12 percent in Huancayo and only 3 percent in Lima. Furthermore, the simple correlation between price and volume for each quality type is still negative and this indicates that the "bulk discount" effect exists even within each quality group.

		Field	Local	District	Region	Capital
Price	1997	0.41	0.38	0.49	0.66	0.94
	2001	0.19	0.23	0.26	0.34	0.42
Volume share all	1997	36%	10%	16%	22%	13%
	2001	18%	8%	19%	36%	17%
Volume share panel	1997	33%	12%	16%	21%	15%
	2001	20%	8%	19%	41%	11%

Table 1: *Price* is the weighted average price per kilo in the local currency Nuevo Soles achieved in the representative destinations. *Volume share all* is the sales to each destination divided by sales to all destinations for all households in each year, while *Volume share panel* is the same for only the 74 households who took part in both surveys.

The decision of selling to distant markets can be viewed in two parts, (i) whether to bring goods to distant markets and (ii) how much to bring. I hence use a Heckman two-step regression procedure and the results are given in Table 2 below¹⁴.

¹⁴This procedure first estimates the Probit function in the bottom part to find the inverse Mills ratio to be included in the OLS of the upper part. The estimation program STATA also allows for a simultaneous estimation of both parts by Maximum Likelihood. However, this method often fails to give a solution. Comparing the results in the specific markets where both methods do give a solution, there are only minor differences in the estimated models. These differences are actually insignificant in a Hausman test. I hence consequently stick to the two-step procedure.

<i>Share distant markets</i> (% of total sales)				
	1997		2001	
	Coeff	St. dev	Coeff	St.dev.
Constant	1.14***	(0.16)	1.73***	(0.15)
Trust	-0.03	(0.06)	0.06	(0.04)
Phone	-0.05	(0.06)	0.07*	(0.04)
Road	-0.07	(0.06)	0.04	(0.06)
Price	-0.50***	(0.11)	-1.05***	(0.08)
Constant	1.51*	(0.87)	1.29*	(0.71)
Volume	0.02*	(0.01)	0.06***	(0.01)
Phone	1.16***	(0.34)	-0.51*	(0.29)
Trust	-1.00***	(0.32)	-1.26***	(0.26)
Road	0.56*	(0.32)	0.86**	(0.34)
Wald Chi	75		327	
N/uncens	158/96		226/122	
<i>Rho</i>	-0.75		-0.88	

Table 2: Heckman cross-section models for each year using *Share Distant market* sales as left hand side variable, i.e. share of total sales going to distant markets. The lower section are the Probit results for participation in distant markets sales. The upper sections are the OLS for households that do participate including the estimated Mills ratio from the first stage to correct for self-selection bias. *Trust* is an indicator of trust within the community, *Phone* is a dummy for public phone in the community, *Road* is a dummy for road access to the community and *Price* is the relative price on sales to distant markets compared to all markets. Significance level: * 10%, ** 5% and ***1%. N is the number of observations and uncens gives the number of uncensored observations.

Share distant markets, i.e. share of total sales measured in monetary units traded in distant markets by the household, is the left hand side variable to be explained in the model. The explanatory variable *Price* is similarly the relative weighted price on products sold to distant markets compared to the weighted price of sales to all markets. I use relative and not absolute measures since my intention is to explain the degree of integration to distant markets as compared to near markets.

The Probit model in the first step calculates the probability of participating in distant markets. The inverse Mills ratio is deducted, and then included in the OLS including only the households who do sell to distant markets in the second step. *Volume* is the total sales volume denoted in tons, while *Trust*, *Phone* and *Road* are as earlier described.

The regression result for the first year, 1997, is given as the left part of table (2). In the Probit section, which reflects the participation decision, we find that the coefficient for *Volume* is positive only at a 10 percent significance level. The positive coefficient for *Phone* is highly significant and *Trust* is similarly significantly negative. This implies that the potentially positive effect of more trust is more than counterbalanced by the effect of being socially more isolated. The coefficient for *Road* is positive. The rather low significance level of 10 percent is a bit surprising, and indicates that the markets are not very developed.

