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LEVERAGING DEVELOPMENT WITH TECHNOLOGY AND MICROFINANCE

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Abstract: *The poor are typically isolated, lacking opportunities and being deprived of necessary developmental assets such as proper communication and networking. Network theories may thus act as an original starting point for interpreting issues of poverty, which can be alleviated by combining basic technology with affordable funding programs such as microcredit. Value-adding technology, levered by microfinance, may then be sequentially added to the development paradigm. To the extent that technology and microfinance can be suitably combined, they may lever scalable productivity, in a way similar to Metcalfe's exponential upsides for networking organizations. This may happen for instance with M-banking, within a 'digital culture' environment, and with viral social networks, such as Facebook or Twitter, or Mobile Apps.*

Keywords: *poverty traps; microfinance; mobile banking; Metcalfe's networking; Mobile Apps.*

JEL Classification: *G21, H81, I30, L31, L86*

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The setting framework

This paper offers an innovative analysis of poverty traps (Collier, 2007; Bowles *et al.*, 2006) that keep the underserved paralyzed in their misery. Empirical evidence (Collins *et al.*, 2009; Albert *et al.*, 2014; Banerjee and Duflo, 2007) shows that the leftover are typically isolated, lacking opportunities and being deprived of necessary developmental assets such as proper communication and networking.

Network theories may thus act as an original starting point for interpreting issues of poverty, which can be alleviated by combining basic technology with affordable funding programs such as microcredit.

The paper is organized as follows:

1. Poverty traps and their cultural background are jointly mapped, starting from social and sustainable capital in rural environments;
2. Microfinance (MF) is then introduced, as a means for sustainable financial inclusion able to overcome some poverty traps;

2 I wish to thank my daughter Elisa for Her helpful comments. A "family" disclaimer applies.

3. Value-adding technology, levered by MF, is then sequentially added to the development paradigm.

This paper shows that culture shapes social capital and consequently can be used to interpret poverty issues. Poverty traps are considered systematically, with their connections and mitigation strategies that also include MF. The analysis of MF shows both its outreaching potential and its limits in the quest for sustainable financial inclusion.

Synergic and levered interaction of capital, investment, technology, and labour mobility threatens static societies and the porous perimeter of social capital. Development bottlenecks are consequently considered, showing how growth can be ignited and scaled up with a bottom-up approach starting from the base of the social pyramid. Technological devices such as Mobile banking or social media are eventually introduced, showing how they can soften bottlenecks, interacting with MF funding. Game changing strategies that combine MF with technology boost growth by leveraging social capital. Cultural consequences may however be uneasy to interpret, so needing further analysis.

Since the topics addressed are broad and would each require individual extensive treatment, the paper is aimed at a synthetic description of the critical matters. The thread followed should help the reader grasp the basic intuitions behind the evolutionary process that goes from tribal 'unbankability' to sustainable financial access, leveraging base technology with MF.

The paper ends with some conclusions and policy recommendations. Final remarks mainly focus on the interaction between intangible (technology-driven) networking and social MF, which stand out as powerful and under-investigated trendy issues.

Social capital and its ancestral roots: a 'cultural' interpretation

An interactive representation of the main poverty traps is connected to a cultural and anthropological representation of the concept of 'social capital'. Social capital is concerned with informal clan legacies and links (Moro Visconti, 2014a), holistically embracing the whole life of the poor, especially in rural areas. This 'social' dimension, which also includes funding issues such as 'social finance', is undergoing massive transformation processes: These are due to powerful interacting factors (e.g., globalization; migration to urban centres, etc.), which severely stress already ailing survival equilibria.

Social capital and its cultural background must be modified in order to become resilient to external shocks.

Social capital is an informal by-product of cultural norms that promote cooperation among individuals, reducing transaction costs and promoting associational life (Fukuyama, 1999) and collective action (Castiglione *et al.*, 2008). To the extent that capital is surplus cumulated value, its social dimension is also connected to intangible and stored growth, shared by a nexus of people.

Culture, defined in terms of prevalent values, traditions, mental attitudes, beliefs, identities and orientations (Harrison and Huntington, 2000) shapes social capital and strongly affects societal development. Pro-growth strategies reflect achievement capacity, hard work attitudes, honesty, seriousness, reliability, the thrift use of money and time, and willingness to invest in (self) education.

