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Transaction Costs and Institutional Arrangements in Potato Marketing by Small Producers in Rural Peru

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ABSTRACT

In order to address the question of what kind of marketing relations induce producers to invest more and/or target their production to specific markets, this study assesses small-scale potato growers' access to dynamic markets. This study defines dynamic markets as those capable of absorbing increasing quantities of farmers' produce, either because of the scale of the market, or because demand is rising rapidly. Using potato marketing in the most important producing region for this crop in Peru – the Mantaro Valley, which is located in Peru's central mountains – as a case study, the dynamic markets considered in this study are the processing (potato chip) market and the seed potato market; both are generally considered more profitable than the traditional potato market aimed for direct consumption.

This study examines the features and conditions governing sales in the various markets where potato growers place their produce. We have employed two consecutive surveys of same producers, one focusing on transactions and the other on the socio-economic attributes of individual producers. Quantitative results were supplemented by in-depth interviews with a variety of participants in the marketing chain, in order to better understand how these producers connect with different markets, and what contractual modalities and conditions enable them to create solid, successful market arrangements.

The research shows that the most complex marketing arrangements are the most profitable. However, these arrangements also involve greater transaction costs, since they take place in markets that demand higher product quality and more product differentiation, requirements that can only be met if growers invest more in the production process. It should be noted that institutional costs play a dominant role in these markets due to information asymmetries. The high transaction costs entailed are a barrier to access for producers with fewer resources, preventing them from entering these more dynamic and hence potentially more profitable markets.

The study also explores the main bottlenecks that producers face in attempting to enter more complex markets, and examines the role that these barriers play in informing producers' choices and decisions regarding activity in given markets and investment. The study found that any isolated actions do not suffice to solve these problems; only a series of interventions (involving education and training, risk management, and organization) can increase the probability of access to these markets under favourable conditions for the growers in question.

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1. INTRODUCTION

Although Peruvian national statistics indicate that the country has enjoyed an economic expansion in recent times (annual growth averaging over 4% in the 2000–2005 period), this growth has not been accompanied by a substantial reduction in poverty. Indeed, aggregate poverty figures show a very modest improvement in urban areas, while rural poverty shows almost no change at the aggregate level.

According to the last report by the World Bank (2005), the only rural area that has proven pro-cyclical in this period is the rural coast. Here, some subsectors – basically those that are export-oriented – have been especially strong, benefiting from a free-trade environment. Growth in the subsectors that supply the domestic market continues to be slim. Expansion in aggregate demand has not helped much to connect the small producers in the country's mountainous areas with markets. Rural producers in these areas remain isolated by institutional barriers and high transaction costs.

In this context the need to integrate small, poor producers into dynamic markets is quite pressing, the key question being what constraints must they overcome for this to be achieved? To address this question, this study draws on information provided by a sample of small potato producers from the Mantaro Valley in the rural highlands of Peru who sell to markets of differing complexity.

Though obviously not the sole approach needed for overcoming rural poverty, one critical objective in any rural development strategy must be to promote access to new and better markets for these small producers. However, any effort to help the activities these producers engage in to become more profitable – by improving their connections with markets – depends on understanding the factors behind the high transaction costs that they face, as well as the mechanisms that translate these high transaction costs into particular economic strategies and technological practices. Such understanding is needed to design effective interventions aimed to improve the well being of these producers by improving their marketing arrangements.

The survey used in this study provides information on individual market transactions, as well as on farmers' socio-economic characteristics. This information will help us to identify both contractual arrangements and transaction costs that surround the main marketing arrangements these producers develop. By comparing contractual arrangements in different markets, the study will show that more complex marketing arrangements can provide better profits, though not everybody can access these transactions. Finally, the study will suggest types of policies that could provide incentives for more favourable contractual arrangements within a policy framework that generates growth in a way that may benefit the poor.

2. CONCEPTUAL AND THEORETICAL FRAMEWORK

Typically, the literature that discusses the interaction between agro-industry and the rural economy focuses on the analysis of marketing linkages. The Latin America experience has shown that this interaction may, in some cases, result in positive effects, by promoting greater institutional development and encouraging investment in technology. (Shejtman, 1998; Saenz-Segura, 2006). There is evidence that access to services and investment in knowledge also facilitates productivity gains and higher incomes for farmers (Evenson, 1992; Swanson et al., 1997); paving the way for the growers to reach niches that could be considered dynamic markets, markets which can be characterized by their more complex, albeit more profitable, contractual arrangements. (Escobal, 2006)

Taking the theory of institutional development as a starting point, one observes that the condition under which producers negotiate their transactions is characterized by information asymmetries and incomplete information (among other market failures). Under this information-gap, diverse institutional forms appear in order to ensure that trade occurs. In this context, contracts are made in order to formalize parties' commitments to the objectives of their marketing arrangement, and may be seen as bilateral co-ordination agreements.

The literature on contract farming underlines the positive impact of technological change and scale of production when market failures are significant. (Key and Runsten, 1999) On one hand, there are potential linkages for small growers, including extension services in areas such as technical assistance, credit and access to inputs. (Glover 1984; Morrissey, 1974; Goldsmith, 1985) Possible negative effects, on the other hand, include market segmentation and exclusion. (Glover and Kusterer, 1990; Little and Watts, 1994)

Less common in this literature is the study of the distortions produced by inefficient agricultural contracts and their relation to transaction costs, which play a particularly important role in hindering the connection of small producers to dynamic markets. Though the literature studies the various types of marketing arrangements that contract farming generates, there has been little attention to what types of arrangements may encourage farmers to produce and invest more and why those linkages are more difficult to reach.

Contract theories regarding marketing arrangements in agriculture

The purpose of this section is to explore the way in which parties involved in a transaction attempt to

deal with uncertainty. We provide a framework for the analysis of the basic conditions under which new contractual forms are developed in agroindustry markets. In this we use contract theory in order to shed some light on how market inefficiencies interact with high transaction cost environments, to curtail the likelihood that a small producer can benefit from dynamic market arrangements.

If one accepts that the contracting occurs in situations in which economic uncertainty, information asymmetries and limited rationality prevails, one must conclude that contracts are never complete in the sense of exhaustively defining the relationship between the parties and all the possible contingencies.¹ This is especially true in agriculture, which is subject to a whole array of factors (including weather outcomes) that are exogenous to the contracting parties.

Gibbons (2005) develops a comprehensive view of different theoretical approaches that aim to explain contract inefficiencies in terms of the expected conduct of the parties at two pivotal times – before and after the realization of uncertain events that may affect payments to the benefit/detriment of each one of the parties. Following this approach, behaviour at the prior stage (ex ante) may be affected by contract provisions and is related to investment decisions (as a response to incentives) that could change the production process of the good being produced. Alongside with this, behaviour subsequent to the resolution of the uncertainty (ex post) affects the final outcome of the transaction.

Wu (2006) discusses this theoretical approach applying it to marketing arrangements in agriculture, identifying inefficiencies associated with contractual arrangements – specifically, ways in which 'blank spaces' left behind in contracts can lead to under-investment at the prior stage (ex ante), or at the ex post stage, triggering rent-seeking behaviour at the expense of the farmer, who is usually the weaker party in these arrangements. This approach could help us to explain the inefficiencies associated with contractual arrangements in the complex institutional and marketing arrangements between agro-industry and small-scale potato producers.

Transaction Cost Theory

According to the transaction-cost approach (Klein et. al, 1978; Williamson, 1979), inefficiencies in contracts occur under a context of incomplete contracts and the presence of asset specificity (relationship-specific investments).² Under these conditions, opportunistic rent-seeking behaviour may occur.³ Regardless of whether the context of contracts in agriculture actually create rent-seeking behaviour by the firms, what producers see is that firms could ex post regulate the flow of potatoes into the plant, since there are not contractible variables ex post (i.e. there are aspects that producers cannot control through contractual provisions such as the firm's unilateral assessment of the product once delivered). Thus producers, who have to make specific investments in relation to such commitments, will under-invest in their production process, as a response to an expected firm's rent seeking behaviour.

The principle source of inefficiency, according to the transaction cost theory, is due to the existence of actions not subject to contractual provisions. The margin of discretion that they leave the firm may be interpreted by producers as increasing risk, regardless of whether the feared behaviour actually occurs; this threat becomes a part of the transaction cost for the producer.

Incentive Theory

The theory of incentives (Holmstrom and Milgrom, 1994; Holmstrom, 1999) focuses on a situation where supervising is costly for the principal (the firm), and so incentives are designed by the firm to encourage the agent (in this case the producer) to invest or make some additional effort. The theory stresses proper design of incentives in a principal-agent situation where adverse selection and moral hazard are important components of both parties' decision-making process. In cases featuring this agency problem, we see principals delegating activities and responsibilities to an agent through a contractual agreement (Laffont, 2002).

Under a principal-agent relationship, the principal (in this case the agro-industry firm) addresses the problem of an imperfect market by building up-front incentives into contracts to ensure that the agent (grower) will put maximum effort in to obtain the desired quality results. Since the firm does not have access to its agent's track record, it uses information on the agent's investment and effort as performance indicators.

If contractual incentives are not strong enough to motivate producers to comply with their commitments to deliver their harvest under the agreed arrangement, the system may prove inefficient and end up creating higher supervision costs for the firm and excluding some growers from the contractual arrangement.

On the otherhand, Wu (2006) stresses the importance of informal 'self-enforcement' mechanisms. These occur when repeated trade transactions take place without necessarily involving formal negotiation either

1. Salanie (2005) shows that complete contracts take all possible contingencies into account. Under this type of contracts, uncertainty about the future is reduced to elements that are outlined in the contract. Under these conditions, there is no need to revise the contract once it is signed.

2. When there exists relationship-specific investments, the generated assets have lower returns outside the relationship so there may exist quasi rents (i.e. difference between the profit earned within the relationship and the profit generated from using the asset in the next best available way).

3. Wu defines an opportunistic agent as one who takes advantage of any opportunity for his ends, often with no regard for principles or consequences.

before or after production. Marketing arrangements here are essentially motivated by the desire to keep the relationship alive for the future. This desire operates as an informal incentive to fulfil commitments: for the buyer to avoid rent-seeking behaviour and for producer to make whatever investment is needed to ensure the quality level required to maintain trust.

The incentive in this case may correspond to the present value of indefinitely maintaining good performance, a behaviour that will encourage the counterpart to do so as well and hence foster an ongoing good relationship. This informal self-enforcement mechanism will function properly whenever the present value of future profits is greater than the present value of accepting another offer 'on the spot'.

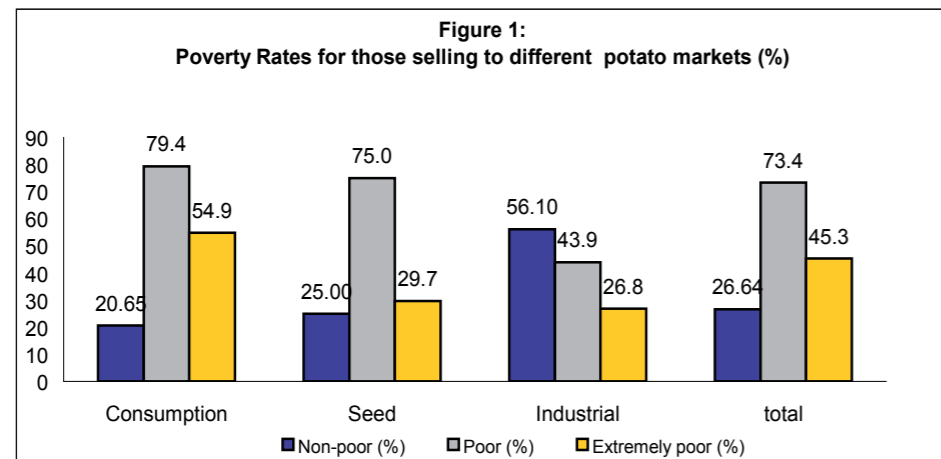
3. THE SAMPLE

This study collected information from 289 potato growers located in the provinces of Chupaca, Huancayo, Concepción and Jauja, which are in the Junín region and belong to the Mantaro Valley. The Mantaro valley, which is located in the Peruvian central highlands, is one of Peru's most important agricultural mountain areas, and has traditionally been one of the country's main centres of potato production and marketing.

