Research Article

The Impacts of the Use of Mobile Telephone Technology on the Productivity of Micro- and Small Enterprises: An Exploratory Study into the Carpentry and Cabinet-Making Sector in Villa El Salvador

Roxana Barrantes Cáceres
roxbarrantes@iep.org.pe
Senior Researcher and
General Director
Institute of Peruvian Studies
694 Horacio Urteaga
Lima 11
Peru
and
Professor
Department of Economics
Pontifical Catholic University
of Peru
1801 Av. Universitaria
San Miguel
Lima 32
Peru

Aileen Agüero
aileen.aguero@gmail.com
Researcher
Institute of Peruvian Studies
694 Horacio Urteaga
Lima 11
Peru

Martín Cavero
mcavero@iep.org.pe
Researcher
Institute of Peruvian Studies
694 Horacio Urteaga
Lima 11
Peru

Abstract

As the mobile telephone becomes universally available in developing countries, the impacts of this technology have been documented in various publications. However, a review conducted by Donner and Escobari (2010) shows that there has been a lack of research into micro- and small enterprises (MSEs). This exploratory research aims to contribute to filling this gap by presenting a qualitative case study of the impacts of mobile telephone use on microenterprises in the carpentry and cabinet-making sector in a poor neighborhood of Lima. Inspired by the Cluster Theory, the study demonstrates that: 1) the carpentry and cabinet-making sector in Villa El Salvador (VES) is mainly made up of a concentration of microenterprises and not an agglomeration; 2) the benefits of mobile telephone use are most evident in marketing and client relations, not in production; and 3) mobile telephone use is integrated into a social reality and the benefits are perceived in relation to existing socioeconomic relationships, rather than via a transformational effect.

Introduction

The literature review carried out by Donner and Escobari (2010) into the use of mobile telephones in MSEs found that information and communication technologies (ICTs) are beneficial because they reduce costs, increase productivity and trust, and facilitate the development of a network of contacts. These impacts were identified in studies that did not distinguish between different types of MSEs as either productive, marketing, or service providers. Other factors that were not considered include the production sector and value chain, whether or not the MSE belonged to economies of agglomeration, production and productivity, level of technification, etc. Establishing these differences is useful because it reveals which types of MSEs benefit from ICT, and in which specific sector MSEs could find a new value for ICT use.

In response to this identified knowledge gap, this study provides an analysis of one sector in particular—the carpentry and cabinet-making microenterprises based in an urban zone of Lima. The study focuses on mobile telephones, which represent the most popular communications technology among the population.[1] To carry out the exploratory study, a

1. In December 2011, national mobile telephone teledensity increased to 110 compared to 11 for landlines (ITU, 2012).

César Huaroto
chuaroto@iep.org.pe
Researcher
Institute of Peruvian Studies
694 Horacio Urteaga
Lima 11
Peru

limited number of in-depth interviews on mobile telephone use were held with carpentry and cabinet-making microenterprise owners based at the Industrial Park in Villa El Salvador (PIVES), located in the southern cone of Lima (Appendix 1). In this area, all kinds of products and inputs are found for producing and selling furniture, demand for which has risen in Peru due to a recent construction boom.[2] Both the geographical zone and the productive sector selected for this study possess relatively homogenous characteristics: The zone is home to a significant number of businesses, and the carpentry and cabinet-making sector represents an important proportion of all MSEs operating in Peru.[3]

In Peru, the importance of MSEs is clear. Data from 2007 show that between 5.8 and 6.1 million microenterprises provide work for 10.4 million people, almost 72% of the economically active population (EAP) in the country, who nevertheless produce only 45% of the national gross domestic product (GDP; Villarán, 2007). By considering productivity levels per worker, a large difference between the microenterprises' productivity compared to medium and large companies can be observed.[4]

Peruvian microenterprises operate in a context of market liberalization and deregulation that have resulted in almost no government support. The PIVES is emblematic in this sense, because it was conceived as one of the most ambitious industrial park projects of the 1980s, yet by the mid-1990s, the project lacked a clear vision toward consolidation. This study aims to contribute to debates on the impacts of mobile telephone use within this business environment.

In the literature reviewed for this study, there is no clear definition of either microenterprise or the conceptual differences among them beyond a simple subgrouping of companies into MSEs; small and medium enterprises (SMEs); micro, small, and medium enterprises (MSMEs); and subsistence microenterprises. Diverse and general definitions are used to describe units of analysis,[5] which lead to difficulties when attempting to identify how specific businesses benefit from mobile telephones, and in which parts of the value chain selected for this analysis mobile telephone technology plays an important role. This study assesses the impact of mobile telephones on different stages of the carpentry and cabinet-making value chain. This value chain has been selected based on a narrower definition that is limited to a sector of companies that tend to face more challenges relating to sustainability—the microenterprises.[6]

This study begins with a review of existing literature on the relationship between MSEs and ICT in Latin America. Based on this review, several hypotheses are established relating to: 1) ICT impacts on MSEs within a

2. Cavero, Agüero, and Huaroto (2012) developed a broad yet specific ethnography for this study.
3. See Appendix 2 for a decision tree and relevant data.
4. In Figure 1, a distinction is made between microenterprise employees and independent workers or the self-employed. In contrast, in the current study, these categories are considered together in one group termed microenterprises.
5. A single category can have such broad margins for inclusion that distinct companies may be classed under the same rubric. For example, Peruvian Law 28015, Law for the Promotion and Formalization of Micro- and Small Enterprises, passed in 2003, classes any (non-agricultural) company with fewer than 50 workers and a monthly sales income of less than US$92,000 as an MSE.
6. Defined as those enterprises with fewer than 10 workers or less than 150 tributary tax units in annual sales, equivalent to selling less than US$16,000 per month. This definition includes self-employed workers.

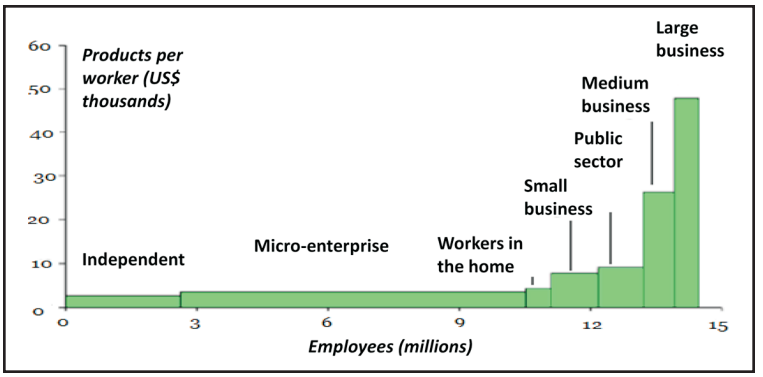

Figure 1. Productivity by type of company (2006).
Source: Villarán (2007). Elaboration: Chacaltana (2008).

context of agglomeration and 2) the anticipated impacts of mobile telephone use on the carpentry and cabinet-making sector. Next, the context of the study is described in detail. The methodology and qualitative results make up sections 4 and 5, respectively. The study concludes with some final reflections and a proposed research agenda.

1. Literature Review and Analytical Framework

Reflecting the heterogeneity of MSEs, literature on ICT impact is varied and focuses on different contexts.[7] Bar, Pisani, and Seabra (2010)[8] find that mobile telephone uses and benefits differ between groups of self-employed and small enterprises in São Paulo. However, these two groups do have some aspects in common, such as the "need" to own a mobile telephone (even though this implies increased expenditure); the importance of being "contactable," which can increase the client base; and the ability to coordinate service logistics. These are the same characteristics identified by Kuramoto (2007) in Peru; Zegarra (2008) in El Alto, Bolivia; and Barrantes, Agüero, and Fernández-Ardèvol (2011) in Puno, Peru. Given the insecurity in São Paulo, the importance of cellular telephones for reducing risks is particularly pertinent.