There is a striking lack of significant coefficients in the second stage of the Heckman model of households in 1997, given in the upper part of the table (2). Neither *Trust*, *Phone* nor *Road* were significant. However, the coefficient for *Price* is negative and significant at 1 percent level. The explanation is probably that people who sell large volumes in distant markets normally trade with intermediaries, while peasants that just bring some sacks of potatoes will sell directly to the consumers in the market. This is hence a "volume rebate" effect. The variable *Price* is hence an indirect description of what type of farmer you are, either intermediary or market seller.

There has been a considerable change in the estimated coefficients between 1997 and 2001. The result of the latter is given in the right hand side of table (2). *Volume* has become more important for the decision of whether to enter distant markets or not. The coefficient for *Volume* is tripled from 1997 to 2001, and the according significance increases from 10 percent level to 1 percent level¹⁵. This implies that peasants who produce a considerable volume have started to specialize by taking more products to distant markets¹⁶.

The importance of access to telephone changes dramatically in the participation decision. *Phone* was significantly positive at 1 percent level in 1997. Four years later the effect has disappeared. In fact the coefficient is negative, but only at 10 percent significance level. People with access to telephone more easily entered distant markets in 1997, but their relative advantage compared to people living in communities has disappeared as markets mature. There are several possible explanations for this change. One is that peasants who live elsewhere have started to use

¹⁵The coefficients are not directly comparable between years since the Probit estimation method actually gives the coefficient divided by the variance of the residual. However, I do not find any pattern that indicates a considerable change in the residual variance, and I will therefore compare the absolute coefficient values given for the two years in Table 2.

¹⁶No households sold only to distant markets in 1997, while more than 10 percent chose this specialized marketing option in 2001. On average, the households selling to distant markets had 120 percent higher total sales than households who sold only to near markets in 2001.

the telephone when visiting communities with public telephone, and then possibly spreading the word on prices and sales opportunities when they go home to their own communities. Another possibility is that information through other channels has become more important. More people travel regularly as public transport has improved. They often share information and often do favors for fellow community members. This might have made the telephone less important since people tend to prefer face-to-face relationships even though they act through middlemen. The reduced importance of living in a community with access to telephone hence represents a catch-up phenomenon for the "slow-starters" who live in communities without such access¹⁷.

The coefficient for *Trust* is negative and highly significant in both years. The Probit analysis indicates that this effect is rather constant as the change in coefficient value is within the standard deviation of the coefficient in 1997. *Road* also has a significantly positive effect in both years as expected, with no radical change in effect.

The Probit results in the lower section of Table 2 are in line with the summary results indicating that some peasants specialize in sales to distant markets. A Mills ratio is calculated from the Probit analysis and included in the OLS on the households that do sell to distant markets to correct for self-selection. The estimated coefficients will then be unbiased. This two-step Heckman procedure presupposes, to secure identification, that at least one variable in the Probit analysis does not also appear in the OLS. I have chosen to exclude *Volume* in the OLS since this is probably most important for the decision to enter the market at all or not. Risk minimizing behaviour implies farmers will spread their sales in different markets. A fixed cost of entry then implies that there is a higher chance of selling to distant markets, the higher production. It then seems reasonable from the risk spreading motive to assume a given distribution of sales between markets that is not dependent on total sales volume¹⁸. I conducted a Hausman test to check for the effect of excluding *Volume*. A Heckman model including *Volume* is compared to the same model without *Volume*. The H_0 hypothesis of the Heckman test is no

¹⁷The decreasing importance of telephone service for participation is supported by the highly significant negative coefficient for the interaction variable between Phone and the dummy for year 2001 in the pooled regression model, see results in Table A2 in the appendix. The only common element for both years is then the residual, which does not seem to be an unreasonable assumption. A panel random effect model fails to give a similar significant effect, see Table A3 in appendix. However, the results from this approach is less reliable since the unobserved household characteristics must be uncorrelated with all explanatory variables including the observed household characteristics to give unbiased results, and this is probably not fulfilled in this data set.