Cultures play a fundamental role in economic development, since it distinguishes those prone that are prone to development for those that are resistant (Landes, 1998; Ferguson, 2011). Within this context, it becomes evident that paradigm changes are sustainable in the long term only if coherent with the local culture.

An essential - even if often neglected - dimension of culture is given by the concept of time and by its psychological perception. Lonely time and passive living represent hopeless significant features that concern in particular the poor. Harrison (in Harrison and Huntington, 1999, p. 299) states that "progressive cultures emphasize the future; static cultures emphasize the present or past. Future orientation implies a progressive worldview - influence over one's destiny, rewards in this life to virtue, positive-sum economics".

Time is the critical parameter to examine the duration of misery, discriminating between chronic and transitory poverty.

Lack of long-term development strategies such as enlarging the 'ring of friends' beyond tribal boundaries may prevent growth achievements.

Obstacles to development, starting from poverty traps, are first of all 'cultural'. Unproductive cultures and limited knowledge, mixed with unkind traditions and inefficient conviviality, undermine competitiveness. This deficit is especially damaging in a world where, according to Porter's pioneering models, competitive advantage is based on proprietary knowledge combined with differential innovation.

Underdevelopment is a cultural state of mind, psychologically rooted in backward ancestral archetypes.

Social norms, shaped by backward cultural archetypes and old-fashioned traditions, affect the development and prove hard to change (Moro Visconti, 2014a). Static clan legacies and tribal bondage profoundly shape the life design and psyche of their members, defining their social dimension and affecting growth opportunities and choices. Unbanked social capital and family clan survival legacies, with tribal loyalty bonding, contribute shaping the cultural perimeter of rural backward environments.

This unsophisticated world is nowadays challenged by technological innovation, which disrupts clan survival safety nets.

The codified perimeter of clan membership, with its Manichean 'in' or 'out' belonging rules, is also threatened by desperate migration from rural sites to urban slums (Collier, 2013). Social media also threaten these ancestral social relationships. Networks, through their technological facilitators, represent relational districts that transcend geographical sources, flattening traditional hierarchical rigidities.

These issues are affected by globalization (Friedman, 2009), whose centripetal forces are however not homogeneous. On one side, physical obstacles and political issues limit migration and protectionism restrains the trading of goods. On the other side, there are intangibles that are intrinsically harder to block due to the viral power of technology.

Globalization, with its uneven impact on poverty (Harrison, 2007) challenges ethnic clan protective boundaries by exposing them to unprecedented confrontation. Preserving clan identities and 'biodiversities' (Moro Visconti, 2014a) against globalization, while favouring cross-cultural mixtures, is an increasingly critical value-adding strategy.

Lawless clans and unruly elites are naturally prone to exploit tokenism and resist change but risk to face, sooner or later, internal collapse.

On the other side, trust, ability, and incentives to cooperate - even beyond suffocating clan boundaries – mobilize talents and unleash unperceived potential. Extractive and inclusive institutions shape an ideal pro-growth habitat, securing property rights (De Soto, 1999), public services, and freedom to contract (Acemoglu and Robinson, 2012). Political centralization offsets local clan discriminations, supporting development. Communities dominate individuals, flattening distinctive differences and suffocating eclectic talents, leaving no room for 'tribal Leonardos'. On the other side, freedom fosters self-reliance and creativity.

Overcoming a gloomy background of interactive poverty traps

Chronic 'poverty' is a multi-faceted, complex and changing concept (Addison *et al.*, 2009; Banerjee *et al.*, 2006; Moro Visconti, 2014b), which goes far beyond social inequalities. It is foremost concerned with the failure of the destitute, due to their vulnerable socio-economic condition, to have a minimum set of essential capabilities. These developmental capacities include freedom, employment, nutrition, instruction, clothing, housing needs, primary healthcare, etc. Their absence may prevent the underserved - lacking social capital - from fully participating in labour and credit markets.

The institutional framework which rules the society (Fukuyama, 2005; Acemoglou and Robinson, 2012) and its connecting webs are also essential, since they provide the basic framework for sustainable development.

Misery scars represent the archetype of cultural backwardness, masterminding the economic lives of the poor and exacerbating their daily survival challenges.