ICTs' utility increases as associations among businesses grow, because ICTs facilitate increased communication and coordination, and they create commercial opportunities by opening up access to information. Agüero (2009),[9] Barrantes et al. (2011),[10] Bustamante (2011),[11] Kuramoto (2007), and Zegarra (2008) all found similar results for rural areas. Barrantes et al. (2011) concluded that the positive impacts increase for medium-scale agriculture and livestock farmers.

As for microenterprises, Boateng (2010) indicates that, depending on the characteristics of productive activity, mobile telephone use supports decision making above all else. The impact is greater when businesses are being set up or closed down, because information and communication are vital at these times.

Among the Italian SMEs that are grouped into industrial districts, Chiarvesio, Di Maria, and Micelli (2004) found that ICTs improve efficiency and competition, either via innovations resulting from increased access to information on the Web or via improved means of communication with suppliers and customers. Chiarvesio and Micelli (2001) indicate that SMEs not only show potential to benefit from ICTs as big businesses have, but that, by forming an agglomeration, they become more adaptable to market variations.

Botehlo and Da Silva (2007)[12] highlight the need to investigate the relationship between agglomerations of Latin American companies and the use of

7. The extensive literature review performed by Huaroto and Agüero (2012) frames this section.
8. The authors studied the impact of mobile telephone use in urban areas of São Paulo by analyzing three relatively poor social groups: lower class youths, sex professionals, and street theatre performers.
9. The author evaluates the impact of the cellular telephone on decision making about production among small-scale farmers in Puno.
10. The study uses quantitative and qualitative methods to evaluate the socioeconomic impacts of mobile telephone use among small-scale businessmen and businesswomen working on markets in the rural zones of Asillo and Taraco in Puno, Peru.
11. This research consisted of providing smartphone technology and training to farmers from two communities in the same valley in the Chancay-Huaral irrigation district in Lima.
12. The authors review existing data on mobile telephone use and MSMEs to provide a summary of results to date and propose a research agenda for Latin America.

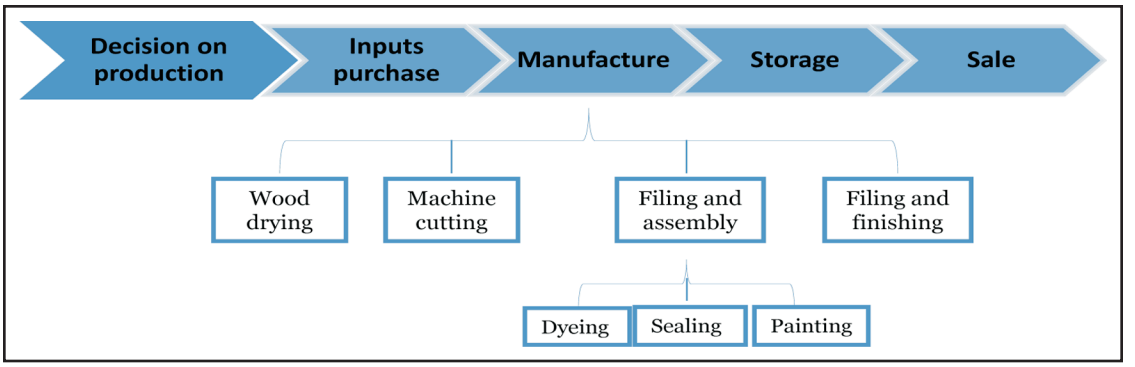

Figure 2. Value chain for the carpentry and cabinet-making sector.
Source: CITE-Madera (2009). Elaboration is by the authors.

mobile telephone technology to facilitate access to information, use undertaken with the aim of reducing transaction costs and improving decision making. Despite the fact that MSMEs sit at the "bottom of the pyramid" in terms of income, no study from a developing country has analyzed this relationship.

Adopting the approach of De Silva and Ratnadiwakara (2008), we begin by identifying the theoretical impacts of mobile telephones on the productivity of each part of the value chain of the carpentry and cabinet-making sector. This sector is made up of microenterprises that this study postulates belong to an agglomeration. Based on Cavero et al. (2012) and CITE-Madera (2009), we identify the different production stages of the MSEs selected for this research (Figure 2).

Observing the productive clusters in Peru, Távara (1994), Visser (1999), and Visser and Távara (1995), identified economies of agglomeration, both external of scale and of diversification,[13] that could benefit from using a mobile telephone.

In regard to decision making about production—the first stage of the chain—the entrepreneur requires information on customer demand. The mobile telephone becomes fundamental to communication with clients, because contact is quickly established. This facilitates arranging meetings and taking orders (as per Bar et al., 2010; Boateng, 2010; Zegarra, 2008). In agglomerated companies, given the trust among entrepreneurs, a better and increased flow of information can be achieved, leading to faster and more efficient decision making (Visser & Távara, 1995).[14]

The second and third stages are the purchase of inputs and the furniture manufacturing. In both, the qualitative impacts of mobile telephone use are similar—it permits more rapid and efficient communication in the business by eliminating the need to physically move from place to place. Likewise, better communication provides the possibility for improving skills among the workforce. By reducing transaction and coordination costs, workers can use the time gained to specialize in a particular element of production. Boateng (2010) calls this an "incremental effect" because it accelerates productive processes and specializes the workforce. These quicker and more efficient processes lead to overall productivity improvements.

In addition, the mobile telephone would further strengthen agglomerations, which, according to Visser (1999), reduce short-distance costs relating to transport, communication, and transactions. Essentially, this is what the external economies of scale of the cluster permit—that the short distance between producers generates positive externalities for everyone else.

13. This study does not explore these impacts in detail nor does it discuss the Cluster Theory in general. The reader can access an exhaustive analysis in Huaroto and Agüero (2012).
14. Relationships of trust are fundamental. According to Távara (1994), the original Cluster Theory emerged from cities in Italy where there is a tradition of families who work in agglomerated association. In the Peruvian context (and in Latin America more widely) this is not the case, since the MSEs are mainly run by migrants who are not entrepreneurs by vocation, but rather of necessity.

Table 1. Hypothesis of Anticipated Impacts of Mobile Telephone Use on the Carpentry and Furniture-Making Sector in the Context of Agglomerated Companies.

Stage-effect	Context of agglomerated companies	Mobile telephone use (study hypothesis)	Theoretical and empirical reference
Reduction of transaction costs in the value chain			
Decision	Lower information costs	Better communication with clients, less uncertainty in decision making, higher demand for furniture	Bar et al. (2010), Barrantes et al. (2011), Boateng (2010), Kuramoto (2007), Visser & Távara (1995), Zegarra (2008)
Inputs purchase Elaboration Final products	External economies of scale. Economies of diversification	Reduction in transportation and coordination costs. Strengthened by external economies of scale and economies of diversification	Boateng (2010), Chiarvesio et al. (2004), Chiarvesio & Micelli (2001), Visser (1999)
Storge and/or transport Sale	Advantages from geographical proximity. Reduction of information costs	Improved access to information, which enables entrepreneur to make informed decisions about where to sell. Better access to market prices	Boateng (2010), Zegarra (2008), Barrantes et al. (2011), Kuramoto (2007), Visser & Távara (1995), Távara (1994), Aker (2008), Jensen (2007)
Value-adding			
Association, cost-sharing, exchange of experience	Joint actions (investments, costs etc.) and sharing knowledge and experiences	Improved information and communication flows, reinforcing the positive effects of the cluster	Chiarvesio et al. (2004), Chiarvesio & Micelli (2001), Bar et al. (2010), Kuramoto (2007), Visser & Távara (1995)
Product positioning	Reputation gained from the quality of the products in cluster	Improved information and communication flows, reinforcing the positive effects of the cluster	Chiarvesio et al. (2004), Chiarvesio & Micelli (2001), Visser & Távara (1995), Távara (1994)
Innovation			
Innovation	Given to consistent competition, there is constant need to innovate to stand out among the cluster	Improved information and communication flows, reinforcing the positive effects of the cluster	Chiarvesio et al. (2004), Chiarvesio & Micelli (2001), Visser & Távara (1995), Távara (1994)

Source: Huaroto and Agüero (2012). Elaboration is authors'.