¹⁸This "exclusion restriction" is due to possible endogeneity problems. Inclusion of the same explanatory variables at both stages is still possible under strong assumption of functional identification, i.e. the residual in the Probit is actually normal distributed. If this condition is not satisfied, the OLS coefficients will in the second step be biased.

systematic difference in (all) coefficients in the OLS part between the two model versions. In 1997, $\chi^2 = 5.46$ implies a probability of 0.25 for wrongly rejecting the H_0 hypothesis and in 2001, $\chi^2 = 0.24$ implies a probability of 0.99. We can hence not reject that there are no systematic difference between the model with and without *Volume*, and I hence stick to the approach of leaving out *Volume* from the OLS part. Especially the strong results in the last year indicate that *Volume* is not an important explanatory variable for *Share distant markets* among the peasants that do sell to distant markets.

Price is significantly negative at 1 percent level in both years in the OLS, and the absolute coefficient value nearly doubles over this period. One immediate interpretation is that it has become more necessary to give "volume rebates" in order to sell a higher share to distant markets. Another possibility is that an increased segregation of marketing strategies among households, i.e. they either sell a small share directly to consumers or they bring a lot of products and dump everything to intermediaries at low prices. A mixed solutions, some sale to consumers and some to intermediaries, become less common as markets mature and people are more specialized.

The effect of *Phone* is significantly positive at 10 percent level. This further supports the notion that trade with distant markets has become more specialized. Peasants that do sell potatoes to distant markets are now more dependent on telephone service in order to maintain contact with the purchasers. Although not significant in any of the years, the coefficient value of *Trust* changes from negative to a positive value¹⁹. The positive sides of information sharing and exchange of favours can as previously discussed now become more important when the peasants have surpassed cultural and geographical barriers and actually started to trade in distant markets.

¹⁹This result is supported in the Heckman model with pooled observations and the random effect model. The results of the former are given in table A2 in the appendix where the positive coefficient (even though not significant) for e_T , i.e. the interaction variable between *Trust* and year 2001. Table A3 gives the results of the latter and then the interaction variable e_T is highly significant at 1 percent level.

<i>Share distant markets</i> (% of total sales)				
	1997		2001	
	Coeff.	St.dev.	Coeff.	St.dev.
Constant	0.43***	(0.14)	0.16	(0.23)
Trust	-0.23***	(0.05)	-0.24***	(0.08)
Phone	0.20***	(0.06)	0.15*	(0.08)
Road	0.17**	(0.07)	0.24**	(0.11)
Volume	0.003***	(0.0007)	0.009***	(0.001)
Pseudo R ²	55%		28%	
N/uncens	158/96		226/122	

Table 3: Tobit estimation. The left hand side variable is *Share distant markets*, i.e. the share of total sales for each household that is sold to distant markets, The variable *Trust* is indicator of trust within the community, *Phone* is a dummy for public phone in the community, *Road* is a dummy for road access in the community and *Price* is the relative price on sales to distant markets compared to all markets. Significance level: * 10%, ** 5% and ***1%. The Pseudo R² is used as indicator for the explanatory power of the Tobit regression models, N is number of observations while uncens is the number of uncensored observations.

An alternative approach is to use cross-section Tobit regression, the results are given in Table 3. *Price* is not available for the households that do not sell. Thus, it is taken out of the regression model. *Volume* on the other hand turns out to be significant at 1 percent level in both years and the coefficient value triples over time. This also supports the notion of increased importance of *Volume* in the participation decision found in the Heckman model. *Trust*, *Phone* and *Road* are all significant with the expected signs, but the change from 1997 to 2001 does not seem to be important in this regression models.