The poor, living on a subsistence income, might be unable to save, especially in hard times (wars, epidemics and illnesses regarding humans, livestock or plants, Biblical plagues such as famine, drought or floods, hail …). When they succeed, they are often unable to find a safe harbour for their savings. Thefts, loans to relatives (rarely paid back), erosion caused by shrinking purchasing power in inflated economies are the main problems faced by 'poor savers'. Keeping cash under the mattress never proves to be a safe strategy.

Savings help poor households to smoothen consumption, keeping it above survival break-even when income is volatile.

In this gloomy environment, self-igniting poverty traps keep the destitute stuck in their misery. For the poorest, each birthday – a milestone through survival - may be a sad anniversary.

Table 1, adapted from Moro Visconti (2014b), illustrates taxonomy of the main poverty traps, mapping out and displaying them according to multi-disciplinary variables (geographical, cultural, social, economic, financial, etc.).

Table 1 Poverty traps and microfinance mitigation strategies

Poverty trap	**Description**	**Connections with other traps**	**Mitigation strategies**	**Impact of social capital / MF**
Land-lockedness	Countries without direct access to the sea may be isolated and subject to higher transportation costs.	The conflict trap, which fixes borders and blocks trade, especially in the presence of hostile neighbors.	Airplane connections, ICT, and other technological and virtual communications. Treaties with bordering coastal countries.	Negligible, since MF cannot reshape borders.
Natural resources curse	Improper and unfair exploitation of fossil resources, to the advantage of local crooks and multinationals.	The conflict trap, since oil revenues may finance wars and cause geopolitical conflicts.	International treaties and public opinion pressures. Competitive auctions among exploiters. Fair subdivision of proceeds.	Negligible, since extractive industries are highly capital intensive and so unfit for MF paradigms.

Poverty trap	**Description**	**Connections with other traps**	**Mitigation strategies**	**Impact of social capital / MF**
Demographic (over)growth	The poorest tend to over-reproduce themselves, sometimes beyond survival thresholds.	Illiteracy trap, especially for women: the lower the illiteracy, the more they reproduce.	Literacy, instruction, emancipation and job opportunities.	As a pro-women instrument, MF can significantly contribute to their emancipation, indirectly limiting excess fertility.
Conflict trap	Civil wars block development, destroying the economy.	Natural resources, uneven exploitation, overpopulation, unfreedom may all interact, igniting or prolonging conflicts.	Foster development, squeezing inequalities, promoting pluralism and reconciliation.	Pro-growth MF may give a (small) contribution to appeasement.
Hunger and malnutrition	The poor are often hungry; under-nutrition brings to deadly illnesses. Disease is a primary consequence of poverty.	It reduces school attendance and learning capacity (illiteracy trap), hampering employment possibilities, especially for discriminated girls.	Improve agricultural production; educate people upgrading hygienic standards; incentive better nutrition.	Economic progress, thanks also to MF, improves economic capacity and softens revenues volatility.
Water shortage	Thirst may limit or block economic activity.	Lack of regular rainfall exacerbates hunger, illnesses, conflicts and child mortality.	Development and improvement of hydraulic distribution systems.	Implementation of small economic activities (such as basic wells), backed by MF.
Climatic changes	Increase of the world temperature, with more volatile weather, causing environmental migration.	Potentially severe side effects on health and nutrition, exacerbating inequalities (World Meteorological Association, 2014)	Cutting CO_2 emissions and deforestation, using renewable sources of energy.	MF can sustain renewable energy micro-investments (Srinivasan, 2007).
Property trap	The poor often live in properties with no legal titling (De Soto, 2003), unfit to be sold, inherited or used as a guarantee.	Illiterate poor are unlikely to have real estate properties.	Expand the cadastral system and record property borders, solving land disputes.	Housing MF or clan sharing of accommodations can soften the problem.
Foreign debt trap	Underwriting of debt financed by foreign countries.	Interacts with aid for development, being a part of it when debt is forgiven.	Avoid over-indebtedness, relying on internal funding.	Foreign debt is a macro issue, whereas MF works on a micro level.