Storage and sale of the product represent the final stages. This study was unable to identify a clear impact of mobile telephone use on storage, because this stage does not generally require high levels of information.[15] At sale, the impacts of mobile telephone use multiply the benefits brought by agglomeration. The cellular phone helps producers improve their product positioning by obtaining better information on market prices (Aker, 2008; Jensen, 2007; Muto & Yamano, 2009). The agglomeration also reduces the costs of information, but it does so by enabling the consumer to access more specialized and competitive offers within the same locality (Távara, 1994; Visser, 1999).

Finally, Távara (1994), Visser (1999), and Visser and Távara (1995) indicate that agglomerations facilitate two elements for microenterprises (independent from the stages of production): 1) "value-

15. Given that microenterprises have low production levels, their storage requirements are sufficiently low that they do not need to rent additional space.

adding," or the capacities to make joint investments and improve the overall product positioning through increased association among members of the cluster and 2) the opportunity for product and process innovations. Sharing a geographical location and common interests gives microentrepreneurs a comparative advantage. The mobile telephone strengthens these elements because, as indicated by Chiarvesio et al. (2004) and Chiarvesio and Micelli (2001), it facilitates a greater and faster flow of information, which creates incentives for joint initiatives and innovation among MSEs (see Table 1).

2. Study Location[16]

Villa El Salvador (VES) is a densely populated district that forms part of South Lima.[17] The economically active population (EAP) totals 172,000 people. They are principally employed in business (22%); manufacturing industries (16.5%); and transport service provision, storage, and communications (11%; INEI, 2007).

Founded in 1971, VES possesses a rich history of social organization and local conceptions of development. An initial milestone was an agreement reached between the central Peruvian government and the main social organization, the Self-Managing Urban Community of VES (*Comunidad Urbana Autogestionaria de VES,* or *CUAVES*), to establish the Villa El Salvador Industrial Park (*el Parque Industrial Villa El Salvador,* or *PIVES*). This was to be an exclusively industrial area providing employment for the migrants living in VES. Upon creation of the district, its first mayor led a process to strengthen and orient MSEs toward shoemaking, dressmaking, carpentry, metal mechanics, and foundry work. In 1988, there were 887 businesses in operation, 247 of which were carpenters.

Given that VES was one of the neighborhoods most affected by the civil conflict (1986–1993),[18] by the end of 1991,

> [T]he civil works had finished in the service centres for five types of activity (dressmaking, shoes and leather products, carpentry, metal mechanics and foundry). At the same time the Centre for Productive Development was inaugurated. The Centre was designed to operate as a training and service hub for metal-mechanics, as well as a sales point and exhibitions centre. (CEPAL-GTZ, 2000, p. 6)

In 1995, the PIVES was given new life under the leadership of the first VES mayor. A Center for Business Development was created that was responsible for "processing specialist information on markets and technology, as well as business service provision in diverse fields (marketing, technical training, communications, legal assessment, accounting etc)." (ibid., p. 7).

At the same time, the center provided incentives for improved production among small-scale businesses, offering awards for "excellence" and the highest exporter. In addition, business fairs provided access to a wider market. By 1998, a total of 901 companies were in operation, 278 of which were in the carpentry sector.

According to our field research, the PIVES currently demonstrates the following characteristics: 1) carpentry, and in particular the manufacture of furniture, continues to represent the sector with the largest number of businesses; 2) since 2000, government support has been delivered through the Center for Wood Technology Innovation (*el Centro de Innovación Tecnológica de la Madera,* or *CITE-Madera*), which promotes innovation and quality improvements at all stages of transformation and industrialization of wood and related products, such as furniture; and 3) a significant number of businesses within the classic zone for carpentry have been transformed into commercial shopping centers. The carpentry workshops have moved to neighboring zones—sharing space in the zone that was previously exclusively dedicated to shoemaking and metal mechanics—or even outside of PIVES.

Jessica Moscoso, director of CITE-Madera, reaffirms the importance of the sector, "[In VES] there were around 1,880 businesses, 43% dedicated to the manufacture and sale of furniture and 57% to marketing furniture" (DESCO, 2010).

3. Methodology

Our research is exploratory. It aims to illustrate the current context and promote further detailed analy-

16. Cavero, Agüero, and Huaroto (2012) describe in detail the study location and its history.
17. 381,000 people live within a 35 km² area.
18. Many businesses moved to other districts to escape the violence. This weakened attempts to strengthen the industrial park.

sis.[19] This study is based on nine case studies of microenterprises producing wooden furniture in the VES industrial zone. To select the cases, the following criteria were used: 1) They were to be microenterprises with no more than 10 employees;[20] 2) among these, at least four case studies were collected on microenterprises that produce basically to survive;[21] and 3) of the remaining MSEs, a relatively varied sample was taken.

In-depth and semistructured interviews were held with nine microentrepreneurs who were asked: 1) basic information about themselves and their business (type of products, number of workers, production rate, customers, and suppliers) and 2) to what extent they use a mobile telephone (or another type of ICT) along the production chain, and how important this is. The field work lasted approximately three weeks during June 2011. A detailed description of the nine case studies can be found in Cavero, Agüero, and Huaroto (2012).

Microentrepreneurs were identified via interviews with representatives from the two institutions that work in the zone, CITE-Madera and the nongovernmental organization DESCO-Urban Programme. These institutions facilitated contact with two furniture producer associations: the Association of Wood Transformation Industries of Villa El Salvador (*la Asociación de Industriales en la Transformación de la Madera de Villa El Salvador,* or *ASIMVES*) founded in 1991, and the VILLA2000 Association (AV2000) founded in 2000.

4. Results

The results of the exploratory study can be summarized into two key findings:

1) The microenterprises are concentrated and not agglomerated. They therefore miss out on the benefits of agglomeration.
2) The positive impacts of mobile telephone use are experienced in vertical relationships (producer-customer or producer-input provider), not in horizontal relationships among microentrepreneurs.

4.1. PIVES: Agglomeration vs. Concentration

Our hypothesis was based on the premise, supported by the original planning behind VES, that we would find an agglomeration and associated economies—of sequence and diversification, and of scale (internal and external). The study showed that the only feature of agglomeration in VES is territorial concentration, principally leading to reductions in transaction costs. The other anticipated impacts shown in Table 1 were not found.

In VES, almost all inputs and services required along the furniture production chain can be found. The microenterprises carrying out wood transformation do not necessarily establish strong links with their peers or suppliers. Benefits of territorial concentration, such as the ease of being located near clients, are recognized. However, among microentrepreneurs, quick and horizontal flows of information do not exist; instead, there is strong competition. The majority work "to order" and any shared information can be "copied," putting the person who had the original idea at a disadvantage because innovations are generally related to the product and not productive processes. The majority of microenterprises analyzed in this study manage insufficient capital to invest in productive innovations, whether in machinery or other inputs.

Considering this, it is understandable why it is difficult for microentrepreneurs to collaborate. Not only do they possess little capital (and therefore lower capacity to recover from losses) to risk in joint investments, but there also exists a considerable degree of mistrust among them. It is difficult to break this mistrust in a competitive environment where joint actions or generating any level of institutionalization are costly, despite recognition of the benefits an association could bring about.