The sample was characterized by the type of markets producers were aiming at: one third of the sample was drawn within the segment of growers that produce potatoes for dynamic markets (seed or agro-industry); while the remaining two thirds were drawn from those producers marketing their potatoes in the traditional consumption market.

The valley is an interesting research area because it is rather special among Peru's highland agricultural areas. It is a strategically located Andean valley, with favourable ecological and climatic conditions for farming, and with good connections to various markets – most importantly, to markets in Lima and to the valleys of the central coast area. In this valley small farmers using traditional technologies to produce their crops for local and regional markets co-exist alongside more modern and specialized farmers aiming at dynamic and complex markets.

Our sample represents, reasonably well, the living conditions of rural producers living in the central highlands of Peru. The incidence of monetary poverty is close to 73% for the sample,⁴ coinciding closely with figures based on the percentage of individuals with unsatisfied basic needs (UBN) as reported by official statistics. (See figure 1 and table 1.) Also significant is the negative correlation between the incidence of poverty and the complexity of marketing arrangements: growers of potatoes targeting the direct consumption market show the highest incidence of both extreme poverty (54.9%) and total poverty (79.4%) as compared to producers aiming other potato markets. It should be noted that though there is a significant proportion of poverty among potato seed market producers (75.0%), the main component (46%) of this is non-extreme poverty, in contrast to the situation of growers for the direct consumption market.



Source: Survey on Farm Services Markets. GRADE

4. The poverty line is about 2 US dollars per day per person.

Table 1: Poor, measured as one or more UBNs

Poverty and products markets

	Consumption	Seed	Industrial	Total
0 UBNs (%)	23.91	32.81	39.02	28.03
1 or more UBNs (%)	76.09	67.19	60.98	71.97
<i>No of Observations</i>	184	64	41	289

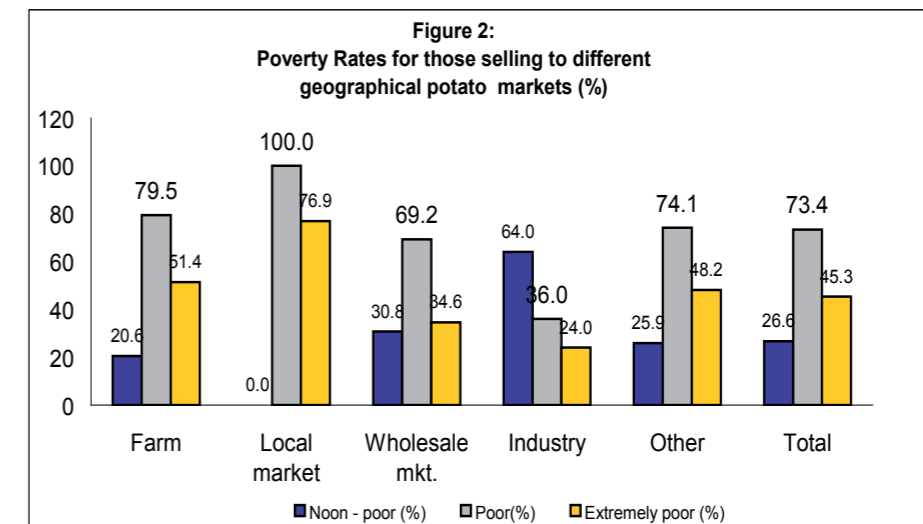
Source: Survey on Farms Services Markets. GRADE

Poverty and Geographical Market

	Farm	Local Market	Wholesale Market	Industrial Plants	Other	Total
0 UBNs (%)	23.29	0.00	37.18	48.00	22.22	28.03
1 or more UBNs (%)	76.71	100.00	62.82	62.00	77.78	71.97
<i>No of Observations</i>	146	13	78	25	27	289

Source: Survey on Farm Services Markets. GRADE

Potato growers not only focus their attention on the type of potato they want to trade (direct consumption potato, seed potato or potato for the agroindustry), they also look at the geographical location of the market they are aiming at, since closer markets (local and regional markets) may involve lower transaction costs than wholesale or industry-related markets farther away. Looking at correlations between poverty and geographically categorized markets, we find that the markets with the highest incidence of monetary poverty are local markets (100%), selling at farmgate (79.5%) and selling to other local markets (73.4%). The greatest proportion of extreme poverty is found among those selling in the local markets and at the farmgate.



Source: Survey on Farm Services Markets. GRADE

Our sample reflects other key characteristics of those farmers producing potatoes in the Mantaro Valley. One important feature is the fact that it mimics the plot size profile of this region, where small plot holdings are the norm. Although differences in plot size between markets cannot be clearly determined (figure 3), there is a marked concentration in terms of small land area under cultivation for potato farming aiming at the direct consumption market. As reflected in table 2, close to 70% of the farmers are in the first and second quartiles.

Figure 3

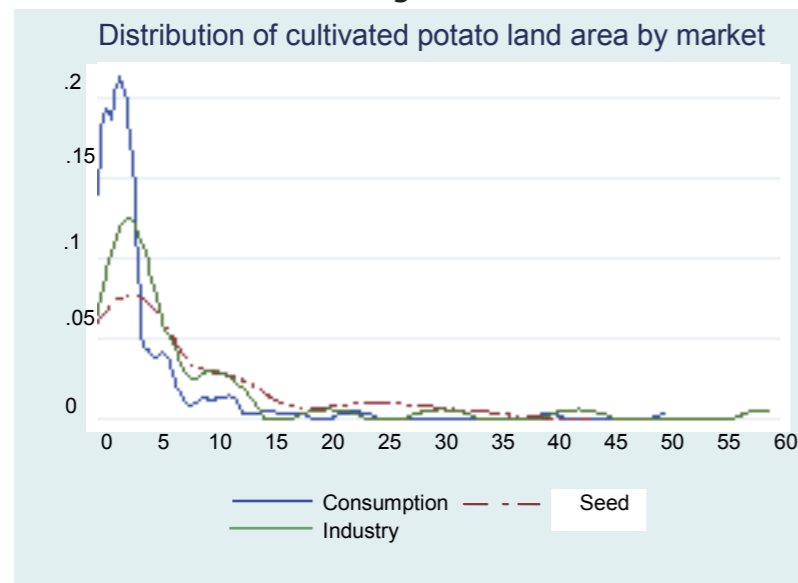


Table 2a: Land holding and product market distribution of cultivated potatoes

	Lower Bound (ha)	High Bound (ha)	Consumption (%)	Seed (%)	Industry (%)
Quartile I	0.16	1.83	33.70	9.38	12.20
Quartile II	1.90	3.00	34.78	31.25	31.71
Quartile III	3.03	6.00	17.93	20.31	26.83
Quartile IV	6.48	60.00	13.59	39.06	29.27

Source: Survey on Farm Services Markets. GRADE

Looking into geographical market distribution of cultivated land, we can see that transactions directed to the industry are concentrated in the highest quartiles of the plot size distribution, opposed to farmers whose transactions take place in wholesale markets and at the farmgate which are evenly spread.

Table 2b: Geographical markets distribution of cultivated potatoes

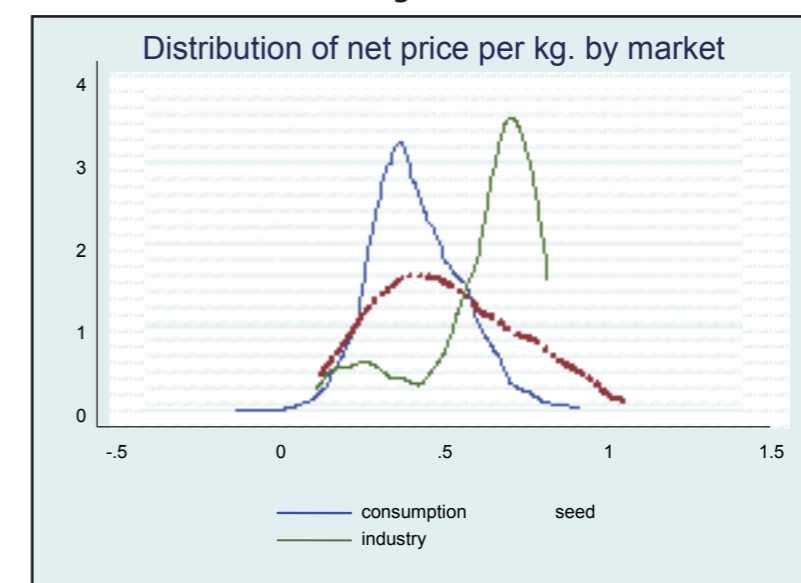
	Farm (%)	Local Market (%)	Wholesale Market (%)	Industry Plants (%)	Other (%)
Quartile I	25.17	63.64	20.78	12.00	33.33
Quartile II	30.77	9.09	22.08	16.00	18.52
Quartile III	23.08	27.27	29.87	24.00	22.22
Quartile IV	20.98	0.00	27.27	48.00	25.93

Source: Survey on Farm Services Markets. GRADE

Finally, the sample also reflects the heterogeneity of the prices that producers received depending on the markets for which they produce. Here there is a clear difference between the relatively low prices that are paid to those aiming at the traditional consumption market and the higher prices that are paid to those selling to the agroindustry markets. As figure 4 shows, the price distribution for those selling to the agroindustry market lies to the right of the distribution of those selling to the consumption market.

It should be noted that this price distribution reflects the low prices received by producers who do not succeed in selling to processing plants (principally because of low quality), and who are thus obliged to take the low prices paid in other markets, which are seen as residual markets. The price distribution reflects the risk that producers face as a function of quality requirements in the market for premium goods. It is interesting to note that small producers that are not successful in selling their produce to the agroindustry may even end up receiving prices lower than prices for potatoes aimed to the final consumption market, despite having made greater investment than growers of potatoes aiming at this market. Finally, prices received by seed potato producers tend to show a much greater spread reflecting a very heterogeneous market.

Figure 4



4. POTATO MARKETING IN THE MANTARO VALLEY

After presenting a theoretical framework and the main socio-economic characteristics of our sample, this chapter examines in detail the structure of the potato market, and the associated marketing arrangements.⁵ Our aim is to explain the complexities of these institutional arrangements under the light of the theories presented in section 2.

According to Peruvian Ministry of Agriculture, the potato production of the Mantaro valley represents approximately 50% of the total output produced in the Junín region, which in turn is the third largest potato producer area in the country.⁶

Depending on usage we could classify the potato market in three: the traditional direct- consumption market, the certified seed potato market and the industrial market (potatoes for chips). The seed and chips markets can be characterized as dynamic markets, as much as they are rapidly growing and the prices that the growers receive for the varieties that go into these markets are much higher than the prices the growers receive for traditional varieties. From the producers' point of view, one essential difference between the traditional and dynamic markets is the degree of complexity of the productive processes (greater investment, technology and product differentiation for the dynamic markets), as well as the complexity of their marketing arrangements (the efficiency of the dynamic markets entailing certain institutional arrangements). The other essential difference for producers is that there is more potential for profit in the dynamic markets, since these markets offer higher prices and potentially more capacity to absorb increasing quantities of output.

