



Labor mobility and technology diffusion: A new concept and its application to rural Southeast Asia



Michael Hübler *

Leibniz Universität Hannover, Institute for Environmental Economics and World Trade, Königsworther Platz 1, 30167 Hannover, Germany

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ABSTRACT

We develop a new concept of rural technology diffusion influenced by labor mobility and business relations. The technology gain effect of labor mobility increases technology diffusion, whereas the technology drain effect decreases it. The concept is applied to survey data from the Mekong region, a new geographic area in this context. In the econometric analysis, which takes spatial correlation and geographic variables into account, technology is measured in the form of the number of mobile phones per village. The results support the technology gain and drain effects and show that labor mobility and business relations can help overcome geographic obstacles to rural development.

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1. Introduction

Advanced technologies, such as information and communication technologies (ICT), are often viewed as one promising way to overcome poverty traps. Therefore, it is important to better understand the drivers of technology diffusion within developing countries, especially in rural areas, and technology spillovers from abroad. Mobile phones play an extraordinary role in this context, because mobile communication systems can more easily and less costly be installed than fixed line systems. This allows the fast spread of mobile communication systems and services in developing countries (cf. Banerjee & Ros, 2004; Hahn & Kibora, 2008; Minges, 1999) even in rural areas, where geographic remoteness and insufficient infrastructure create obstacles to technology diffusion and prevent the installation of fixed line systems. Mobile phones are accessible and affordable for villagers even in remote rural areas. They enable mobile communication and provide access to information, for example about prices on agricultural markets, the weather, new political developments or the situation of relatives and friends. Access to communication and information is an important step forward in a situation of poverty and lack of perspectives to overcome it. Since mobile phones are widely used in Africa, a recent literature stream has examined determinants of mobile phone use with focus on Africa (see Section 2 and the summary by Buys, Dasgupta, & Thomas, 2009).

* Tel.: +49 511 762 19569; fax: +49 511 762 2667.

E-mail address: huebler@iuw.uni-hannover.de

Following this literature stream, we examine geographic and socio-economic attributes as well as existing technologies as indicators for rural technology diffusion, measured as the spread of mobile phones.

Whereas the literature has extensively scrutinized trade and foreign direct investment (FDI) as vehicles for international technology diffusion (cf. the overviews by [Saggi, 2002](#), and [Keller, 2004](#)), it has neglected migration. The literature leaves open, what role socio-economic networks through national and international labor mobility, business activities and other economic relations play for international technology spillovers and technology diffusion in rural areas. We fill this gap by asking the question: are labor mobility and business relations relevant drivers of rural technology diffusion measured by mobile phone use? We hypothesize that the national and international mobility of workers and business relations, for example via small-scale enterprises or joint economic projects of villages, create socio-economic linkages that enhance technology diffusion. We interpret technology diffusion in terms of the flow of technological knowledge, of physical technical devices as well as of the financial means that are necessary to acquire, use and maintain technical devices. We examine geographically differentiated measures (province, country, abroad as well as rural and urban) for labor mobility and business relations. Our survey data contain a rich set of economic and geographic indicators at the village level that allow us to study the economic and geographic integration of villages and the relation to rural technology diffusion.

Whereas former studies on the determinants and implications of mobile phone use focused on Africa, the literature on technology diffusion and economic development has so far neglected Southeast Asia. We fill this gap by focusing on the Southeast Asian Mekong region, which differs from Africa in terms of the political, economic and geographic conditions. More specifically, we study rural areas of the countries Thailand, Vietnam, Laos and Cambodia. Our study is one of the first that make use of the most recent survey data from villages in these countries for 2013 (data for Thailand and Vietnam for previous years have been introduced and applied by [Hardeweg, Klasen, & Waibel, 2012](#); [Hardeweg, Wagener, & Waibel, 2013](#)). Our study is the first that includes the survey data from Laos and Cambodia. Technology diffusion across villages is modeled in the form of spatial correlation of mobile phone use across neighbor villages. Although mobile phones are widespread in these countries, in 2013 mobile phone coverage still varied significantly across villages so that research into its determinants is promising.

We proceed as follows: Section 2 positions our work in the literature. Section 3 develops a new geographic concept of rural technology diffusion with the spotlight on labor mobility and business relations. Section 4 describes the data and the variables. Section 5 discusses the econometric results. Section 6 concludes.

2. Relation to the literature on technology diffusion

Our work is embedded in the following macro- and micro-economic literature streams.

2.1. Macro-economic studies

At the macro-economic level, an extensive literature has examined international technology spillovers driven by international trade and foreign direct investment and found mixed results (cf. the overviews by [Saggi, 2002](#), and [Keller, 2004](#); more specifically e.g. [Hübler & Keller, 2010](#); [Mazumdar, 2001](#), for energy intensities of developing countries; [Kretschmer, Hübler, & Nunnenkamp, 2013](#), for foreign aid; [Du, Harrison, & Jefferson, 2012](#); [He & Mu, 2012](#); [Xu & Sheng, 2012](#), for FDI in China). Another broad macro-economic literature has on the one hand identified the benefits generated by international migration of educated workers, especially via diaspora networks. It has on the other hand identified the drawbacks of international migration, especially the so-called brain drain (cf. the overviews by [Commander, Kangasniemi, & Winters, 2004](#), and [Kuznetsov, 2006](#)). Our work transfers this macro-economic view of migration to the micro-level. Though, not all countries can benefit from technology spillovers to the same extent. A prominent literature stream has identified a global digital divide with respect to information and communication technologies (e.g. [Chinn & Fairlie, 2007](#)). In this context, it has been shown that better education and policies that promote competition and economic growth foster the spread of mobile phones across developing countries and help overcome the digital divide, whereas higher (per capita) income is not necessarily a main driver of technology diffusion ([Dasgupta, Lall, & Wheeler, 2005](#); [Kiiski & Pohjola, 2002](#)). Though, independent moderate regulation of the telecommunication market is preferable over strict or no regulation ([Howard & Mazaheri, 2009](#)). Other results confirm income and policy as relevant determinants for the diffusion of information and telecommunication technologies (ICT), but question education and political freedom ([Balioune-Lutz, 2003](#)). In the following micro data-based study, we will test the impact of wealth and access to schooling on technology diffusion.

2.2. Micro-economic studies

For the micro-economic level, econometric and model-based approaches have been developed that describe the diffusion of technologies in developing countries, in particular the adoption of agricultural innovations (cf. the critical reviews by [Besley & Case, 1993](#), and [Doss, 2006](#); cf. [Berger, 2001](#), for an agent-based spatial model). In the following analysis, we model rural technology diffusion following the spatial-econometric view of diffusion processes with the help of spatial correlations of neighbor entities (cf. [LeSage, 1999](#); for a critical discussion of economics and spatial econometrics see [Corrado & Fingleton,](#)

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