This also explains why the information flow

19. This choice was based on time limits and access to microenterprises. The mistrust demonstrated by entrepreneurs toward outsiders presented a challenge in terms of establishing contact and carrying out interviews.
20. This was true of all except one microenterprise, which had 12 permanent workers. This case serves as an example of a company that began to grow, accumulate capital, and move toward economic sustainability (in relation to the total sample).
21. Defined as a company that is run by its owner who has a maximum of four employees, of which at least two are nonpaid family members and whose annual sales do not exceed 50 tributary tax units (we were unable to confirm this ultimate indicator). Based on MTPE (2008).

among peers is low. Lack of trust and strong competition increase cooperation costs. Some interviewees mentioned that they had collaborated with peers in emergencies; for example, lending tools when others were failing (cases 1 and 5). Yet mistrust and risk prevent them from venturing into substantial changes, such as renting a shop together, sharing costs, or establishing a client base without the need for intermediaries.

Of the different dynamics expected from an economy of agglomeration, the only one present in VES is the transaction cost reduction resulting from territorial concentration. The other impacts are not produced due to insufficient capital, the dependency of working "to order" and the competition this creates, the shortage of skilled labor,[22] the migrant background of entrepreneurs and the related lack of previous links to strengthen any association, the type of relatively basic manufacturing industry,[23] and the lack of government support. Furthermore, in the case of successful microenterprises, instead of innovating, they prefer to transform their workshops into showrooms, renting out some space and maintaining artisan manufacturing methods characterized by the use of old machinery and workers who are paid per piece, among others.

It is clear these microenterprises differ substantially from those previously mentioned in Italian industrial districts. No kind of leadership was identified in VES, neither from a political or economic class nor from the government (as highlighted by Távara, 1994). The presence of two associations—ASIMVES and VILLA2000—could provide a means to establish effective leadership, but neither has developed a long-term vision of PIVES. The two associations operate as guarantors of the status quo or aim to obtain new lots in the park.

4.2. Mobile Telephone Use According to Stage of Production

4.2.1. Production decision making (to order or deal with stock)

All the interviewees produce "to order." However, it is necessary to distinguish between those who sell *directly* to clients (cases 1, 3, and 4) and those who sell *indirectly* (the remainder).

In the first group, cellular phone use is fundamental because it enables old and new clients (recommended by the former) to call the microentrepreneur and ask whether a specific order can be taken. Even if, at times, a mobile may not be working and a landline is used to receive calls instead, all interviewees concurred that a mobile is more practical because it can be kept on one's person wherever they are and contact can be established more quickly. This is important because initial contact can lead to work, a similar impact to those identified by Bar et al. (2010), Boateng (2010), and Zegarra (2008) for other productive sectors or in different contexts.

Once the product and quantity have been agreed on, in cases 1 and 4, the moment arrived to personally find clients. This meeting served, above all else, as a way to agree on a price and define the details of the product.[24] The microentrepreneur from case 1 said, "Usually it's to order. People never like what you show them, so they ask you to change something or modify some part."

The microentrepreneur from case 4, who is more specialized, indicated that, with repeat customers, such as an architect who renovates houses, contact can be established without the need for a face-to-face meeting. The order is taken by cellular phone, the price and furniture model are sent by email, and the sale can also be confirmed via these means. However, repeat clients are few in number. As can be anticipated (Bar et al., 2010; Barrantes et al., 2011; Boateng, 2010; Bustamante, 2011; Molony, 2006; Myhr & Nordström, 2006), long-term relationships are those that benefit most from mobile telephone use. Initial uncertainty can be overcome and transaction costs reduced because, given increased trust, it is no longer necessary to monitor the market or look for better prices.

In case 3, the client ascribes to a predefined model. The microentrepreneur asks his master car-

22. The majority of workers lack a secondary school education, and some did not finish primary school. In addition, the training that some workers receive only covers basic aspects of production and hardly covers management and administration.

23. Distinct from modern industries with complex production processes that permit increased specialization in each element and stage of production.

24. At times, the carpenter understands that the client's order is not possible. For example, measurements and angles can cause problems for assembly or a metallic component may be requested that cannot be found on the market.

penter how much a product costs, and then he sends the quote to the client via email. The mobile telephone is an important addition for this microentrepreneur because it enables him to coordinate quickly with his carpenter and send the quote immediately to secure the contract:

> I call him [the carpenter] from here. He goes to his computer and the contract is made with him. I mean, I call him at the office and I say "There's an order for 10 beds of this model," and the contract is made direct with the carpenter who confirms when the product will be ready.

As for those microentrepreneurs who sell to intermediaries, first contact is also usually made via mobile telephone. This is the moment when the products and required quantities are defined; only later is the quote discussed in person.

Personal contact also occurs when the intermediary has a shop in PIVES or if he sells in other shops outside the district but visits PIVES to keep up-to-date on the competition. In these cases, the cellular phone is used to coordinate a meeting at the workshop (some days, the microentrepreneur goes out selling) where the parties discuss the new orders face-to-face (unless these orders are predesigned models and consequently do not require further discussion, which is an exception). The microentrepreneur from case 8 explains the importance of this first contact via cellular phone for meeting and defining the order and contract, and thereby not losing an opportunity for work:

> My client calls me and we arrange to meet in an hour. Well, there are times when I go out because I forget. I am in the industrial park and the customer arrives, and so they call me "Sir, your workshop is closed. Where are you?" Sometimes, the client is one step ahead. They want to buy some piece of furniture and if you're not there, you lose out. You have to say "Wait for me a second, I'll be right with you." And sometimes the client says that they will come back, but then you've already lost them.

The retailers also take very specific orders, so personal contact is all the more important. According to the microentrepreneur from case 5:

> It can't always be explained over the phone personally, because if you tell them that you won't do one thing and that you will modify something else, the clients I come across want a design that can be made like this and that, and they don't realize the reality and that sometimes it just can't be done.

The first contact is important to confirm the possibility of work as soon as possible. In contrast, the final design approval and quote tend to be handled in person. Then it is usually the moment for a deposit to be paid so the necessary materials can be purchased. Case 9 provides an example of this:

> The customer calls and says "Sir, I need such-and-such by next week and I'll come over now or tomorrow to pay the deposit." So I look at my budget for the wood and when he comes over [we say], "How much do I leave?" "Leave me so much," and then I buy the wood.

This microentrepreneur stresses the importance of the cellular phone in attracting new clients:

> Some customers called other people they knew and they got in touch with me and I had to buy a mobile telephone. So now they call me directly and sometimes a deal can be made in any moment. Sometimes I am in my bed at 9 at night and they call me on my mobile, "We need a set of cabinets for next week, I'll come over tomorrow to pay the deposit!" So the cellular phone is having some effect.

In summary, the cellular phone is fundamental for "first contact." When the order is for a predesigned model, everything can be coordinated via mobile telephone, thereby saving time. With bespoke models of furniture, the contract tends to be made in person, with previous coordination via mobile telephone serving to reduce transport costs and waiting time. The hypothesis set out in Table 1 is therefore corroborated: The main impact of mobile telephones is the cost reduction related to accessing and obtaining information.

4.2.2. Input provision

At this stage, cellular phone use is infrequent. The majority of microentrepreneurs go personally to investigate prices and examine the quality of the material they buy. This is due to 1) proximity of the shops, as well as previous knowledge of specialist stockers and 2) deep mistrust. With regard to proximity, territorial concentration itself helps to reduce transaction costs. In terms of mistrust, the mobile phone by itself cannot overcome this (Bar et al., 2010; Boateng, 2010; Molony, 2006; Zegarra, 2008).

The cellular phone is not used as a priority for transportation of stock. In general, the microentrepreneurs use the larger "cargo taxis" that drive around PIVES' avenues. In this case, a price is agreed directly with the driver. If the amount of material bought is small, the microentrepreneurs themselves transport the goods in regular taxis or via mototaxis.

Only the microentrepreneur in case 3 indicated that he used his cellular phone to ask a wood supplier whether he had the required material and what quantity. He then passed the information on to the master carpenter for him to go to view and buy the goods. This mobile communication only helps avoid the trip to find the material; a journey is still required to verify its quality.

The impact on transaction costs is minimal. Furthermore, some of the anticipated impacts set out in Table 1 in relation to external economies and economies of diversification (the latter being significant both because microenterprises tend to manage low levels of capital and because their production is largely based on artisan techniques) also did not seem to occur.