In addition, differentiating market outlets by the kind of potato a grower produces (i.e. consumption potato, seed or industry) is useful to classify potato markets in the Mantaro Valley depending on the geographic proximity of the sales point. We have classified potato transactions into two geographical markets, one operating at the farmgate and the other operating in the wholesale market, and one contract market which typically requires that the potato be delivered to the industry; the respective final sales point will affect marketing costs as well as other transaction costs.

It should be noted that technical assistance in the area also plays a dominant role in producers' decisions to enter these market outlets. As Escobal (2005) has indicated, technical assistance in the areas studied is provided mainly by two NGOs: FOVIDA (Fomento a la Vida) and ECOSER (Empresa de Comercialización y Servicios Agropecuarios). These NGOs established themselves as providers of extension services after participating in the publicly funded Peruvian Farm Innovation and Competitiveness Programme (Programa de Innovación y Competitividad para el Agro Peruano, or INCAGRO).⁷ They offer technical assistance and training for potato growers, who seek help to increase productivity and move into more complex markets.

5. The information used in this section is based on the surveys described in the previous section, interviews with key informants from the marketing chain as well as from secondary sources (Ministry of Agriculture and existing literature).

6. The country's potato crop averaged 3.1 million tonnes per year between 2001 and 2005. The production is basically concentrated in highland regions with Puno (14%), Huanuco (14%) and Junín (11%) being the largest producer areas.

7. This project provides a competitive subsidy fund to increase the supply of technical assistance and to strengthen services markets that encourage innovation. Funds from the Fondo de Tecnología Agraria (FTA or Farm Technology Fund) and the Fondo para el Desarrollo de Servicios Estratégicos (Fund for the Development of Strategic Services or FDSE) partially underwrite the cost of these services, leaving the rest to be covered by the producers in the area in exchange for the services they use.

4.1 The product markets

4.1.1 Direct-consumption potato market

Though there are no accurate statistics on the final destiny of potatoes produced, estimates from the Ministry of Agriculture show that the major outlet for the country's potato produce is direct human consumption, while the second largest outlet is the seed market. The agro-industry production outlet is a recent development and represents a smaller share of the market.

Potato growing for the traditional market of direct consumption involves a longstanding system of production, which is the most widespread in the Mantaro Valley. Producing for this market is substantially cheaper than producing for any of the other two dynamic markets.⁸ One advantage for farmers that produce potatoes for the direct-consumption market is that they can sell different varieties of potatoes, since the demand is characterized by the household's preferences and uses. This feature is important because diversifying the crop varieties and reduces the risk of climatic impact on yields without affecting market access. Diversifying varieties also allows producers some control over the price risk in the spot market, taking advantage that some varieties may be more profitable than others in the wholesale market.

Since this market trades in mainly fresh potatoes (i.e. potatoes with no industrial processing), it can be sold in several ways: the farmgate, at local fairs, wholesale markets and also through more formal arrangements like contracts with supermarkets.⁹ In the case of the Mantaro Valley, and particularly in our sample, most of the transactions in the area under examination occur at the farmgate or wholesale markets. The latter is the most attractive outlet for producers, since greater quantities of product can be placed, while retaining the profit margin that may be appropriated by intermediaries when sales are made through other arrangements (farmgate, local markets). Nevertheless, as will be seen in section 4.2.2, there are several bottlenecks that hinder growers' capacity to connect through this arrangement.

As the direct-consumption market is mainly a spot and open market, prices are the principal coordinating mechanism. (Shejtman, 1995) Prior commitments as to quality are not made, nor do producers need to commit to specific investments in order to sell under this arrangement; there are generally no formal contracts or documents associated with the delivery of the produce.

4.1.2 The potato seed market

Seed is the most important element in the potato production process, since high-quality seed ensures both greater yield and greater income for the grower.

The Mantaro Valley is one of the main sources of seed for the coastal regions of Peru, especially for the valleys of the central and southern coast. Jauja has become the principal seed producer in the valley thanks to its climatic conditions, which are favourable for reproducing potatoes free of diseases that can be transmitted through seed potato.¹⁰

Depending on the production system, the production costs could be higher than the production for the traditional potato market. Certified seed production is more costly because it involves a higher level of technology and investments in a complex multi-stage process that differentiates classes and categories of seed.¹² Alongside this highly sophisticated system is the informal system, which produces cheaper seeds. This basically involves 'qualified producers'¹³ who are not registered or certified by the authorities and produce potato seed in the way that it has traditionally been produced for consumption, selling the smaller potatoes (seconds and thirds categories) as seed. (Alarcón, 1994) Another important source of informal seed is the own crop produced during the last season by every farmer.

Demand for seed is basically from potato producers, associations of producers on the coast or individual growers in the area, and from firms that market agricultural inputs. The principal points of sale are the farm, certain wholesale markets, and seed firms (which sell seed produced by member growers). Growers working on formal markets connect through enterprises and grower associations, while growers from the informal markets are connected through spot markets.

There are no official statistics on seed demand, however, average estimates from the Ministry of Agriculture,¹⁴ based on the proportion of potato sown, indicates that almost 525 tons of seed are used for potato production every year.

8. According to data from the Ministry of Agriculture and FOVIDA (Fomento a la Vida), the cost of producing processed potatoes may be double the cost involved in producing potatoes for direct consumption. These figures are shown in a statistical annex at the end of this paper.

9. The present study did not explore this market, since there was little occurrence of it in the sample.

10. ECOSER (2003)

11. The cost of becoming a registered seed producer includes, among other things, paying a S/.480.00 registration fee to SENASA; a demonstration of access to technical assistance; and providing formal documentation of land ownership or notarized land rental agreements, in addition to registering the land with CODESE at approximately S/.20.00 per hectare and paying 2% on seed sales. (Source <http://www.incagro.gob.pe/proyectos.shtml?x=1592>)

12. Seed potato categories are defined in seed legislation (Ley General de Semilla) and in the regulatory provisions promulgated under that legislation. There are three 'classes' and four 'categories', without counting the pre-basic seed.

13. This refers to those who have acquired prestige as seed potato producers due to their agronomical management practices.

14. In terms of the average amount of seed used every season during the period from 2001-2004, under the assumption that the quantity of potato seed shown per hectare is 2,000Kg.

Institutional issues in the seed market

In the area under study, there are two production systems: the formal and the informal. The formal system produces certified seeds under the certification of the National Agrarian Health Service (SENASA) and supervised by the Regional Commission for Seeds (CODESE). The informal production system is the source of the uncertified seeds for the market, and is the widespread production mode in the valley. Although there is no statistics about market share, it is possible that the market for certified seeds represents just a minimum proportion of the whole market, since growers' seed main source of seed are their own crops or the crops of 'qualified producers' and there is no credible public seed certification system operating in the country.

This lack of proper health controls¹⁵ creates an institutional problem in which investment by formal seed growers is discouraged by the aggressively informal seed market, in which uncertified seed is priced lower (the cost of producing it being lower) and there exists many producers who simply lack the spending capacity to purchase certified seed.

It is possible that the main reason why producers avoid using certified seed is the widespread awareness of its costliness. However it is also true that uncertified seeds could lead to sanitary problems, since the buyer cannot identify whether the seed is free of virus or not until it is too late. In this context, the transactions are a matter of trust on the 'qualified growers'.

It should be noted that in Jauja, the existence of the ECOSER plays an important role in promoting formal production and marketing of seed. Once producers join the ECOSER arrangement, they are benefited with a reduction on production costs and seed certification costs brought about through economies of scale (i.e. purchase of inputs in bulk). Farmers who are members of ECOSER are officially registered as seed growers.

4.1.3 The industrial (Processed) potato market

According to estimates from the Ministry of Agriculture, the share of the national potato crop absorbed by the industrial market is just 3%.¹⁶ This includes the dynamic and growing potato chip industry, in which the Valley is a very important supplier.¹⁷ There are no historical statistics on potato chip production, but Bernet et al. (2002) estimates that the main agroindustry enterprises (small and big firms) purchases approximately 330 tons per week; Bernet et al (2002) also show that the structure of industrial potato market is highly concentrated: the most important firm, Frito-Lay, represents at least 50% of the market, followed by Laurel with 7%, with the remaining market consisting of approximately 25 small-size firms.

To enter this market, producers must adapt their production systems and quality standards to the requirements of the industry, which imply additional investments and technical assistance. One of the important quality requirements (related to sugar content and water content) restricts production to one variety of potato 'Diacol Capiro',¹⁸ which is the only one able produced in the valley that could meet the relevant standards for frying.

Despite the fact that publicly available data about production costs of this potato variety does not exist, we found in our data and through interviews with Ministry of Agriculture officials that the cost of producing for the industrial market may be twice that of producing for traditional markets (direct-consumption).¹⁹ In order to cover these additional costs, financing is required in most of cases: input costs are higher, entailing, for example, use of certified seeds and improved agronomic practices, which often require technical assistance.

Institutional issues – contract-based agroindustry arrangements

According to Shejtman (1998), contractual arrangements in agriculture involve grower-firm relationships of an intermediate type, lying between vertical integration schemes and open-market contexts. It is a 'synchronized' form of contractual arrangement that promotes efficiency for firms, and is a response to the high costs that they would otherwise encounter in overseeing growers' production process.

In the area under study we found two types of marketing arrangements: one handled through contractual relations, which in turn is the most important outlet for the industrial potato; and the other, less important, linked to small enterprises that not necessarily request contractual arrangements or high quality standards, and also handle potato chips rejected by bigger firms, this makes those enterprises a residual market where price is led by wholesale trends, a departure from the contractual mode.

Contractual relations include direct contracts with medium-size growers (approximately 20 in the valley), and also contracts with small producers (approximately 30) through an intermediary entity, FOVIDA, which is a NGO that provides technical assistance to small-scale growers orientated in the industrial market. An important activity of FOVIDA is to act as an intermediary to simplify and reduce the

15. ECOSER (2003)

16. This estimate includes craft processed products like 'chuño potato' (dehydrated frozen potato) and other dried potato products, as well as the higher value-added industrial products (pre-cooked and frozen potatoes, strips and potato chips).

17. According to Frito-Lay, which is the largest firm in the field, purchases from the Mantaro Valley represented 50% of total purchases prior to 2003, now representing approximately 30%.

18. In the coastal valleys growers could use 'Canchan' varieties because of frying boundaries.

19. This assertion was confirmed through key informant interviews during the fieldwork. For more details see Annex IV.

oversight costs for main industry firms²⁰ while providing at the same time access to technical assistance for producers.

This contractual mode has changed the production setting in the valley, bringing an institutional component to the growers' marketing arrangements, while allowing agro-industry to plan on having raw materials of high quality, under predictable conditions of security, stability, and delivery times. At the same time, these arrangements have become the most important source of income for those growers who have been able to enter into this agreement.

This market outlet is more profitable for growers because of the higher prices paid, which provides an incentive to meet the higher quality and standards required by the firm. In addition, it offers the possibility of guaranteed sales, and established timeframe for production sales.

However, at the same time, this type of transaction involves higher production and transaction costs since it is a higher-quality-demanding market, requiring technical assistance most of the time and also needing to overcome institutional barriers – such as the fulfilment of contractual agreements – as well as becoming a formal business.²¹ In addition, risks are a constant threat in producing for this market, as the variety – Diacol Capiro – is particularly sensitive to climatic anomalies.

Some of the high quality requirements imposed by firms can be tested at the time of delivery and are set forth in detail in the contracts, they include sugar levels, percentages of dry material, pulp and peel colour, etc. These requirements are assessed by means of fry tests and raw tests applied to a random sample of the potato entering the industrial plant. If the producer is unable to meet these standards – not an infrequent occurrence – the producer's crop is rejected and the producer must absorb all losses.