3.5.2 Household specific change in trading behaviour

The summary variables in table (1) demonstrate a radical shift in trading behaviour. The share of total sales for all households that is sold in the field decreases by 13 percentage points, while the sale in the regional center Huancayo increases by 20 percentage points. The sale in field is often characterized by stable and long term contacts between seller and purchaser. Going into the field with a transport vehicle represent a sunk cost that weakens the bargaining position by the purchaser since the producers are geographically separated and harvest at different times. The purchaser hence have to trust that he will not be exploited when he turns up. This relationship between a peasant and a traders can continue to exist, but might now be a component of a different trading pattern. It is probably more efficient that the farmer brings the products to

the trader in the distant markets. The peasants then has to be reasonably sure they have a purchaser. With established contacts beforehand, the telephone becomes an important tool to actually coordinate timing and place of delivery. It was less important when the purchaser went out to the field, since the two parties normally agreed when and what to trade the next time.

I use household characteristics that are constant over time in this analysis. This makes it impossible to use fixed effects panel models since it is not possible to separate between the effect of the observed and unobserved individual characteristics²⁰. However, it is possible and even more fruitful to approach our main concern of catch-up in trade to distant markets in a rather direct manner. Do communities with high trust and without access to telephone service increase their share sold to distant markets more rapidly than their counterparts? The results are given in Table 3 below.

<i>ΔShare distant markets</i> (change share sold to distant markets)						
	Full sample		One year		Both years	
markets	Coeff.	St. dev.	Coeff.	St. dev.	Coeff	St. dev.
Constant	-0.37*	(0.21)	-0.53	(0.32)	-0.21	(0.27)
ΔVolume	0.06*	(0.03)	0.11**	(0.05)	0.11*	(0.06)
Trust	0.13*	(0.07)	0.21*	(0.11)	0.7	(0.11)
Phone	0.01	(0.01)	-0.04	(0.11)	0.18	(1.12)
Road	0.10	(0.09)	0.11	(0.17)		
R ²	0.09		0.18		0.21	
Adj R ²	0.04		0.11		0.13	
N	74		50		33	

Table 4: OLS model to explain *ΔShare distant markets*, i.e. the percentage points change in the share of total sales to distant markets. *ΔVolume* is the change in total sales volume, *Trust* is an indicator of trust with the community, *Phone* is a dummy for public phone in the community, *Road* is a dummy for road access in the community (excluded in the last model since all household are then connected) and *ΔPrice* is the percentage points change in the relative price on sales to distant markets compared to all markets. Significance level: * 10%, ** 5% and ***1%; N is number of observations, R² and Adj R² are explanatory powers. The "Full sample" model is run on the subset of all 74 households that are

²⁰Another possibility is pooling of observations. The whole data set consists of 384 household observations, i.e. 158 households from 1997 and 226 households from 2001. There are some radical changes in the estimated coefficients given in Table 2 and the χ^2 indicator value from the Hausman tests comparing the models for the two years is -62 for the Heckman model and -64 for the Tobit model. These tests indicate there has been a significant shift in the underlying relation explaining the share sold to *Distant markets*. One possibility is however to include interaction variables, i.e. a given variable interacted with a year dummy for 2001, which is interpreted as the shift in the coefficient value. The results from these exercises are given in table A2 and A3.

included in both years, the "One year" includes only the households that have sold in at least one year to Distant markets and the "Both years" model includes only households that sold to distant markets in both years. "Road" is excluded in the last as only these households only lived in communities with road connection.

The left hand side variable to be explained in an OLS model is $\Delta Share\ distant\ markets$, i.e. percentage point change in share of total sales that is traded in distant markets. There are three different sub-samples of households in Table 4. "Full sample" includes all households that take part in both surveys. "One year" includes households that sell to distant markets in at least one of the years²¹. "Two years" includes only households that sell to distant markets in both years.

The results given in Table 4 above support the interpretations given on the changes in coefficient values between years in the Heckman cross section models. In the two first sub-samples the significantly positive coefficient for $\Delta Volume$, i.e. the percent change in total sales volume, also indicates a difference between large and small traders in their marketing strategy since the former have increased their share sold to distant markets. The positive coefficient for *Trust* gives further evidence for the results found in the cross section analysis for the peasants that do sell to distant markets where a negative coefficient in 1997 turned positive in 2001. Being a member of a more traditional community is hence no longer a drawback for the peasants who sell to distant markets²². The coefficient for *Phone* and *Road* are insignificant. This implies that these variables have no effect on the shift in *Share distant markets*. The number of observations is reduced to 33 households in the "Both years" category, which further weakens the results. Now, only $\Delta Volume$ gives a significant result. The exclusion of households that enter and exit in either year also reduces the variance in the left side variable considerably²³.