Poverty trap	**Description**	**Connections with other traps**	**Mitigation strategies**	**Impact of social capital / MF**
Income inequalities	Socio-economic differences, (spending capacity), between different social classes.	Most poverty traps unequally affect the population, sparing or privileging happy minorities.	Public choices, financed by taxation, support redistributive social programs. Since innovation widens inequalities, access to technology should be broadened.	MF can soften inequalities, providing access to otherwise unaffordable financial products. Development softens inequalities
Lack of energy	Energy access is crucial for productivity, boosting economic activities.	Landlockedness, conflicts and other institutional traps may block infrastructural investments, such as (expensive) power grids.	Reliable power allows longer working hours and better working conditions, boosting productivity.	MF (connected with micro-energy projects) allows financing of small onsite investments (Levaï *et al.*, 2011), connected to infrastructural backbones.
Language trap	Languages spoken by small and alienated ethnic groups isolate them	Linguistic landlockedness interacts with geographical, isolation.	Education, introducing a second spoken language, possibly English	Microfinanced technology, adapted to local idioms, can ease keyboard usage, access to Internet, etc.
Illiteracy	Analphabetism blocks instruction, keeping the poor segregated from knowledge economy.	Demographic overgrowth; lack of primary assets (teachers, schooling facilities).	Capillary investments in education, from basic levels to academic ones.	Social gatherings such as group lending and MF returns promote development and resources for school fees.
Digital divide (IT exclusion)	Lack of Internet and ICT access. Inequalities mostly depend on uneven access to technology (Diamond, 1997).	Language trap (lack of keyboards, Web sources, etc.); lack of energy.	Increasing Internet connections. Bridging top-down technologies with bottom-up applications.	Scalable M-banking proves cheap and useful.

Outreaching microfinance for sustainable financial inclusion

According to the United Nations' definition: "microfinance can be broadly defined as the provision of small-scale financial services such as savings, credit and other basic financial services to poor and low-income people."

MF is one of the most popular devices used to make social capital sustainable, providing basic funding to otherwise unbanked households. A synthetic description of MF is provided, within a social and rural underserved context, as a path-breaking invention to promote financial inclusion. The key for a feasible and progressive solution to the primary MF targets

– maximizing outreach and impact while preserving long-term, possibly unsubsidized, sustainability – is to insist on seeking for financial innovation, to find unconventional solutions to intricate problems. Whereas traditional asset-based lending may be unfit for intangibles with little collateral value, cash-flow based MF may suit better.

The main MF issues recalled, explaining why MF may work where traditional banking is unfit and how group lending can be conveniently connected to family clans and social capital issues.

Since MF is proving itself an exciting but also a limited means of financing, some critical issues inspired by these concerns are proposed, with particular attention to the trade-off between outreach and sustainability. In other words, the biggest threat which affects MF is probably given by the double challenge of making it simultaneously widespread ('outreaching' even the poorest to optimize financial inclusion) and self-sustainable in the long-term (functional also without the intervention of start-uppers).

This paragraph will synthetically show:

- The various reasons for which traditional banking is unfit for the poor (bottleneck issues, lack of guarantees, etc.):
- Important features of MF that can help overcome these traps (group lending, marketing approach to the client, complementarities of different financial products, etc)
- Drawbacks of MF (imbalances between demand and supply, high interest rates, etc), and explanation of the trade-off between outreach and self-sustainability
- The different evolutionary pathways of MF.

MF bottleneck issues, such as traditional lack of economic scalability (mainly due to the unitary high cost of any lending transaction, even to small borrowers), are critically considered, proposing some innovative solutions, which are for instance inspired by technological applications. These innovative instruments may be represented by Mobile banking, by now widespread especially in underdeveloped areas (such as Kenya, where M-Pesa collects some 8 million clients) and by consequent applications (branchless banking; computerized clearing and scoring systems, etc.).

Traditional banking systems are unfit for illiterate poor with no guarantees, while specific products for unconventional borrowers might prove successful in widening financial access. This could reduce inequalities and foster economic development. Financial innovation and flexibility are a key solution for innovative forms of lending without tangible collateral.

Lack of access to traditional sources of mainstream finance is often a critical element underlying persistent income inequality and slower growth (World Bank, 2008). Financial inclusion, driven by the removal of access barriers to financial markets, helps the talented poor with promising opportunities. Financial development also reduces income inequality (Beck *et al.*, 2007) and is a crucial facilitator of growth.