Since the agro-industry potato market is not highly developed, and demand is extremely concentrated in a very few formal firms, growers prefer formal contractual arrangements than selling on the spot market (the probability of selling this type of potato on the spot market is minimal, and the profits are unattractive in comparison with sales to formal firms). However, higher institutional costs are associated with the contractual arrangements.

To sum up, we should underline that more dynamic markets (industrial potato chips and formal seed markets) have more complex institutional structures. As we have seen, seed markets could be potentially profitable but are still poorly developed. In the case of the potatoes going to agro-industry, this is also a highly profitable market for the small farms, however there are inefficiencies associated with contractual arrangements, since contracts are incomplete and market failures – like asymmetry of information – prevail. Under these circumstances marketing arrangements associated with dynamic markets are more costly for producers.

Using the theoretical framework discussed in the previous section, some of the inefficiencies derived from contractual arrangements which take place in the agroindustry market can be characterized thus:

- According to the **transaction cost theory**, the principal source of inefficiency is due to the existence of actions not subject to contractual provisions because of the incomplete nature of contracts. In the context of the Mantaro Valley and agro-industry arrangements, an incomplete contract is the one which is signed by the firm but does not place controls on its assessment of quality at the time of delivery, thus the margin of discretion that it leaves to the firm may be interpreted by producers as increasing risk, regardless of whether the feared rent seeking behaviour actually occurs. This threat becomes a part of the transaction cost that the producer needs to consider.

- On the otherhand, under the **incentives theory framework**, inefficiencies in the Mantaro Valley contractual arrangements may occur when supervision costs for the firm appear. Given that growers may face low short term penalties they may be inclined to shift to the spot market (which does not involve stringent quality standards) when prices in that market are advantageous. A producer's failure to fulfil such commitments increases the firm's co-ordination costs.

The fact that the firm rejects the product when it claims it is below its quality standards, may generate incentive problems, as the firm may have failed in designing an appropriate incentive scheme to encourage the producer to invest adequately in the production process. This also leads to an inefficient transaction.

4.1.4 Socio-economic characteristics of potato producers by market outlet

Having described the main characteristics associated with each market, we found important differences in our sample in terms of socio-economic characteristics of the producers targeting each market outlet. Access to more dynamic markets (whether formal seed or agro-industry markets) is limited to potato producers with more human, physical and social capital. This represents persistent barriers for poorer growers.

The household educational level is a variable that distinguishes between those who succeed in selling to more complex markets, and those who do not. The producers selling to the agro-industry have on average two more years of schooling than those selling their crop elsewhere. Also, their average land holding is also greater (double), as well as the average value of their productive assets. In addition their ex-ante financial position is more solid as their initial savings are three times the average among producers aiming for the traditional consumption market, and their line of credit is also larger by a factor of three.

Producers who reach dynamic markets also spend more, on average, for technical assistance. Most of the interviewed producers targeting the industry market stated that they had received technical assistance in the year before the survey, and a majority also stated that they had received training courses in that

period.

Finally it should be noted that there is a positive correlation between use of technical assistance and yield per hectare, though the study was not able to pinpoint evidence of differences in yield according to target market, since the potatoes aimed to the final consumption market includes multiple varieties.

Table 3: Characteristics of potato producers by market

Variable	Direct Consumption	Seed	Industrial
Sex of head of household (1 = male)	0.96	0.95	0.83***
Age of head of household	49.26	47.08	47.39
Average years of schooling of head of household	10.10	10.98	12.12***
Maximum school years reached by any household member	12.14	13.11**	13.68***
Average years of experience in potato production	17.10	17.09	18.44
Average years of experience in selling potatoes	14.41	14.48	11.85
Use of certified seed (1 = yes)	0.25	0.58***	0.76***
Total area of own land in hectares (ha)	1.87	5.70***	5.59***
Value of productive assets in median values (S/.)	4,442	13,668***	15,456***
Value of household assets in median values (S/.)	2,035	3,482***	3,092
Median value of farm stock (S/.)	4,114	5,445	9,404***
Total savings (S/.)	3,487	7,806***	11,511***
Maximum credit line received (S/.)	7,044	17,020***	21,988***
Number of organizations of which a member	1.38	1.52	2.29***
Index of risk by principal components	12.37	12.86	12.30
Received technical assistance in the last 12 months	0.18	0.45***	0.76***
Average spending on technical assistance (S/.)	15.16	21.03	146.20***
Attended some training course (1 = yes)	0.17	0.47***	0.80***
Use of certified seed (1 = yes)	0.25	0.58***	0.76***

Note: *** ** * Differences significant to 99%, 95% and 90% respectively
Source: Survey on Farm Services Markets. GRADE

Table 4: Matrix of principal aspects of marketing in geographical markets

Principal Aspects	Open SPOT Market		Contract Agriculture Processing plants
	Farm	Wholesale markets	
Product sold	Potato for consumption, seed, industry	Potato for consumption, seed	Potato for industry
Agent used	Producers, warehouse, merchants, corporate entities	Merchants, warehouse	Corporate entities
Prices	Prices volatile, follow price trends, wholesale markets	Price volatile and sensitive to supply and demand in La Parada wholesale market	Price premium for quality, and in some cases for uniformity (selection)
Receipts	No receipts, invoices, etc.	No receipts, invoices, etc.	Sales receipts required. Producers without RUC ID number sell through technical marketing assistance organizations (FOVIDA)
Transportation costs	Transportation cost indirectly charged to producer via price discount for logistical expenses	Transportation costs vary depending on locations. Partnering with producers could reduce cost	Cost of sending a sample for quality evaluation, as well as delivery to plant. Partnering with other producers for transportation could reduce costs.
Deterioration during transport	Producer not directly affected by deterioration in transport	Greater risk for producer, since deterioration equals lower quality and correspondingly lower price	Delivery for product is at plant. Seller (producer) is responsible for any deterioration. Contracts include clauses on healthiness of merchandise (which implicates transportation)
Contracts	No contracts or receipts for delivery signed	Parties do not sign contracts, but do make informal commitments before shipment	Contracts detail conditions such as delivery date, quantity, quality, price and date of payment
Problems with fulfilment of contracts		Fulfilment problems on both sides	Producers fail to fulfil contracts when potato is scarce, since spot market offers better prices.
Mode of payment	Cash on delivery most common mode	Payment may be in cash, but some merchants pay only when they have sold the product. Delays in payment by merchants	Payment within a period following submission of invoice

Source: Interviews with key informants. GRADE

4.2 Geographical markets

In order to explore, in more detail, the bottlenecks associated to potato marketing in the Mantaro Valley, we need also to look at the different points of sale. As we have mentioned transactions which happened under spot market arrangements can take place at the farmgate, wholesale markets and processing plants.²²

4.2.1 The farmgate

As opposed to contractual arrangements, selling at the farmgate involves no tax obligations (transactions are not recorded for tax purposes and taxes are not levied) or trade commitments (no contracts). Since the farm is an open market, there are no restrictions or barriers to sale of any particular type of potato. Commercial varieties are sold for direct consumption or for wholesale; agro-industry varieties and seed potato are all marketable, which is not true in the other markets, which demand specific types of potatoes for specific uses (such as the case of industrial processing plants or wholesale markets).

Our survey indicates that farm transactions are less onerous in terms of negotiation and monitoring costs (see table 2) – only 3% of producers reported signing a document on delivery of the produce. Informal marketing arrangements may be less complex than formal ones with transaction costs being lower because contracts are less frequently used and because no process of monitoring compliance is involved.

This complements the open-market negotiating mechanism. In farmgate 99% of producers receive payment in cash on delivery, while the least favourable arrangements involve at least a two-day waiting period. This reflects producers' preference for immediate liquidity over extending credit. However this kind of arrangement is limited by the price that the purchaser is willing to pay. Avoiding credit risk is also important, given minimal resources and the cost of obtaining financing.

Sale at the farmgate also has the advantage of being unaffected – at least directly – by deterioration during transport. When the buyer receives the product at a plant or in the marketplace, losses due quality deterioration occurring during transportation is typically assumed by the producer, a risk which is circumvented when delivery is made at the farmgate. It should be noted that in all types of sales arrangements the cost of transportation is typically borne entirely by the producer.²³

The perception of risk is an important factor in producers' decisions to sell to particular markets, since the producer faces factors beyond their control such as climatic shocks or unfavourable developments in the market. Thus it is not surprising that, according to the survey, more frequently than in the other markets, producers generally prefer to let others experiment first with new products (see table 5). The survey also showed that losses from theft in the marketplace, deterioration during transport, lack of familiarity with the market, and having product rejected for quality reasons are all incentives for the risk-averse producer to sell at the farmgate.

Due to the high risks and high transaction costs involved, is no surprise that growers feel more confident about selling at the farmgate than taking the merchandise to other markets, such as wholesale markets or processing plants. They run less risk of being stolen, and spend less for each sale – having no logistics costs. They are, however, likely to receive a lower price than they would in wholesale markets.

4.2.2 Wholesale markets

Wholesale markets trade commercial potato varieties mainly for direct consumption²⁴ and, to a lesser extent, for seed usage. The most important wholesale market in the area under study is located in Huancayo, the capital city of the region. However, the bulk of wholesale merchandise goes to 'La Parada' market,²⁵ located in Lima and the largest wholesale market in Peru. According to the statistics over incoming volumes, it averages 480 million tons annually (which represent 16% of the national production), principally from the highland regions (approximately 70%). Among these, Junín supplies 20% of the total incoming volume, from the Mantaro Valley.

An important feature of wholesale markets is that relations between producers and merchants are asymmetrical and essentially based on trust. According to our sample 77% of the growers, who sold in wholesale markets, pointed out that *trust* is a major issue in deciding the merchant to whom are going to sell. The trust is created mainly through social networks and is sustained by years of doing business with each other. The average number of years a merchant is known was the highest for this market (7.8 years) as opposed to 2.6 years knowing a buyer coming from a processor plant, thus trust in a merchant seems to be a prerequisite for producers deciding to sell to this market, where there are no formal agreements, and

22. The sample also gathered information on transactions occurring at local fairs, which represented the smallest volumes in the sample and the lowest average prices paid. However, given the small number of observations for these markets it was impossible to explore in more detail the marketing arrangements involved here.

23. Since the usual purchasers (whether intermediaries or wholesalers) subtract from the price paid all costs associated with transporting the merchandise.

24. The varieties most in demand in this market are Canchan, perricholi and Yungay, the former two principally by poultry retailers and supermarket firms that function as distributors.

25. La Parada is a wholesale market which basically sells potatoes for direct-consumption, and as the most important market, it represents approximately 80% of the total volume coming into Lima according to data generated at the city border checkpoint.

the merchant's dominant position creates a more risky and costly context for negotiation and monitoring than is the case of farmgate transactions.

Under asymmetrical conditions between the grower and the merchant, the wholesale market represents a risky place for producers to sell, since there are no formal agreements over the final price at the time of delivery. It could happen that the price paid is different from the price negotiated,²⁶ since prices are highly volatile – often changing substantially day to day.²⁷ This context could be extremely adverse for producers as they do not have alternatives in order to reject lower prices (having already made expenditure for transportation). Warehousing the product is theoretically an option, but it generates additional costs.

The cost of trading in this market is even higher for producers who want to enter it, but lack recommendations of merchants from friends or acquaintances. Such producers are highly vulnerable to the precarious conditions under which the physical market operates (theft being a particular threat); to the informality of transactions; and to the consequences of having little experience in the market.

Another problem that producers face is that the sale value ultimately assigned to merchandise is primarily a function of buyers' subjective assessment of quality – and differences in quality imply small differences in value (as the produce is unilaterally categorized as of first, second or third quality). Furthermore, the quality of the product that the merchant buys may have been subject to deterioration during transport, in contrast to situations where the product is delivered at the farmgate. Indeed, producers allocating their produce to this market outlet are the most affected by deterioration during transport, with 42% of respondents reporting losses on this account. At the same time, the survey found the greatest incidence of conflicts regarding quality for those allocating their produce in this market.