4.2.3. Carpentry production with wood

The mobile telephone can play two roles. The first is in production control, and the second relates to the microentrepreneur's customers, be they final or intermediary.

The mobile telephone is used only minimally during production control, because the majority of microentrepreneurs are also operators. They directly supervise the work, and such communication is conducted face-to-face. Only for those business owners who are not also operators (cases 3 and 4), the mobile phone helps to reduce uncertainty about the order book. The microentrepreneur communicates constantly with the manager, who confirms that everything is running well or consults about problems that need to be resolved.

With regard to contracting new workers (for example, during peak periods), the cellular phone enables people to be located quickly and thereby helps the microentrepreneur ensure that orders can be met.

Regarding client relationships, the cellular phone facilitates changes during the production process and helps avoid wastage costs from a returned or defective product. The mobile telephone also permits the microentrepreneur to provide personalized service. The majority of interviewees confirmed that the cellular phone is important for letting the customer know the status of their order, for consulting on details, and for confirming the delivery date.

At times, the client asks for modifications to the model and interrupts the production process, increasing the workload. The microentrepreneur's flexibility to accept these changes is important because attentive and considerate customer service opens the doors to new work arising from customer recommendations.

Cellular phone use is extensive among microentrepreneurs who sell to intermediaries. The microentrepreneurs in cases 5, 7, and 9 indicated that the cellular phone is vital for quickly coordinating and resolving doubts about measurements, models, whether the furniture piece can be produced, etc. As the microentrepreneur from case 5 stated:

> The clients describe something and you have to tell them that it can't be done, and you have to give them criteria and ideas. For example, in order to build a shelf the measurements may be correct but you still have to consult the client because you need to understand how it will fit against the wall and any weight that it will need to sustain. You have to know all of this.

The cellular phone enables these impasses in unfeasible and costly furniture design to be overcome. Doubts can arise during manufacturing, assembly, or finishing. Thanks to the cellular phone, these can be resolved quickly, avoiding a long pause in production. By enabling the client to be located anywhere, at any time of day, the cellular phone also saves on coordination costs. This cannot be achieved with a landline telephone. The microentrepreneur of case 7 explains the possible reason for these setbacks when working with retailers:

> Sometimes the client wants something specific and the seller says yes, yes. So in order to secure the client, the seller agrees to something that does not work, that isn't viable. As a carpenter I know whether something is wrong or too big or too small. Sometimes we are brought strange orders which, in all honesty, you have to respond by saying "Call your client because this isn't going to work."

The time saved thanks to the cellular phone is vital for everyone involved, because every hour lost

is "dead, immobile capital," and immobility not only affects the microentrepreneur; it also affects the workers, because they get paid per piece.

For the buyer, using a mobile telephone can reduce the risk of going to collect a product that is not yet ready. When asked the question, "How important is a mobile telephone for your business?" the microentrepreneur from case 8 responded:

> Ah, quite important. I mean, I've had clients before who travel all the way from Los Olivos. Once, we drew up a contract and I had to finish it by Wednesday. But sometimes, for whatever reason, I can't get it done. So I call and say "Please come on Thursday instead, I'll have it ready first thing."

Avoiding misunderstandings or resolving impasses can strengthen the relationship between the client and manufacturer, or at the very least, it can help avoid deterioration of the relationship.[25]

Once again, we have identified that the impacts of mobile telephone use at this stage of the value chain are basically incremental,[26] reducing the costs of accessing and obtaining information.

4.2.4. 'The order is ready': Storage, transport, sale, and postsale

The intermediaries who buy from microentrepreneurs tend to call them by mobile telephone to find out whether the order is ready. Upon obtaining confirmation, they go to the workshop to collect the products and take on the transport costs themselves. When they ask the microentrepreneur to deliver the products to their shop, they usually arrive by a taxi cargo service. Only the microentrepreneur in case 5, whose workshop is outside of PIVES, called transportation companies in advance to agree on the price and save time.

In terms of storage, given that work is undertaken "to order" and in small quantities, the workshop also functions as a small store (case 1). Only in exceptional cases is it necessary for the microentrepreneur to rent a small store close by (case 5).

Those who sell "directly" either call the customer or send him an email to notify him the product is ready for collection. In cases 1 and 4, work "to order" includes transport costs. Delivery is coordinated via cellular phone, as are arrangements for final payment. In case 1, the client pays for the cargo taxi, and in case 4, the microentrepreneur coordinates his own transportation, which is paid for out of profits made from the customer, who is satisfied with his "furniture under design."[27]

The cellular phone enables companies to receive queries or order changes before delivery. Some clients call because they are dissatisfied with the product, and the microentrepreneur has to take it back and make changes. This implies increases in cost and time that the manufacturer takes on, so as not to run the risk of looking bad or losing future recommendations.

The microentrepreneurs express dissatisfaction with the use of mobile telephones at this stage because intermediaries can use excuses to not pay them on time. Some interviewees indicated that it is usual for them to be paid two weeks late, which is why they decide to go to the shop. Molony (2006) and Zegarra (2008) have found that it is easy to cheat with a mobile phone. This is why microentrepreneurs prefer to receive payments and buy key inputs personally.

4.2.5. Strategies for obtaining new clients

For the microentrepreneurs, it is critical that they find new clients. The most effective way to achieve this is via a recommendation, which can only happen if the work is well executed and delivered on time. A recommendation may also depend on whether the microentrepreneur demonstrates flexibility in adapting to the client's demands. Yet this only works for those microentrepreneurs with contacts in families from socioeconomic levels High, Medium High, or Medium[28] (cases 4 and 1, and to a lesser degree, case 3). They organize the production to order direct with the clients, and the mobile telephone is fundamental for making contact that arises from recommendations.

When these networks are not present, micro-

25. Even though the microentrepreneurs work thanks to orders passed on from intermediaries, they are aware that this dependency relationship is undesirable. The ideal situation is to sell directly to the client, thereby earning more.
26. They accelerate existing productive processes, but the impact does not become transformational (defined as an impact that instigates change in productive processes; see Boateng, 2010).
27. Furniture with specialized or modern designs, usually requested by designers who follow international trends.
28. In the High/Medium level, family income is above S/.6000, and in the Medium level, family income is between S/.2000–6000 (APEIM, 2005, p. 8). This classification is only for Metropolitan Lima and Callao.

entrepreneurs must sell to intermediaries. It is difficult for them to attract clients directly, because they lack contacts and are not in the right place to be able to show off their products, such as in the galleries and showrooms in the classic and more commercial zones of PIVES. Renting a cheap shop[29] enables microentrepreneurs to obtain clients directly, as demonstrated in cases 5 and 6.

Case 7 demonstrates the challenges of starting to sell directly. This microentrepreneur explains how, by becoming the competition to existing clients (the intermediaries), the intermediaries could stop buying from him:

> If I want to set up a shop myself, I need to have sufficient capital to not have to return because once I become competition, those that give me work now won't give it to me again.[30]

In cases 1 and 4, the creation of a Web page promoting the business was successful in attracting clients. This strategy requires advanced knowledge and should be coupled with a constant use of email to build relationships with future customers and offer them models that can be found on the Internet.

5. Final Reflections and a Research Agenda

This study provides evidence of the positive, incremental effects of mobile telephone use on wood transformation microenterprises. In contrast to other ICTs, the mobile telephone facilitates the rapid flow of information in the vertical negotiation processes. The mobile also improves emergency responses or furniture production impasses with bespoke design. As indicated by Overa (2006), the mobile phone increases the efficiency of existing trust relationships.

This study verified these effects at different stages of the value chain. In the first stage, the cellular phone enables the microentrepreneur to quickly establish the work terms and arrange a meeting to receive the deposit and make needed adjustments to the furniture design. During production, the cellular phone helps the microentrepreneur resolve queries or emergencies, and thereby avoid wasting worker time. This is critical when furniture is being produced with bespoke designs or when technical issues require further client consultations. At the moment of sale, the cellular phone provides the means to confirm quickly with the client that the product is ready, as well as to arrange delivery. This reduces uncertainty and improves time-management.