The most exciting promise of MF (for a general and also critical overlook, see Armendariz De Aghion and Morduch, 2010; Dichter, 2008; Moro Visconti, 2014b; Yunus, 2007) is that it may reduce poverty with a self-fulfilling mechanism. Once adequately ignited, it works without requiring continuous donations that often spoil and humiliate the poor, emptying the donors' pockets.

Unsubsidized sustainability and profitability combined with outreach to the underserved is the most ambitious and difficult goal of MF.

Microfinance institutions (MFIs) differ from traditional banks since they have to use innovative ways of reaching the poorest clients, unsuitable to mainstream institutions. This involves mixing unorthodox techniques such as group lending and monitoring, progressive

lending (if repayment records are positive), short repayment instalments, deposits or notional collateral.

Group lending, even beyond clan legacies, is the most celebrated MF innovation, making it different from conventional banking. Frequent repayments (short term instalments, starting immediately after disbursement) are another smart pragmatic device, avoiding balloon payments where the principal is all reimbursed at maturity. Given the financial illiteracy of many poor (which find it hard properly to understand that 'time is money'), postponing repayments for years to come would typically end up in a disaster, both for them and for the incautious lender. The dark side of frequent repayments is that they might prove unaffordable for the poorest, thus preventing sustainable outreach.

Another frequently unnoticed but important feature of MFIs – atypical in mainstream banks – is a marketing approach to the client: poor potential customers, especially from rural and under-populated areas, rarely know if a MF branch exists and where it is, cannot afford to travel long distances and suffer from cultural ignorance about financial matters.

Physically meeting a potential client is expensive and time-consuming, but proves useful both to reach him and his clan and also to reduce information asymmetries (getting acquainted with him and his family, life, job and environment) and to speed transactions, enforcing compliance. M-banking and other innovation devices can soften these inconveniences. Small loans bear high unitary costs of screening and monitoring, which substantially increase operating costs, without scale benefits that are possible only with larger loans.

Different financial products and institutions can usefully be complementary in serving the demand for credit, flexible and segmented according to the different needs of borrowers, taking into account cultural and developmental aspects. Group lending allows moving beyond moneylenders and penniless barter economy, trespassing clan legacies and financial exclusion.

Imbalances between demand and supply remain however huge and billions of potential MF borrowers are not entitled to access fair and regulated finance. This aspect is quite peculiar in a world which generally faces the opposite marketing problem (abundant supply in desperate search of new demand and subsequent fierce competition) and where global liquidity has never been so abundant (and thus cheap).

High-interest rates might prove too expensive and unbearable for borrowers, giving them opportunistic incentives and leading to moral hazard and higher probability of failure. Efficient technology can cut transaction costs and reduce lending rates (Vong and Song, 2015; Bakhrun et al. 2014).

MFIs generally operate according to one of the following three different evolutionary modes: bare survival, longer-lasting sustainability or full self-sufficiency (Pollinger *et al.*, 2007):

- In the bare survival mode, MFIs barely cover their operating expenses, facing a progressive erosion of the start-up sponsored capital and resulting unable to generate any retained resources for future operations. These institutions, unless continuously sponsored, are condemned to Darwinian selection and failure;
- Sustainability is concerned with the ability to secure longer lasting survival, reaching and keeping a break-even point between earned revenues and subsidies vs. fixed and variable running costs. Sustainable MFIs earn their cost of capital;
- Self-sufficiency is an even higher standard that enables to increase the quality and the number of products and reaching new clients.

According to standard evolutionary patterns, most MFIs start out as NGOs with a social vision, funding their operations with grants and concessional loans from donors and international financial institutions that provide the primary source of risk capital.

Empirical evidence shows that the provision of financial services to the poor requires subsidized loans (soft financing), at least for the start-up of simple and often informal banking activities, which can progressively transform themselves into regulated MFIs. Subsidies might include grants for capacity building, audit, staff recruiting, office building, ICT investments, etc., as well as the financing of the transition from NGOs to licensed banks.

Subsidizing is an unavoidable but dangerous start-up mechanism, which can spoil and humiliate the poor, unless they are properly trained for self-sustaining development.