4.2.3 Processing Plants in agro-industry contractual arrangements

Contractual arrangements are the most attractive outlet for selling potatoes. However the grower connected to this market outlet has to overcome higher transportation costs, higher costs of negotiation and contract monitoring. In addition sellers to this market outlet are obliged to wait additional days to be paid in cash, which in turn increases transaction costs.

Related to the advantages of this market transaction outlet are the higher net prices paid (net of transportation), less problems of quality recognition (4% as opposed to 11% in wholesale markets) and less occurrence of grower's default. It is important to note that most of the growers selling through this market mentioned they trusted merchants (93%) while having the least average period of time knowing them (2.6 years).

Table 5: Transaction Characteristics

	Variables	Spot Potato Market		Contract Agriculture
		Farm	Wholesale markets	Agro-industry
Principal characteristics by market	Total volume sold by producer (t)	17.98	42.4***	49.0
	Average price (S/. x Kg)	0.42	0.46**	0.73***
	Net transportation price (S/. x Kg)	0.42	0.39	0.64***
	Transportation cost (S/. x Kg)	0.00	64.48***	89.02***
	Merchandise signed for (1 = yes)	0.04	0.38***	0.93***
Negotiation costs	Number of visits for negotiating	0.13	0.48***	0.45
	Number of hours spent negotiating	0.31	3.81***	0.83
Monitoring costs	Number of visits for negotiating	0.37	0.83**	0.95
	Monetary costs (S/.)	1.10	15.07***	21.64
	Cost in hours	0.17	2.78***	2.16
Marketing problems	Deterioration of merchandise in transport is a problem - important or very important (1 = yes)	0.03	0.39***	0.59
	Has had problems of non-fulfilment by merchant	0.03	0.02	0.04
	Producer failed to fulfil contract once	0.12	0.09	0.00
	Conflict because quality not recognized	0.07	0.11	0.04
Relationships of trust	Trust in the merchant to whom selling (1 = yes)	0.54	0.77**	0.93*
	Level of trust in merchant (7 = total trust)	5.13	5.63**	6.40**
	Average years merchant known	4.99	7.89**	2.59***
Availability of liquidity	Cash payment (1 = yes)	0.99	0.95*	0.59***
	Average days taken to pay	0.65	5.54	17.52

Note: *** ** * Differences significant to 99%, 95% and 90% respectively

Source: Survey on Farm Services Markets. GRADE

5. DETERMINANTS OF ACCESS TO DYNAMIC MARKETS: METHODOLOGY AND EMPIRICAL EVIDENCE

The methodology chosen for the initial phase of this study is the strategy proposed by Williamson (1979), which circumvents the need to directly evaluate the transaction costs associated with different marketing arrangements. The methodology requires reformulating the arguments of the transaction cost theory regarding the effects of certain observable attributes on the costs of carrying out transactions in different markets.

More formally, if an agent is choosing between two transactions (T1 and T2) in search of the one that renders lower transaction costs (CT), we may state that the observe transactions follows:

$$T^* = T^1 \text{ if } CT^1 \leq CT^2 \\ = T^2, \text{ if } CT^1 > CT^2 \quad (1)$$

where CT1 and CT2 are the transaction costs involved in these two transaction arrangements. Although CT1 and CT2 are not directly observable, we may derive them from the observable characteristics reflected in the vector X, as an expression of the attributes of or constraints facing the individuals. If we assume that there is a linear relationship between transaction costs and the vector of the parameters associated with certain inherent attributes of the producer:

$$CT^1 = \beta_1 X + \varepsilon_1 \quad (2)$$

$$CT^2 = \beta_2 X + \varepsilon_2$$

26. For price formation in wholesale markets, and its relationship with prices on the farm, see Escobal (1997).

27. Potato prices are formed daily in the wholesale market as a function of the quantity that has come to the market and the quality demanded. Given changing price conditions in the market, producers may receive prices less than those initially agreed on or expected. This makes producers vulnerable, since by the time of the transaction they have already incurred transportation expenses.

Translating equation (2) into probabilistic terms, we state the probability of observing transaction 1 as follows:

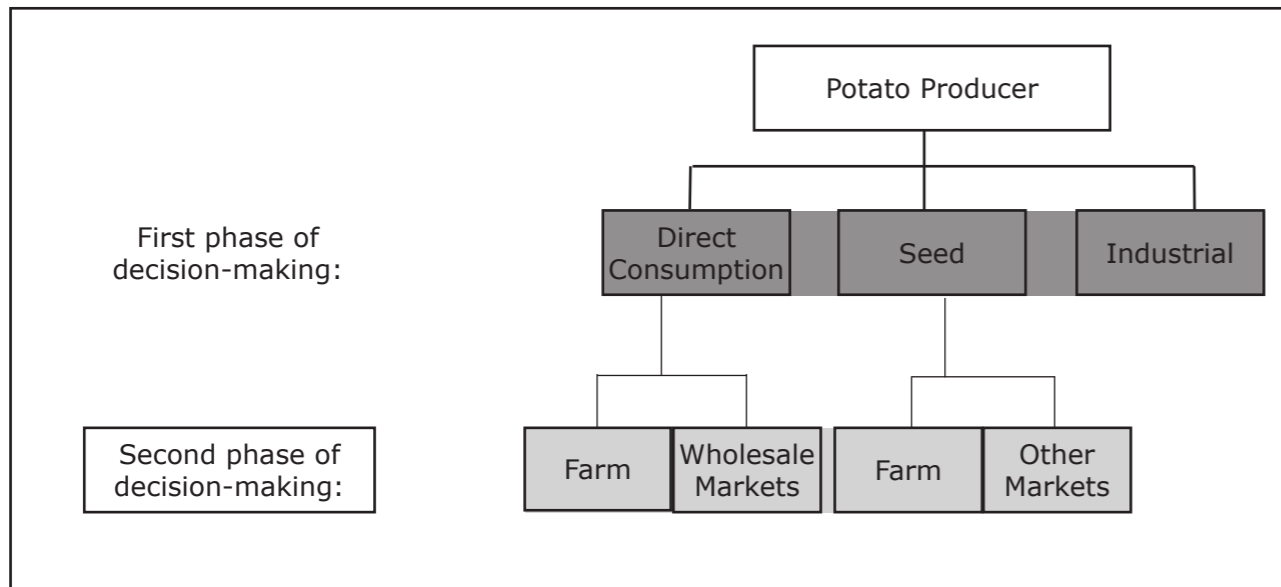
$$Prob(CT^1 < CT^2) = Prob(e_1 - e_2 < (\beta_2 - \beta_1)X) \quad (3)$$

This conceptual strategy provides a basis for the theoretical construct that we use to evaluate a potato producer's decision to participate in a given market because of its lower transaction costs. We employ the approaches set forth in section 2, considering the various possible markets outlets in the area.

The evaluation takes account of all the costs that a producer would hypothetically face if selling to a market other than that in which he actually sold, costs that are understood to be quite significant. We quantify transaction cost as the producer's distance from the market stated as a probability.

5.1 Modelling sales decisions

One way of studying growers' sales decisions is to follow decision-making as a strategy executed, in steps, over time. This process can be modelled as a hierarchical structure in which the first step is a decision to produce a particular type of potato (for direct consumption, seed, or industrial use), and the second (if the decision is to aim for the final consumption market) involves the subsequent decision regarding to which market to sell when direct-consumption product is involved (wholesale market, farm, local market, etc.). Our assessment assumes an underlying relationship between a geographical market and the decision to participate in a product market, when open-market arrangements are involved.



Our sequential model takes the following mathematical form:

$$Prob [Y_{i2} = 1 | X_{i1}, X_{i2}] = \frac{e^{X'_{i2}\beta + \gamma E[Y_{i1} | X'_{i1}]}}{1 + e^{X'_{i2}\beta + \gamma E[Y_{i1} | X'_{i1}]}}$$

where X_{i1} is the vector of explanatory variables for the attributes of the household, taking into account demographics (age of head of household and family labour supply), education (years of schooling completed by head of household and other household members), assets (title to land, amount of land owned, index of land fragmentation), risk (degree of risk aversion, on a principal component basis), access to credit (grower's credit line for credit), organization (number of organizations in which the household participates).

We also considered variables associated with accessibility of the household: the altitude of the location, distance to the centre of the city of Huancayo and type of access to the land. Since technological processes for some types of potatoes, such as industrial and seed, are highly dependent on agronomical and climatic conditions, we incorporated variables representing access to irrigation (since the area studied is an Andean valley), and the effect that negative agronomical factors (salinity of land, permeability to water, steepness, etc.) have on decisions about participating in a market where quality demands are stringent.

X_{i2} is the vector of variables incorporating information on the characteristics of the spot market transactions and on those household characteristics that will be assessed during a second phase of the study in order to identify preferences for one or another spot market, as well as barriers or bottlenecks in access to wholesale markets (which move the greatest volume and allow for the largest income) within the market segment that does not involve formal sales contracts.

Table 6 lists the variables used for the two different phases of the modelling exercise.

Table 6: Variables to consider in estimating sales decisions according to the potato market

	Name of variable	Mean	S.D.	Min	Max	Description
Phase 1	riego2	0.5	0.5	0.0	1.0	irrigated plot(1 if it has irrigated plot, 0 if it rained)
	desvagro2	0.2	0.4	0.0	1.0	plot with agronomic problems (1 = yes)
	at_med	2.1	1.7	0.0	10.0	number of suppliers (median) of technical assistance in area
	Name of variable	Mean	S.D.	Min	Max	Description
Phase 2	Comerc	0.7	0.5	0.0	1.0	years knowing merchant to whom sells
	pdeter	0.2	0.4	0.0	1.0	perception of deterioration during transport (1 = important or very important, 0 = other case)
	seglim	16,645	1,699	13,683	24,868	distance to Lima (minutes)
	Name of variable	Mean	S.D.	Min	Max	Description
Both phases	Household characteristics					
	educjefe	11	4	0	17	years of schooling, head of household
	educresto	29	19	0	86	years of schooling, rest of household
	olabfem	1.4	0	0	5	number of household female members who are day labourers
	olabmasc	1.8	1	0	6	Number of household male members who are day labourers
	lcredito	12,744	20,707	100	230,000	maximum credit line received
	risgcp	12.5	2.3	5.1	14.9	index of risk by main components, lesser values = greater risk aversion
	Production variables					
	nvaried	2.1	1.0	1.0	6.0	number of potato varieties producer ordinarily plants
	Assets					
	titparc	0.1	0.3	0.0	1.0	PETT title (1 = has title, 0 = does not have title)
	valstopec02	5,542	8,653	0	90,900	Value of farm stock as of 2002
	halpropia	3.7	6.6	0.0	50.0	area of own land plot
	ifrag2	0.5	0.3	0.0	0.9	land fragmentation index (1 = greatest fragmentation, 0 = no fragmentation)
organiza	1.6	1.4	0.0	7.0	number of organizations of which is a member	
Access						
altitud1	3,420	141	3,241	3,768	altitude of dwelling	
tamd	17,169	36,308	880	140,000	size of district (population)	
seghuan	3,922	1,667	867	12,004	distance to Huancayo (minutes)	

A multinomial logit model was estimated for three decision categories in the first phase, assuming independence of irrelevant alternatives.²⁸ Since after making this decision producers who decide to sell in the final consumption markets face different spot market options – such as farm, wholesale, local markets, etc. – understanding that the most complex but profitable contractual arrangements lie in wholesale markets, and given the small number of observations of sales in local markets, a decision logit for wholesale markets versus farm sales of consumption potatoes was conducted in a second phase.