All the microentrepreneurs indicated that the cellular phone is indispensable for business, especially given that clients prefer this means of contact. Not having a mobile telephone could seriously affect relations with customers who are immersed in a culture of ubiquitous communication, ultimately useful for both parties.

The additional productivity impacts arising from transformational effects (Boateng, 2010) come about where characteristics of economies of agglomeration exist, which is not the case in the study zone. Our findings question the supposition that territorial concentration automatically creates networks of trust, strong information flows, and economies of scale (which share characteristics with the economies of agglomeration, in that they do not lead to joint investment initiatives or innovation processes, or to economies of external and internal scale, shown as a hypothesis in Table 1). This does not occur in PIVES for the following reasons: 1) Producer organization is weak; 2) little financial capital is available, which increases the costs of taking on risks related to innovations; 3) there is only low-quality microentrepreneur training; and 4) the industry is based on artisan techniques.

We are faced with a concentration of microenterprises that benefit from quick access to inputs, but that also compete with their peers and suppliers, rather than establishing relationships of cooperation and trust. This concentration results in a precarious status, one where the microentrepreneurs work directly with their clients without interrelating with their peers to work collaboratively. Subcontracting processes do not demonstrate any degree of specialization. Those who subcontract are only responsible for putting the furniture in the shop

29. Such as a furniture fair. Renting space in shopping precincts can be expensive (US$500 a month for 20 m^2).
30. This is more difficult for businesses that do not manufacture the entire product (for example, they undertake assembly and lamination, but not finishing work). Without offering a final product, clients cannot be attracted easily (cases 7 and 9).

window, taking on the role of retailers and enabling the microentrepreneur-producer to obtain better profits by focusing on manufacturing.

The absence of economies of agglomeration or horizontal relationships among microentrepreneurs means that many benefits that could be generated by mobile phone use are not experienced. The cases presented in this study clearly show the incremental benefits arising from mobile telephone use. However, no transformational effects occur, nor are any impacts felt on social relations. Productivity improvements are limited to exchange or marketing, and to the vertical relationships between the producer and the client, or between the supplier and either the client or the input supplier.

To what extent does mobile telephone use contribute to substantial transformation of social, political, and economic processes, thereby improving the productivity of the most vulnerable microenterprises? How competitive are they if the only impact is a reduction in transaction costs (one of the common impacts arising from global expansion of mobile telephone technology)? Are the best technological means for generating transformational change the cellular phone or a different kind of ICT such as access to the Internet?

It is necessary to revisit the contextual challenge set out in the introduction—the heterogeneity of microenterprises and the need for specific research. It is not only necessary to identify the context of the sector and the dynamics of the economy in which the microenterprises operate; it is also important to specify the type of business, whether it is a microenterprise, whether it is a retail or manufacturing company, how profitable it is, whether some level of accumulation is present, how much capital is managed, etc. This study shows that, even among a limited sample selected based on sector, zone, and type of microenterprise, there are big differences in mobile telephone use and, consequently, in the mobile phone's impacts on people's well-being.

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References

Agüero, A. (2009). Education, mobile phone use and production decisions: A rural case study in Peru. Mobile 2.0 beyond voice? Preconference workshops at the *International Communication Association (ICA).* Retrieved from http://www.mobileactive.org/files/file_uploads/final-paper_aguero.pdf

Aker, J. (2008). *Does digital divide or provide? The impact of cell phones on grain markets in Niger.* (BREAD Working Paper 177). Retrieved from http://www.cgdev.org/content/publications/detail/894410

APEIM (La Asociación Peruana de Empresas de Investigación de Mercados). (2005). *Niveles socioeconómicos en Lima Metropolitana y Callao* [Socioeconomic levels in Metropolitan Lima and Callao]. Retrieved from http://www.apeim.com.pe/images/IF_Niveles_Socio.pdf

Bar, F., Pisani, F., & Seabra, C. (2010). *Apropiación y uso: Estudio de caso en Brasil* [Appropriation and use: Case study in Brazil]. In M. Fernández-Ardèvol, H. Galperin, & M. Castells (Eds.), *Comunicación móvil y desarrollo económico y social en América Latina* (pp. 223–272). Madrid: Fundación Telefónica.

Barrantes, R., Agüero, A., & Fernández-Ardèvol, M. (2011). La telefonía móvil en el ámbito rural: Estudio de un caso en Puno, Perú [Mobile telephony in rural areas: A case study in Puno, Peru]. In M. Fernández-Ardèvol, H. Galperin, & M. Castells (Eds.), *Comunicación móvil y desarrollo económico y social en América Latina* (pp. 139–185). Madrid: Fundación Telefónica.

Boateng, R. (2010). Enhancing micro-trading capabilities through mobile phones: The case of women traders in Ghana. *Information Technology in Developing Countries, 20*(1), 2–7. Retrieved from http://pearlrichards.org/images/stories/2009/feb2010.pdf

Botehlo, A., & Da Silva, A. (2007). *Mobile use/adoption by micro, small and medium enterprises in Latin America and the Caribbean.* (Background paper). Lima: Diálogo Regional sobre la Sociedad de la Información (DIRSI). Retrieved from http://dirsi.net/files/finals/070215—botelho.pdf

Bustamante, R. (2011). *Información para la agricultura y capital social. Uso de smartphones entre pequeños agricultores en la costa peruana* [Information for agriculture and social capital:

Smartphone use among small farmers in the Peruvian coast]. Proceedings of the *5th ACORN-REDECOM Conference,* Lima. Retrieved from http://www.acorn-redecom.org/papers/acornredecom2011Vento_Espanol.pdf

Cavero, M., Agüero, A., & Huaroto, C. (2012). *Teléfonos móviles y productividad de la microempresas. Estudio cualitativo del sector carpintería y ebanistería en Villa el Salvador* [Mobile phones and productivity in microenterprises: Qualitative study of the carpentry and cabinet-making sector in Villa El Salvador]. (Documento de trabajo). Lima: Diálogo Regional sobre la Sociedad de la Información (DIRSI).

Centre de Estudios y Promoción del Desarrollo (DESCO). (2010). *Desafíos para las MYPE de Lima Sur* [Challenges for SME in South Lima]. *El Comercio,* Suplemento contratado.

CITE-Madera (El Centro de Innovación Tecnológica de la Madera). (2009). *Estudio descriptivo 'Control de calidad en la fabricación de muebles en madera en MYPE de Lima'* [Descriptive study 'Quality control on the carpentry-making sector of SME in Lima']. Lima: CITE-Madera. Retrieved from http://www.citemadera.gob.pe/images/publicaciones/documentos/DOCUMENTO_2_Control_calidad_copia.pdf

Chacaltana, J. (2008). *Una evaluación del régimen laboral especial para la microempresa en Perú, al cuarto año de vigencia* [An evaluation of the special labor regime for microenterprises in Peru, on the fourth working year]. Preparado por encargo de la OIT. Retrieved from http://www.cedepperu.org/img_upload/c55e8774db1993203b76a6afddc995dc/Ley_Mype_Per___final_final_revisada.pdf

Chiarvesio, M., Di Maria, E., & Micelli, S. (2004). From local networks of SMEs to virtual districts? Evidence from recent trends in Italy. *Research Policy, 33,* 1509–1528. Retrieved from http://xcsc.xoc.uam.mx/apymes/webftp/documentos/biblioteca/distrito%20Italia.pdf

Chiarvesio, M., & Micelli, S. (2001). Networks without technologies in industrial districts of northeast Italy. In A. Mariussen (Ed.), *Cluster policies—Cluster development?* (pp. 79–91). Nordregio Report 2001(2). Stockholm: Nordregio. Retrieved from http://www.nordregio.se/filer/Files/r0102micelli.pdf

De Silva, H., & Ratnadiwakara, D. (2008). *Using ICT to reduce transaction costs in agriculture through better communication: A case-study from Sri Lanka.* Colombo: LIRNE*asia.* Retrieved from http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1565184

Donner, J., & Escobari, M. (2010). A review of evidence on mobile use by micro and small enterprises in developing countries. *Journal of International Development, 22,* 641–658. doi:10.1002/jid.1717

Huaroto, C., & Agüero, A. (2012). *Uso de móviles & MYPE: revisión de la literatura & marco teórico para su estudio* [Mobile use and SME: Literature review and theoretical framework for its study]. (Documento de trabajo). Lima: Diálogo Regional sobre la Sociedad de la Información (DIRSI).