Scalable development, beyond the foreign aid trap

Foreign aid funding is inspired by top-down strategies, challenged by bottom-up on-field solutions.

A balance between top-down and bottom-up approaches may be represented by blending ubiquitous technology with on-field feedbacks and implementation.

While technology, globally applicable everywhere (with little if any adaptation), follows an exogenous top-down deductive pattern, locally fine tuned MF is more influenced by bottom-up feedbacks.

Technology, if mindfully combined with (micro)finance, can ignite a Schumpeterian disruptive business model to sort out poverty entrapment, promoting self-sustainable growth – the theoretical dream of any economist. Without technology, catching up proves harder. According to the Economist (2014), the digital revolution is bringing sweeping change to labour markets in both rich and poor worlds. However, wealth creation in the digital era has so far generated little employment. The digital transformation seems to be undermining poor countries' traditional route to catch-up growth. Moving the barely literate masses from fields to factories has become harder.

Inculturation of growth strategies from the bottom of the social pyramid (Prahalad, 2006) widens the consensus and social sustainability of development strategies. The bridge between playfield MF and outsourced technology mixes bottom-up with top-down strategies. This methodological confrontation is familiar in the foreign aid literature, for example in the theoretical debate between Jeffrey Sachs and Bill Easterly. While Sachs (2005) advocates that poverty can be eradicated pouring money at the problem, with massive top-down foreign aid, Easterly (2008) backs a bottom-up strategy, consistently with Moyo (2009), who claims that foreign aid is not keeping its promises.

Top-down may have the following 'caustic' definition: take global decisions in one room and wait to see what happens; when this does not generate revolts, it is because most people at stake are not involved in decision-making, so it is possible to go on step by step to a no return point. Conversely, bottom-up may require exhausting on site cultural confrontation.

Collier (2007), investigating on poverty traps, contributes softening these controversial academic disputes.

Boosting development with Metcalfe's networking

Communication technology, levered by MF, can boost development, especially if ignited by exponential social networking.

Metcalfe's law states that the value of a network (*n*) is proportional to the square of the number of connected users of the system; in formulas, $n * (n-1) = n^2 - n$. This axiom characterizes many of the linking effects of communication technologies and Internet, but also social networking and related poverty issues.

The law has often been illustrated using the example of (by now out-fashioned) fax machines in the telecom industry: a single fax machine is useless, but the value of every fax machine increases with the total number of fax machines in the network, because the total number of people with whom each user may send and receive documents increases. Likewise, in social networks, the greater number of users with the service, the more valuable the service becomes to the community.

Even apparently closed and self-contained rural clans are increasingly exposed to path-breaking outside technological challenges and temptations. In particular, social media attract and fascinate the youngest.

The link between Metcalfe's networking principles and poverty issues is based on one fundamental aspect of deprivation, which is characterized by the intrinsic lack of any relationship with developmental nodes. In other words, the poor are needy mainly because they are isolated, stuck in their misery traps and unable to emerge without external help (such as social and sustainable capital). Any kind of networking (social and cultural; technological; economic, etc.), especially if synergistically combined, may significantly soften poverty traps with exponential effects that are scalable and self-fulfilling. Enduring sustainability can be enhanced by technologically scalable replication.

The network effect aggregates newcomers, acting as a magnet for the segregated poor. The negative side of this effect is network exclusion, with its underestimated sunk costs even in terms of loss of value: as a network grows in size and value, its outsiders face growing disparities (Tongia and Wilson, 2011). Poverty traps prevent networking connections, an effect that, if perhaps negligible in the past, is nowadays a core issue.

Foreseeable trends of development are increasingly influenced by both physical (e.g. for transports; TLC; energy storage and delivery, etc.) and intangible networks. The latter are in particular globally connected, going beyond spatial and temporal limits (everywhere; anytime and immediately, somewhat beyond Einstein's relativity) and fitting MF lending capacity.
Outsourcing and cloud storing represent technological devices that may soften local poverty entrapment.

It should however be recalled that the interaction of different variables, within a 'multi-outcome' network matrix, typically produces unpredictable results.

Figure 1 and complementary Table 2 jointly show how primary poverty entrapment, represented by an isolated starting knot, can be progressively softened. This is achieved by first solving survival poverty issues (such as nutrition and healthcare), and then investing in instruction – by far, the most powerful developmental asset. Technology can boost development, making it scalable, especially if connected with access to financial tools such as MF.