²¹ Among the 50 households that entered distant markets in at least one of the years, 33 were active in both years, 8 households only sold in 1997 and 9 households only in 2001. There is hence a considerable entry and exit from sales to distant markets.

²² The numerical effect of *Trust* is rather strong. According to the point estimate, a community with one point higher trust indicator on the scale from 1 to 4 will have 21 percentage points higher change in share sold to distant markets, e.g. with same share in 1997 the share for more trusting community will be 21 percentage points higher in 2001.

²³ We can also include change in the relative price obtained in distant markets in this sub-sample of households. This variable would then be highly significant, but none of the others. However, the change in price is highly endogenously due to the bulk discount effect, i.e. farmers that sold little to high retail prices and shifted to intermediate sales will have to lower their price, and is hence left out of the analysis. The simultaneity between price and volume might be solved by using an instrument variable that is uncorrelated with the residual but correlated with prices. It has not been possible to find such variable that is truly independent in the data set. The models in this article that include *Price* must hence be interpreted in light of this simultaneity problem.

4 Conclusions

Peasants in Latin America are definitively poor. Herrera (2001) estimate that 70 percent of the people living in rural Peru are poor and about half of these are considered extremely poor. This implicates that peasants today do not necessarily enjoy a better life than their ancestors in pre-Hispanic times. Four years is a rather short period to measure rural development in this comparison. However, the marketing opportunities for the potato peasants in this area have changed radically in the last decade through the construction of new roads, improvement of rural footpaths and, not least, the complete liberalization of the agricultural markets. Some households are quick to exploit new opportunities, while others are latecomers who do not take the chance of entering distant markets before the gains are obvious for everyone.

Quite radical changes in household behaviour might hence come about in a rather short time. The econometric results in this study of small-scale peasants indicate that such dynamic change is actually taking place in the Peruvian highlands. The effect of access to telephone service on the decision to sell in distant markets was significantly positive in 1997 and insignificantly negative four years later. This implies that households living in communities with public telephone service has learned how to surpass this drawback, for example by using the telephone while visiting their neighbour communities or they substitute with other forms of communication.

Trust between members of a given community might have opposing effects on trading behaviour. On the one hand members in communities with a high trust level will probably be more able to help each other out in the trading process, for example through entrusting others to take the products to market or giving each other vital information on prices, contacts and sales opportunities. High trust can on the other hand signal that the community is rather isolated (in several dimensions), since the possible punishment of social ostracizing is more powerful in enforcing common norms, the less outside options exist. The total effect on the decision to sell to distant markets turns out to be significantly negative. This result is further consistent with the view that norms of cooperation are probably more prominent in traditional tasks than in modern tasks like marketing and sales. However, this negative effect seems to have become weaker from 1997 to 2001. Panel data show households in trusting communities have a higher increase in the share sold to distant markets. Moreover, there is a shift from negative to positive effect of trust on the share sold to distant markets for the households that do participate. This may illustrate how initial cultural and historical drawbacks are surpassed over time as markets mature.

Institutional restrictions to free trade of land is probably one of the reasons why we can observe this catch-up effect in trade with distant markets by the initially less integrated households. This dynamic development might have been quite different if this had not been the case. If "early-movers" earn more because the profits from sales to distant markets are indeed higher than sales to near markets, they could buy land from the others and the result would be an increased inequality in the land distribution. Being left without land and finally learning how markets work would then be of no use for "slow-starters".