International Telecommunication Union (ITU). (2012). *ICT data and statistics explorer.* Retrieved from http://www.itu.int/ITU-D/ict/statistics/explorer/index.html

Instituto Nacional de Estadística e Informática (INEI). (2007). *Buscador de información por distrito* [Information search engine at district level]. Lima: INEI. Retrieved from http://proyectos.inei.gob.pe/mapas/bid

Jensen, R. (2007). The digital provide: Information (technology), market performance and welfare in the South Indian fisheries sector. *Quarterly Journal of Economics, 122*(3), 879–924.

Kuramoto, J. (2007). *TICs, MIPYMEs y género en el Perú: Una primera aproximación* [ICT, SME and gender in Peru: An approximation]. Proyecto GATE, Oficina de la Mujer en el Desarrollo, Orden de Trabajo 2, USAID Perú. Retrieved from http://www.usaid.gov/our_work/cross-cutting_programs/wid/pubs/MYPES_Peru_full_document_01-07.pdf

Ministerio de Trabajo y Promoción del Empleo (MTPE). (2008). Política de estado de promoción y formalización de la MYPE y acceso al empleo decente [State policy of promotion and formalization of MSE and access to decent employment]. Presentation at the National Seminar

Acceso al financiamiento, desarrollo económico e inclusión social, [Access to finance, economic development and social inclusion]. Santiago de Chile. Retrieved from http://www.mintra.gob.pe/contenidos/semanaSST2008/seminario09052008/politica_estado_promocion_mype.pdf

Molony, T. (2006). 'I don't trust the phone; It always lies': Trust and information and communication technologies in Tanzanian micro- and small enterprises. *Information Technologies & International Development, 3*(4), 67–83. Retrieved from http://www.itidjournal.org/itid/article/download/238/108

Muto, M., & Yamano, T. (2009). The impact of mobile phone coverage on market participation: Panel data evidence from Uganda. *World Development, 37*(12), 1887–1896.

Myhr, J., & Nordström, L. (2006). *Livelihood changes enabled by mobile phones: The case of Tanzanian fishermen.* (Bachelor's thesis). Uppsala, Sweden: Uppsala University, Department of Business Studies.

Overa, R. (2006). Networks, distance, and trust: Telecommunications development and changing trading practices in Ghana. *World Development, 34*(7), 1301–1315.

Távara, J. (1994). *Cooperando para competir. Redes de producción en la pequeña industria Peruana* [Cooperating to compete. Production networks in the small Peruvian industry]. Lima: Centre de Estudios y Promoción del Desarrollo (DESCO).

United Nations. (2008). International standard industrial classification of all economic activities. *Statistical papers,* Series M, No. 4 Rev. 4. New York. Retrieved from http://unstats.un.org/unsd/cr/registry/isic-4.asp

United Nations Economic Commission for Latin America and the Caribbean and German Development and Cooperation Agency (CEPAL-GTZ). (2000). *Parque industrial de Villa El Salvador: Una iniciativa para el desarrollo económico local en el Perú*. [Industrial park of Villa El Salvador: An initiative for local economic development in Peru]. (Documento de trabajo en el marco del Proyecto CEPAL-GTZ de Desarrollo Económico Local y Descentralización). Santiago de Chile: CEPAL.

Villarán, F. (2007). *Políticas e instituciones de apoyo a la MYPE en el Perú* [Policies and support institutions for SME in Peru]. Lima: Mimeo.

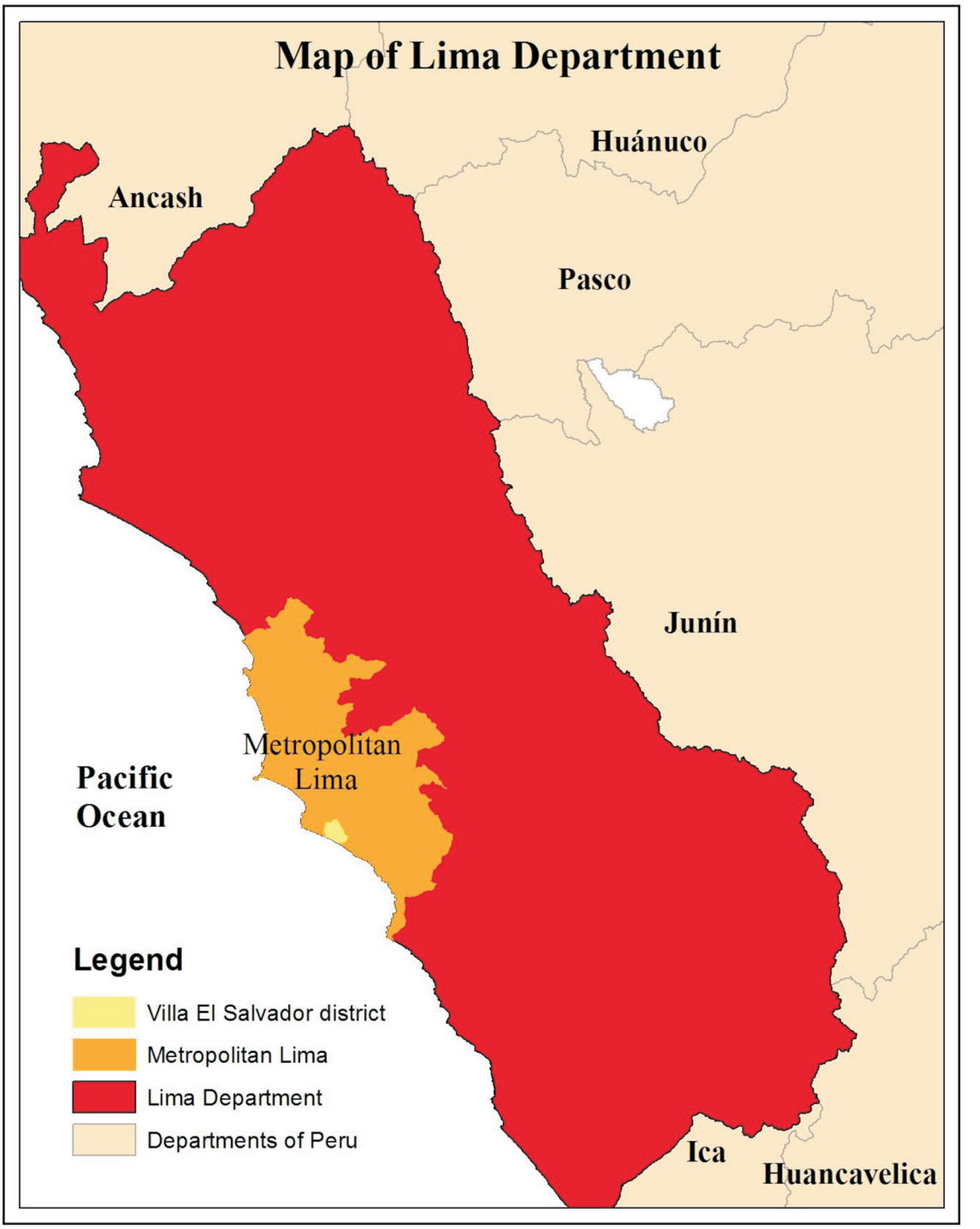
Visser, E. (1999). A comparison of clustered and dispersed firms in the small-scale clothing industry of Lima. *World Development, 27*(9), 1553–1570. Retrieved from http://time.dufe.edu.cn/wencong/aglomeracionestudy/n3edc342a6072d.pdf

Visser, E., & Távara, J. (1995). *Gamarra al garete (concentración local y aislamiento global)* [Gamarra goes adrift. Local concentration and global isolation]. Lima: Centre de Estudios y Promoción del Desarrollo (DESCO).