Note that our estimates continue to assume that the grower has considered whether to deal in a particular market, and has decided to do so. Hence, the analysis will centre on the different barriers involved in marketing arrangements in different markets, assuming that the producers in the sample are already a part of the market, having carried out at least one transaction in some market. The decisions considered will be between dynamic, more profitable markets and more traditional options.

5.2 Estimating the multinomial logit model (first phase)

In this case, the model to be estimated represents the choice of a products-market in which to sell, which in turn leads to a decision on what type of contractual arrangement should be employed. In this decision-making phase, there are three categories to choose from: the potato market for direct consumption, the seed market and the industrial market. Considering selling potato for direct consumption as the base category, ($j=0$), we estimate the probability that a producer will decide to enter into the seed or industrial market, instead of just selling to the direct consumption market. The probability for producer i is as follows:

$$Prob_{ij} = \frac{e^{\sum_{k=1}^K \beta_{jk} X_k}}{1 + \sum_{j=1}^2 \frac{e^{\sum_{k=1}^K \beta_{jk} X_k}}}{(4)}$$

Where:

i = individual I ;

j = 0,1, 2 potato markets;

β = parameter that will have $J-1$ estimates

X_k = K explanatory variables.

Our estimates show that the overall adjustment of the model is reasonably good. The chi-square test rejects the null hypothesis that the model without the inclusion of the explanatory variables is adequate at a level of significance of less than 1%.

The results indicate that, on one hand, the probability of dealing in a market with formal and complex contractual arrangements increases when there is a greater number of technical assistance providers in the area (at_med), as well as when the head of household's education level is higher ($educjefe$), and to the extent that the household belongs to a greater number of organizations ($organizac$). The effect of owning or having title to land has a noticeable effect on the probability of deciding to sell in the industrial market, since this type of asset is a precondition for making specific investments, and in the second case it also plays an important role as collateral for credit, and for eligibility to programmes such as FOVIDA. It would seem that the eligibility effect reflected in this variable is stronger, given that the credit variable ratio (odds) does not help to distinguish between the preference for the industrial and preference for the final consumption market, though it is significant. A variable that fails to explain outlet decisions is the distance to Huancayo. Although the variable is statistically significant it does not provide information on whether a decision to sell to the industrial market becomes more likely for those that are near Huancayo.

On the other hand, the effect of the risk-aversion variable is unclear, since this market is considered risky, as the variety involved is climate-sensitive and requires more water, and unfavourable conditions will produce an inferior product. However, some producers consider it a safe market, since it offers higher prices, formally guaranteed in advance.

Land-fragmentation is negatively correlated with the decision to produce processed potatoes. Thus having dispersed land creates higher cost in terms of time or supervision and cultivation as well as transportation and warehousing. Thus, the producer whose land is more dispersed is less likely to sell product for complex processing, or to markets that involve more complex production and marketing.

Factors involved in the decision to sell in the seed market include variables such as risk aversion and the number of varieties the grower normally plants. The former shows that greater risk tolerance is

28. Multinomial models estimated assume that selection between alternatives is not related to the markets in question, under the assumption of the independence of irrelevant alternatives, which stated that the selection is independent of the remaining existing alternatives (i.e. the other alternatives are irrelevant). Under this assumption adding or eliminating the other market outlets should change neither the decision nor the co-efficients.

correlated with deciding to participate in this market, where there is competition from informal producers who offer the product at almost predatory prices. Having a number of seed varieties is important, since it permits a producer to diversify risk, given that different varieties are in demand at different periods as a function of price and supply at any given time.

We found evidence that for the seed growers producer-group, who invested in order to produce a desirable product for the seed market, having a good location to grow the crop is a decisive factor. Thus higher places will be relevant to this market, since low temperatures minimize disease for the crop and the seed.

Another interesting finding is the relation between risk perception and the age of the producer in the likelihood of entering into more complex markets. It seems to be that the greater the age of the head of household ($edadjef$), the more likely they are to be reluctant to enter this complex market; the difference in probability in comparison with younger growers is significant. However, having productive assets such as land ownership allows a producer to make the investments needed to participate in this market. Thus, those enjoying such benefits are more likely to participate than those who do not own their own land.

We also find proximity to the centre of the departmental capital to be a significant variable, since it permits access to various factors and services that are available only there. However, this also seems to be important for growing consumption crops.

Table 7: Results

Multinomial logit of decision to sell in potato markets

Variable	RRR	Coef.	StdErr	z	P> z
Seed					
riego2	0.36	-1.01	0.49	-2.04	0.04
at_med	1.26	0.23	0.20	1.17	0.24
desvagro2	0.78	-0.25	0.41	-0.61	0.55
altitud1	1.00	0.00	0.00	1.70	0.09
edadjef	0.96	-0.04	0.02	-2.42	0.02
educjefe	0.98	-0.02	0.05	-0.29	0.77
educresto	0.99	-0.01	0.02	-0.66	0.51
olabmasc	1.16	0.15	0.28	0.53	0.60
olabfem	1.13	0.12	0.29	0.42	0.67
organizac	1.15	0.14	0.16	0.90	0.37
nvaried	1.45	0.37	0.19	2.00	0.05
ifrag2	0.80	-0.23	1.18	-0.19	0.85
titparc	0.47	-0.76	0.50	-1.52	0.13
hapropia	1.18	0.17	0.05	3.21	0.00
risgcp	1.15	0.14	0.08	1.79	0.07
seghuan	1.00	0.00	0.00	3.14	0.00
Industrial					
lcredito	1.00	0.00	0.00	0.23	0.82
_cons		-12.91	6.30	-2.05	0.04
riego2	3.65	1.29	0.82	1.58	0.11
at_med	1.72	0.54	0.23	2.37	0.02
desvagro2	2.35	0.85	0.56	1.52	0.13
altitud1	1.00	0.00	0.00	1.09	0.27
edadjef	0.98	-0.02	0.02	-1.16	0.24
educjefe	1.14	0.13	0.07	1.72	0.09
educresto	0.93	-0.04	0.02	-1.63	0.10
olabmasc	1.14	0.13	0.39	0.33	0.74
olabfem	2.34	0.85	0.41	2.07	0.04
organizac	1.77	0.57	0.19	2.96	0.00
nvaried	1.06	0.06	0.25	0.24	0.81
ifrag2	0.01	-4.85	1.37	-3.55	0.00
titparc	7.20	1.97	0.57	3.47	0.00
hapropia	1.05	0.05	0.06	0.89	0.38
risgcp	0.95	-0.05	0.11	-0.48	0.63
seghuan	1.00	0.00	0.00	4.23	0.00
lcredito	1.00	0.00	0.00	-3.27	0.00
_cons		-14.00	11.98	-1.17	0.24

Baseline category:	Consumption potato
Number of observations:	289
LR chi2 (34)	183.25
Prob > chi 2	0.00
Pseudo R2	0.35

To further understand the relationships between the variables, we have graphed the relation between the probability of a producer's access to the market and the odds for each variable. The markets (represented by their initial letters) appear in the trajectory for each explanatory variable. We chose the direct consumption category as our baseline. An increment of one standard deviation point in each explanatory variable shows the effects on the different categories.

The letters at the right side of the baseline category are most likely to occur with increments in the explanatory variables, while the letters at the left have less probability of occurring.

The distance between two categories, in this case represented by letters – seed (S), Consumption (C) and Industry (I) – indicates the magnitude a variable's effect on the probability of entering a dynamic market. For example, in terms of distance, a higher index of fragmentation (ifrag2) makes a producer's probability of entering the industrial market less than one quarter the probability of his entering the seed market. On the other hand, more secure title to land makes a producer's probability of entering the industrial market more than four times the probability of a producer's entering the seed market.

We see that an improvement (decrease) in the explanatory variable land fragmentation may have greater impact than improvements in such variables as head of household's age, other household members' educational level, altitude, distance from the departmental capital, and line of credit, for which the categories are rather close.