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5 Appendix

5.1 Variable summary

	1997			2001		
	N	Mean	St. dev	N	Mean	St.dev
Trust	158	2.35	(0.49)	226	2.31	(0.50)
Phone	158	0.47	(0.50)	226	0.54	(0.49)
Road	158	0.72	(0.45)	226	0.78	(0.41)
Total sales	190	23.2	(29.1)	244	27.6	(29.1)
Share field	190	0.27	(0.24)	244	0.21	(0.28)
Share local	190	0.21	(0.27)	244	0.19	(0.31)
Share district	190	0.26	(0.21)	244	0.27	(0.29)
Share region	190	0.18	(0.18)	244	0.25	(0.32)
Share capital	190	0.63	(0.13)	244	0.06	(0.18)
Share distant markets	190	0.25	(0.24)	244	0.31	(0.37)
R Price region	109	1.19	(0.21)	120	1.18	(0.19)
R Price capital	42	1.46	(0.23)	38	1.29	(0.21)
R Price distant markets	113	1.27	(0.19)	126	1.20	(0.19)
Land				196	4.1	2.6
Plots				182	6.3	2.5

Table A1: Variable summary: *Trust* is indicator from 1 to 4, *Phone* and *Road* dummies, *Total sales* denoted in tons, The prefix *Share* indicate the share of total sales in percent that is sold to the indicated market, The prefix *R price* give the give relative price achieved in the given market compared to average price for all markets. *Land* is cultivated land per household denoted in hectares and *Plots* is the number of plots of land.

5.2 Heckman pooled with interaction

<i>Share distant markets</i> (% of total sales)				
	OLS		Probit	
	Coeff.	St. dev	Coeff.	St. dev
Constant	0.56	(0.37)	1.72	(1.88)
e_C	0.59***	(0.23)	-0.21	(1.12)
Trust	-0.03	(0.05)	-1.00***	(0.32)
e_T	0.09	(0.06)	-0.26	(0.41)
Phone	-0.05	(0.06)	1.16***	(0.34)
e_Ph	0.12*	(0.07)	-1.67***	(0.45)
Road	0.07	(0.07)	0.56*	(0.31)
e_R	-0.03	(0.09)	0.29	(0.46)
Price	-0.49***	(0.10)		
e_Pr	-0.56***	(0.14)		
Volume			0.02*	(0.01)
e_V			0.04***	(0.01)
Lambda	-0.12	(0.08)		
e_L	-0.03	(0.09)		
R ²	0.68		0.42	
N	218		384	

Table A2: Pooled Heckman with interaction variables with *Share distant markets*, i.e. share of total sales taken to distant markets, as right hand side variable. The left side of the table is the results for the Probit at first stage, the left side of the table is the OLS in the second step. Explanatory variables are: *Trust* is indicator of trust within the community, *Phone* is a dummy for access to public telephone service in the community, *Road* is a dummy for road access in the community and *Price* is the relative price on sales to distant markets compared to all markets and *Volume* is total sales. The prefix *e_* indicates interaction between the variable immediately above with a dummy for year 2001. *Lambda* is the inverse Mills ratio calculated from the Significance levels * 10%, ** 5% and ***1%.

5.3 Panel random effects

<i>Share distant markets</i> (% of total)		
	Coeff.	St. dev.
Constant	0.93***	(0.31)
r_C	-0.60***	(0.19)
Trust	-0.12**	(0.05)
e_T	0.21***	(0.67)
Phone	0.18***	(0.06)
e_Ph	0.03	(0.07)
Road	0.11	(0.07)
e_R	0.03	(0.72)
Volume	0.002**	(0.0009)
e_V	0.004***	(0.001)
R ²	0.54	
N/Groups	148/74	
Rho	0.33	

Table A3: Panel data set random effect model including household observed in both surveys with *Share distant markets* as right hand side variable. Explanatory variables are: *Trust* is indicator of trust within the community, *Phone* is a dummy for public phone in the community, *Road* is a dummy for road access in the community and *Volume* is total sales. Significance levels * 10%, ** 5% and ***1%. R² is the overall explanatory power, N is number of observations and Rho is the fraction of variance due to the unobserved individual effects.