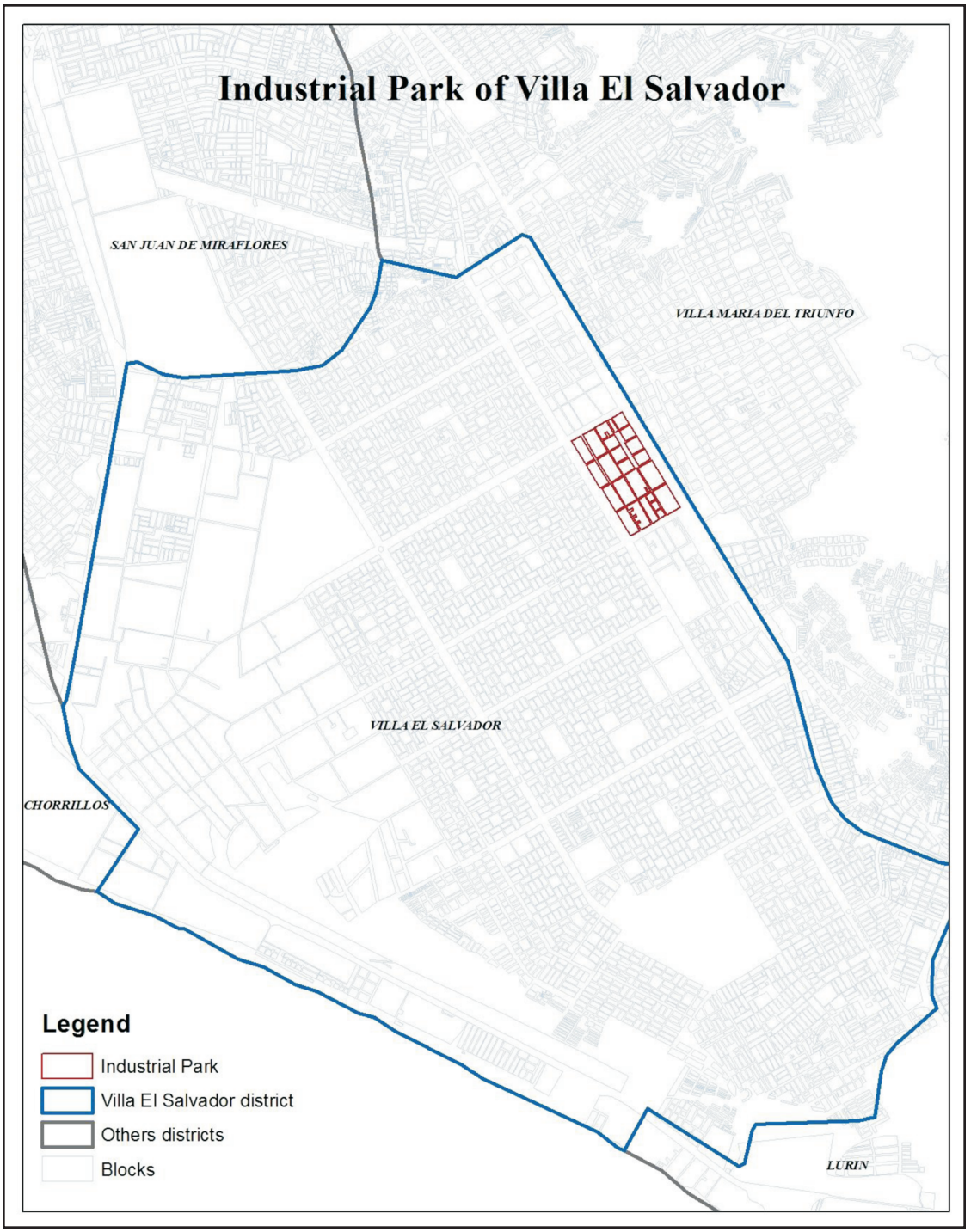
Zegarra, J. (2008). *La telefonía móvil entre los productores y comerciantes de la Feria 16 de Julio de El Alto, Bolivia* [Mobile telephony use among producers and vendors at the 16 de Julio Market in El Alto, Bolivia]. (Serie Concurso de Jóvenes Investigadores, 5). Lima: Diálogo Regional sobre la Sociedad de la Información-International Development Research Centre (DIRSI-IDRC).

Appendices

Appendix 1. Maps



Map 1. Lima Department, Metropolitan Area, and the District Villa El Salvador (VES).



Map 2. Industrial Park of Villa El Salvador.

Appendix 2: Selection of the Manufacture Sector and of the Carpentry Subsector

The sector was chosen based on the definition of microenterprise presented in the introduction to this study, on the agglomeration characteristics identified in the literature review and the analytical framework, and on statistical information about microenterprises in Metropolitan Lima provided by the National Household Survey (NHS) for 2009.

Due to the heterogeneity displayed among the productive units classified as *microenterprises,* as well as the exploratory and qualitative character of the current study, preference was given to those sectors representing an important proportion of all businesses. Only sectors that represent a minimum 5% of all businesses in Metropolitan Lima were preselected. Only six of the 16 "large productive groups" represent more than 5% of the total sample. These are: manufacturing (11%), construction (5%), wholesale or retail (33%), transport and storage (16%), food and drinks services (12%), and other services (9%). These six sectors represent 87% of the total sample of microenterprises in Metropolitan Lima.

Second, sectors were chosen that provided examples of "agglomeration" in Lima. The aim was to obtain evidence on the possible combinations of external economies and ICT use that would lead to increased use of the latter. Table A-1 shows the sector analysis according to these criteria. This study does not include the wholesale or retail sellers due to the size and heterogeneity of the sector. Therefore, two possible sectors remain:

1. Manufacturing: Represents 11% of all MSEs in Metropolitan Lima. Examples exist of apparent agglomerations that aim to benefit from external economies, such as textile manufacturing in Gamarra and the furniture industry in VES. Among the five potential industries, manufacturing possesses lower levels of informality, subsistence companies, and transient commerce (street vendors).
2. Transport and Storage: Represents 16% of all MSEs in Metropolitan Lima. Examples of apparent agglomerations are not as well known, nor do they reach the scale of the manufacturing sector. Furthermore, this is a sector with high degrees of informality, subsistence companies, and transient commerce.

Manufacturing companies were selected for the study because they are more accessible than the transport sector. They are less complicated to locate, they tend to be better organized, and the concentrations of businesses tend to be larger. The manufacturing sector was then split into 15 subgroups. From these, carpentry and cabinet-making were selected based on two factors: 1) the large proportion (11%) of all manufacturing companies working in this sector; and 2) the concentration of this sector in VES, which is well known.

Table A-1. Concentrations and Agglomerations in Lima.

Sector	Meets criteria?	Examples
Manufacture	Yes	Gamarra, VES
Construction	No	No known agglomerations exist, and the benefits that these companies would obtain in agglomeration are also unknown.
Wholesale or retail	Yes	Polvos Azules, Wilson
Transport and storage	Yes	There are agglomerations of removals transportation companies, but they are not well known.
Food and drinks service	No	Agglomerations do not exist among microenterprises in this field, but they do exist among medium-sized companies.
Other services	No	Some agglomerations of hairdressers and laundry shops exist, but they are not significant, and the benefits of mobile telephone use are unclear.