Figure 6

I. Results for human and social capital variables

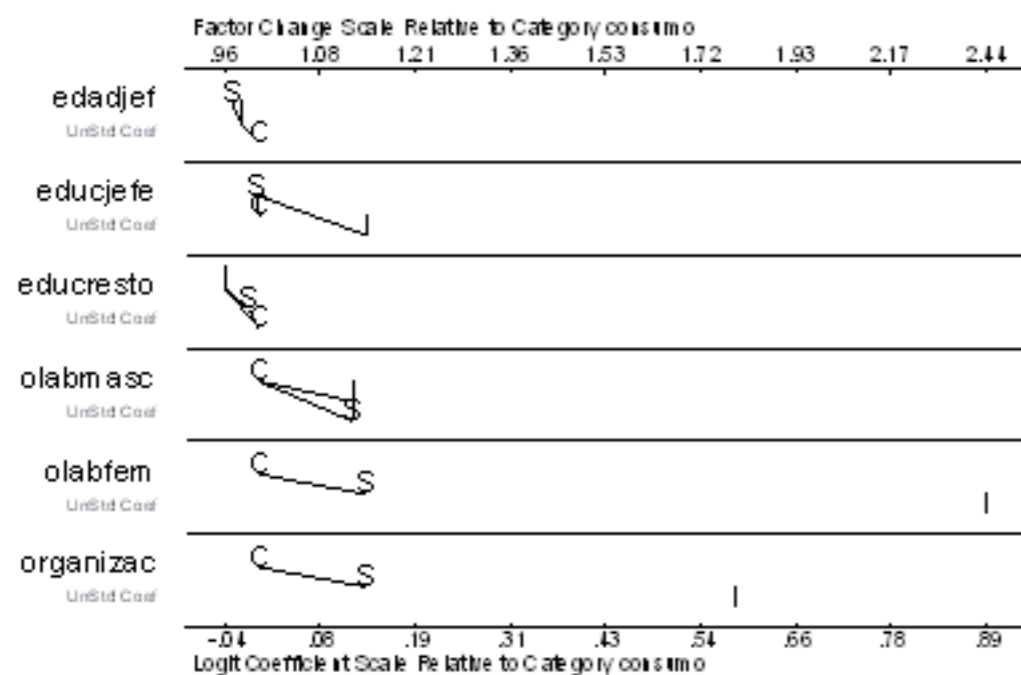


Figure 7

II. Results for agronomic and access variables

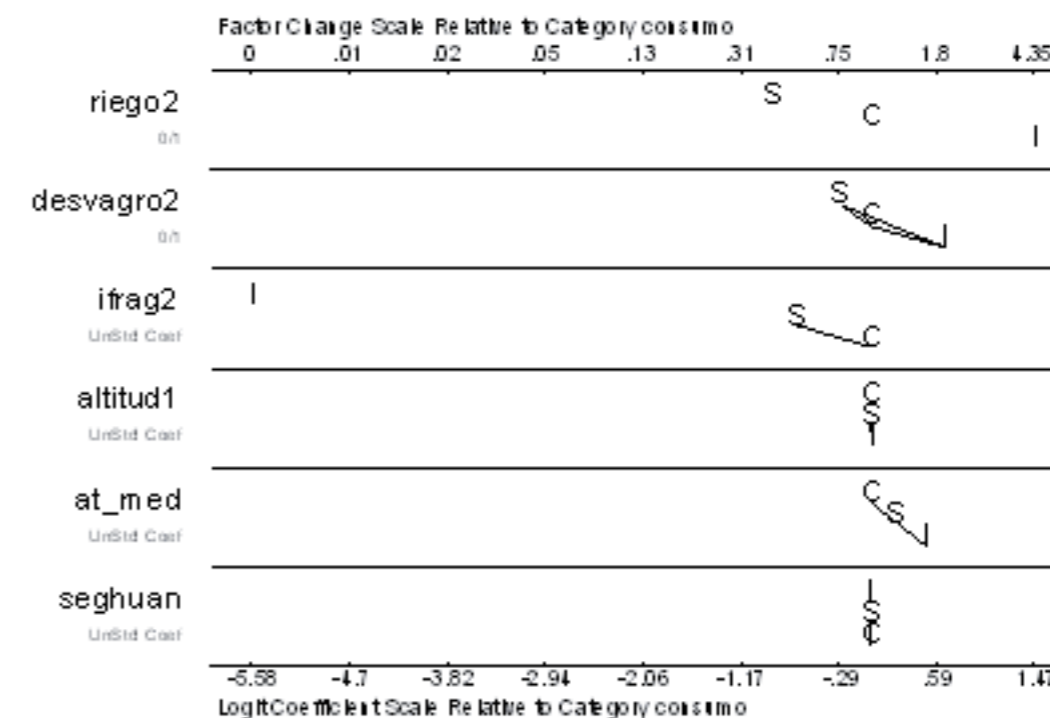
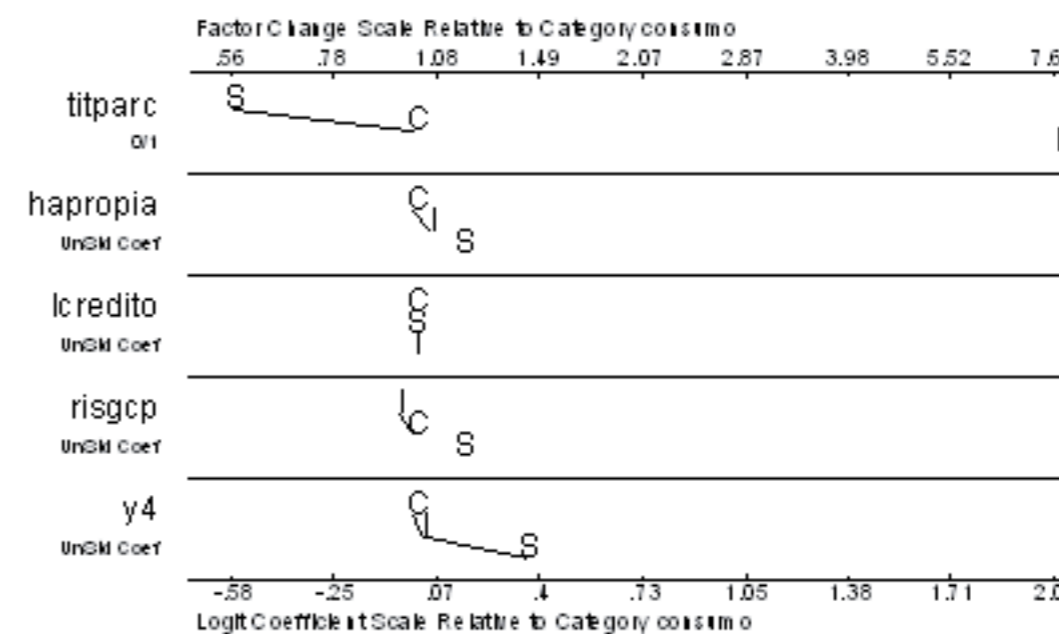


Figure 8

III. Results for land ownership and risk variables



5.3 Estimating the logit model (second stage)

In this second stage, we evaluate the probability of participation in the wholesale market using a logit specification. Here we are interested in identifying those transaction costs characteristics negatively correlated with the probability of participating in this market.

The probability follows a logistic distribution function expressed by:

$$P_i = P(Y_i = 1) = F(x'\beta) = \frac{e^{x_i\beta}}{1+e^{x_i\beta}}$$

$$P_i = P_i + u$$

Some variables that are significant in the first stage are not significant in the second, which tends to corroborate the idea that the decision-making phases are associated with different times and are independent. There is evidence showing that variables such as number of varieties cultivated and distance from region's capital are not significant at the second stage, unlike the first.

Table 8: Results of sales decision logit estimation in wholesale consumption markets

Variable	dy/dx	Coef.	Std Err.	z	P>z	[95% Conf. Interval]	
Years wholesaler know	20%	0.864	0.153	5.650	0.000	0.564	1.163
Median value of perceived deterioration	-19%	-0.840	0.291	-2.890	0.004	-1.411	-0.270
Years selling potatoes	1%	0.056	0.029	1.940	0.052	-0.001	0.113
Head of household's years of schooling	16%	0.713	0.405	1.760	0.078	-0.080	1.506
Head of household's years of schooling squared	-1%	-0.039	0.022	-1.820	0.069	-0.082	0.003
Inverse of mills ratio (2)	-4%	-0.167	0.178	-0.940	0.349	-0.516	0.182
Inverse of mills ratio (3)	-1%	-0.057	0.088	-0.650	0.518	-0.228	0.115
Risk aversion index	3%	0.143	0.136	0.136	1.060	-0.122	0.409
Number of varieties planted	7%	0.316	0.345	0.920	0.360	-0.361	0.993
Distance in minutes to centre of Huancayo	0%	0.000	0.000	0.260	0.794	-0.001	0.001
Distance in minutes to centre of Lima	0%	0.000	0.000	-0.650	0.516	-0.001	0.000
Area of own land	-4%	-0.181	0.195	-0.930	0.351	-0.563	0.200
_cons		-3.937	3.818	-1.030	0.303	-11.419	3.546
Number of observations			184				
LR chi2 (15)			141.63				
Prob > chi2			0.00				
Pseudo R2			0.61				

The number of years the producer has known the wholesaler is significant, however, increasing the producer's probability of moving into this market by approximately 20%. Median perceived deterioration is a variable that measures the deterioration of the producer's merchandise in transport to all the markets in which he has sold. This latter factor provides an indication of the effect that the producer's connection with wholesalers has on his selection of markets; if his connections are poor, he will not risk selling in a market where his revenue will depend on the market's assessment of his produce's quality (as firsts, seconds, or thirds).

The educational level of the head of household is also an important variable. Though the most skilful producers may be expected to succeed in entering this market, skill may be correlated with educational level, which increases the probability of participating in this market, though at decreasing rates.

6. CONCLUSIONS AND POLICY IMPLICATIONS

This study shows clearly that there is a group of small producers capable of making strategic investments to gain access to dynamic markets where their produce is more profitable. We have also shown that these producers are capable of establishing more complex contractual arrangements with potential purchasers. We have also documented that the access to these dynamic markets depends on their undertaking of institutional and technological innovations.

The research shows what factors are most relevant to small agricultural producers' decisions to enter 'dynamic' markets, i.e., markets that can absorb increasing quantities of crop. There is a segment of producers whose 'distance' from these markets is not so significant as to make their entry into them implausible. However, their degree of organization, educational level and training, and access to credit are constraints on their enjoying the additional benefits that the markets offer.

Table 8 summarizes these indicators according to the results of a simulation based on the estimates made in the previous chapter. Here we see how the probability of gaining access to a dynamic market increases for those who overcome certain bottlenecks. Interestingly, the simulation suggests that no single bottleneck seems to explain producers' inability to enter these dynamic markets. Rather, more than one bottleneck must apparently be solved in order to enjoy the benefits of dynamic potato markets.

Describing the transactions that small producers carry out in these markets, the study suggests that when producers move into more distant markets, they establish more complex marketing arrangements – arrangements that are likely to be more impersonal and subject to greater transaction costs.

The relationship between small-scale agriculture and agro-industry

Failures of the market are common in rural Peru, due to problems such as deficient infrastructure, market segmentation, problems in fulfilling contracts, imperfect information, and high risk or uncertainty in terms of the State's fulfilment of its regulatory role. In this context, it is unrealistic to expect agroindustry

itself to succeed in bringing small growers into product markets. A non-competitive market situation and lack of private initiative may be a rationale for intervention by the government and/or NGOs, but such intervention should be approached cautiously, so as to avoid magnifying existing problems and delaying – or, worse yet, impeding – the development of efficient and competitive markets.

As we have mentioned, relationships between small producers and the dynamic markets identified in this study have in all cases been mediated by an NGO. Where thin markets are predominant, NGOs may provide the 'social capital' needed to successfully link small producers who face high marketing and transaction costs with processors and agro-industry firms facing high levels of uncertainty and supervisory costs. In such environments, NGOs can provide information on access to the market through their networks of contacts. They can also reduce the transaction costs associated with negotiating contracts, and help build trust on both sides of a transaction. Furthermore, they can help develop a capacity for collective action by small and dispersed producers.

Table 9: How close are small producers to more dynamic markets? (Marginal contribution to estimated probability)

	Primary incomplete	Secondary & higher	Difference	Significance
1. By head of household's education level	0.04	0.08	0.04**	0.04
	Tercile I (up to 1 hectare)	Tercile III (<=2.5 hectares)		
2. By size of (own) land parcel	0.06	0.10	0.04**	0.01
	Tercile of most fragmentation	Tercile of least fragmentation		
3. Fragmentation of land	0.07	0.10	0.03*	0.07
	Most averse tercile	Least averse tercile		
4. Aversion to risk	0.05	0.07	0.02	0.28
	None	1 or more organizations		
5. Membership in organizations --- 3 or more	0.04	0.08 0.12	0.05*** 0.08***	0.00 0.00
	Tercile I (up to S/. 4,500)	Tercile III (S/. 9,500 or more)		
6. By credit line	0.04	0.13	0.08***	0.00
	Extremely poor	Not poor		
7. By monetary poverty --- Not extreme poverty	0.05 0.05	0.11 0.08	0.06*** 0.03**	0.00 0.04
	At least 1 UBN	No UBNs		
8. Poverty as measured by UBNs	0.06	0.11	0.06***	0.00

Source: Simulations based on estimates made in this study

How successful has the intervention of the NGOs been? The evidence shows that average net income per hectare is much higher for growers who have been able to connect with dynamic markets than for those who have continued selling in traditional markets. This finding is strong, even when with controls for differences in individual assets between the two groups (e.g., education and amount of land).

A number of mechanisms come into play when an NGO functions as an intermediary between agro-industry and a small producer to help producers gain access to the sort of additional benefits described here. As Johnson et al. (2002) mention, organizations use their information networks to identify and contact clients, to gain access to market information and inputs, and to obtain financial and technical assistance. FOVIDA, for instance, uses its information network effectively to help small potato producers gain access to new opportunities in dynamic markets.

The role of the NGOs in facilitating relationships between small producers and dynamic markets is evident in various activities, which, following Johnson et al. (2002) may be summarized as: (a) using information networks, (b) building trust, and (c) building capacity for collective action.

a) Information networks

FOVIDA is a case of an organization that has been able to use its network of producers on the coast (which FOVIDA developed before beginning to work in the mountains) to identify suppliers of Capiro seed for the mountain areas. Like other NGOs, FOVIDA has used its familiarity with inputs markets to reduce transaction costs for small producers. It has also provided technical and financial assistance. As regards the latter, the NGOs do not themselves provide credit to small producers, but use their influence and capacity to help groups of small producers gain access to credit.

b) Trust-building

NGOs such as FOVIDA have been able to build social capital in the form of trust by assuming supervision costs that the processing industry would have borne to monitor fulfilment of contracts, and by managing emergencies that arise. Rapid response to emerging problems has had a positive impact on the quality of merchandise delivered to the processing plant. As the industry sees product meeting quality standards, trust builds and solidifies. In the case of FOVIDA, increasing trust has progressively affected the industrial partner's behaviour, and FOVIDA's importance as a supplier to the firm has increased, further consolidating its relationship with the firm.

c) Capacity for collective action

NGOs have organized small producers to act collectively as a way of obtaining economies of scale in the inputs and products market. Joint marketing and input purchasing, collective quests for financing, and collective purchasing of auxiliary services such as technical assistance are all major factors, and have tangible benefits in terms of lower-cost inputs and higher profit margins.

Pending issues

Although NGOs have succeeded in providing solutions for a number of failures of the market, critical problems remain to be solved.

One of these in the potato market is the absence of a developed formal seed market. Given the characteristics of the product and the seed varieties used, the private sector is unlikely to get involved in developing, reproducing and selling certified seed. This could change if a vendor developed an adequate reputation for quality and reliability, and could thus charge a higher price and/or take advantage of lower unit costs as it gained a significant share of this market. For such a scenario to play out, however, a seed-certification system must be developed. Inappropriate regulation in the seed market – amply documented by Tripp and Gisselquist (1996) among others – has taken a toll in terms of less competition, greater costs for producers (partially covered by subsidies, which, however, are unsustainable) and limited access to inputs that could strongly boost agricultural productivity. Inadequate regulation can also generate high costs by failing to control such factors as negative externalities (e.g., introduction of exotic pests) and lack of information. Thus, it is essential that there be a proper balance of regulatory activity, avoiding both under- and over-regulation, and to achieve it, the State must have a clear concept of its role. On one hand, it must ensure public goods that facilitate efficient seed production and marketing. On the other, it must develop a flexible regulatory framework that takes account of the heterogeneity of the seed market.

To develop seed production and marketing, the State must finance (not itself conduct) research and development of seed and seedling varieties that are of special value to small producers because they reduce risks in the production process by virtue of their resistance to specific pests, drought, early germination, etc. Opening research projects to proposals and bids from the private sector (universities, of course, included) has proven an effective approach in many countries. As far as regulation is concerned, it is indispensable that regulation by the State be separated from research and development activities. For instance, the State could encourage the creation of private seed-certification organizations that would be officially accredited upon meeting specific standards, and that would remain subject to supervision by a regulatory agency.

There are critical public goods and services issues that affect potato producers' opportunity to connect with dynamic markets. One is credit, where the government is pressured to replace the private sector, rather than deal with the underlying problem of an undeveloped credit market. Here, a microfinance scheme, supplemented by a second-storey bank to manage the risk inherent in local credit entities that absorb covariate risk, is an alternative worth exploring.

Research and technology-transfer policy is another example of the current lack of direction in government. Obviously, this area generates public goods and services that the private sector has little interest in developing. However, public spending has been minimal, dispersed, and totally lacking in consistency.

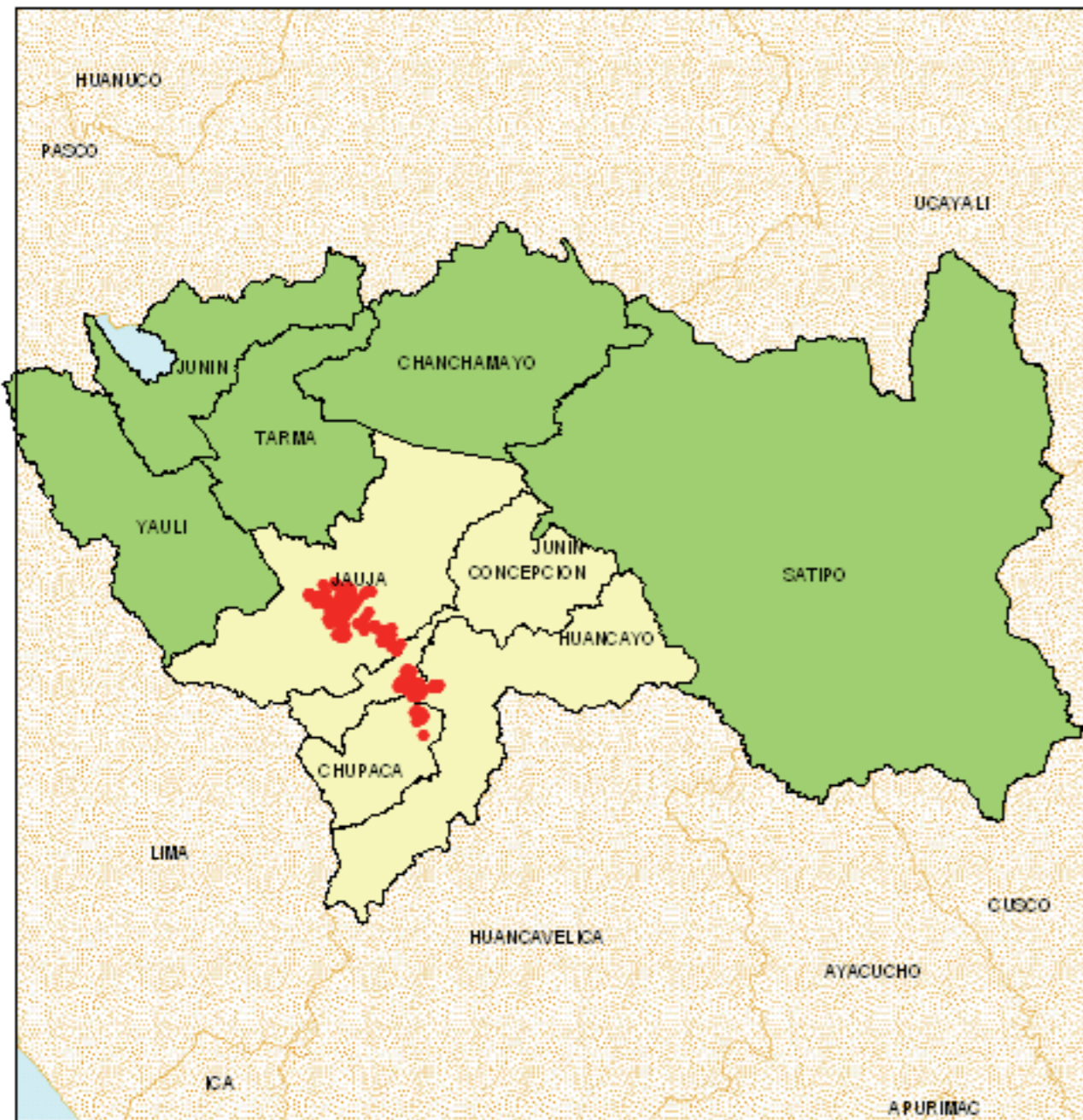
Furthermore, the issue of public spending here continues to be confused with direct execution of such spending by governmental entities. This is an exemplary area for the public sector to call for bids from the private sector (again, universities must be included) for high-priority research and technology-transfer projects. A public-sector unit should be in place to monitor such programmes.

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ANNEX I
Map of the Study Area



ANNEX II
Distribution of the sample

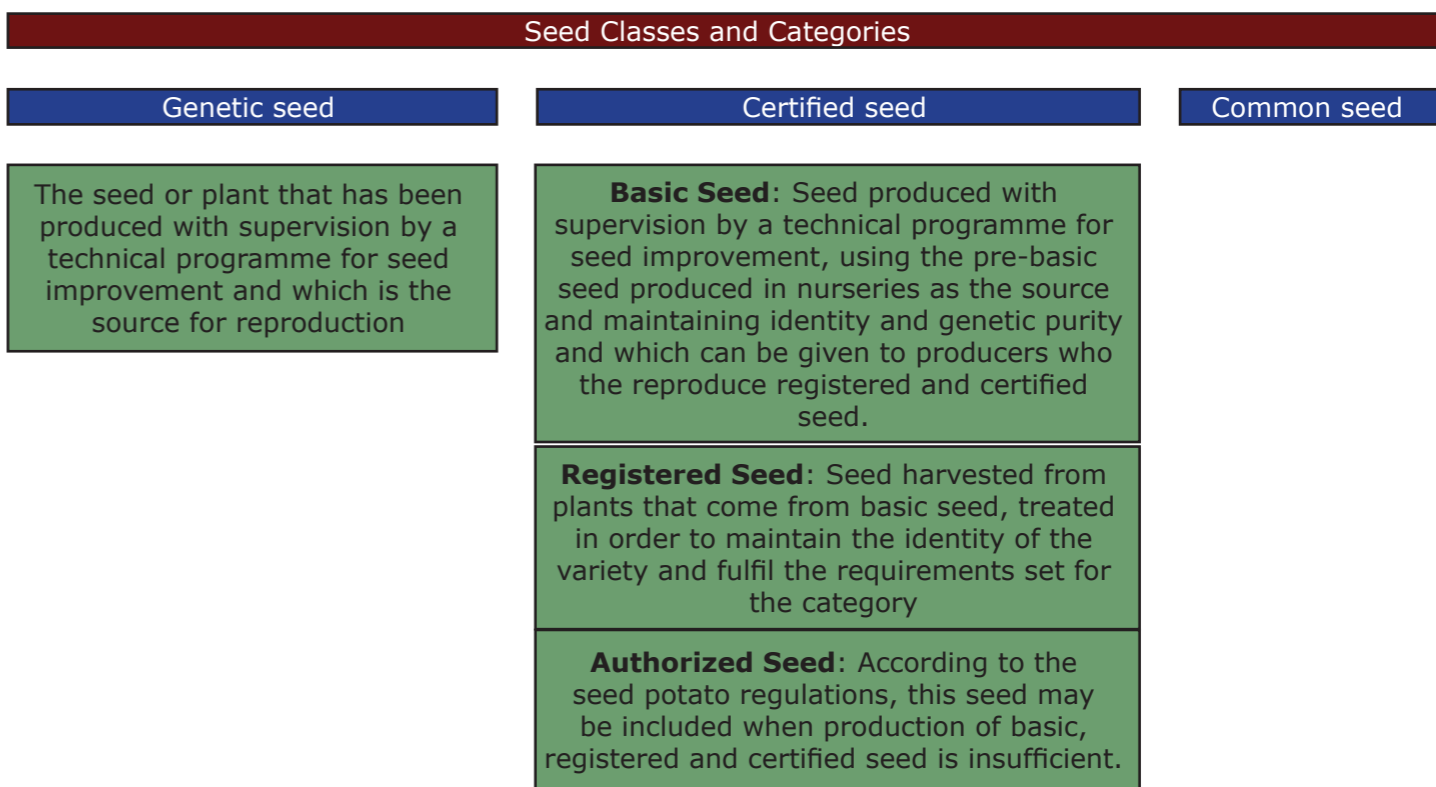
The distribution of the sample over the markets in question shows a large proportion of producers selling processed potato outside the contractual scheme, possibly due to rejection by the processing plant. The distribution of this produce by market venue is: farm, 64%; wholesale markets, 23%. Most producers of consumption product sold on the farm (51%).

Table: Sample distribution according to products markets and geographical markets

Geographical Markets	Products Markets		
	Consumption	Seed	Industrial
Farm	51%	64%	29%
Local Markets	7%		2%
Wholesale Markets	33%	23%	5%
Industrial Plants			61%
Other Markets	10%	13%	2%

Source: Survey on Famr Services Markets. GRADE.

ANNEX III
Notes on seed classes and categories



Note: the clasification foes not include the pre-basic seed, which is produced in nurseries from in-vitro seedings obtained from tissue culture laboratories following a virus-cleaning process.

ANNEX IV

Production Cost by Market Outlet (S/. x ha)

Activities	Consumption (Canchan variety) 1/	Industrial (Caporo variety) 2/
	Total (S/.)	Total (S/.)
1. Land Preparation	60.00	574.00
2. Sowing	315.00	2,186.00
3. Other Cropping Activities	615.00	698.00
4. Inputs	4,202.28	3,540.00
5. Harvest Activities	812.00	1,510.00
6. Transport and Other Services*	600.42	1,900.00
TOTAL CROP COSTS	6,604.70	10,408.00

Note: *Including technical assistance and administrative costs

Source: 1. Ministry of Agriculture - Regional Office for Agricultural Promotion, Concepción.
2. FOVIDA