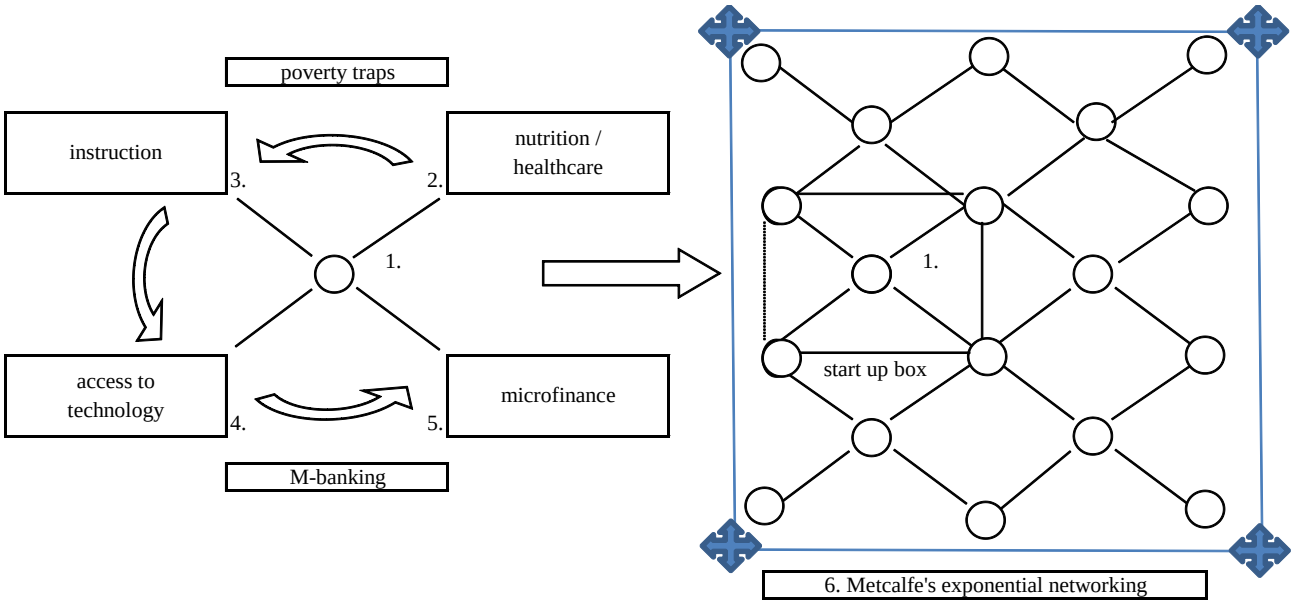

Figure 1 Boosting development with Metcalfe's networking

Table 2 Consequential steps of networking development

	Node (step)	description
1.	Fulcrum of poverty entrapment (start-up node / box)	Centripetal poverty prevents start-up of growth-enhancing networking, exponentially linking nodes with their multiple ties.
2.	Primary survival means	Nutrition and healthcare are the first antidotes against primary survival traps. They interact with instruction (see node 3) and other poverty traps solutions (summarized in table 2).
3.	Primary developmental assets	Instruction is the foremost primary 'software' behind braininess productivity, together with other intangible attitudes such as thrift, investment, hard work, organization, and discipline.
4.	Scalable technological applications	Technology, if properly combined with primary survival assets, makes productivity scalable and replicable.
5.	Leveraging socio-economic development with MF	When survival needs are backed by affordable entry level technology, they can be complemented by suitable funding (e.g., MF associated to basic technology, such as M-banking).
6.	Metcalfe's exponential networking	In the presence of a suitable background (satisfaction of survival needs accompanied by 'micro' funded technology), networking can boost productivity.

A still unanswered question concerns the relationship between MF and (Metcalfe) networking and its value adding connections. M-banking and social media, examined in the next paragraph, represent a paradigmatic example of how MF and technology can interact in order to boost development.

Social network capital, if properly used, may facilitate poor agents' escape from poverty traps (Chantarat and Barrett, 2012).

Viral development, from Mobile banking to social media applications

Social media represent the gathering interaction among members of the web where they create, exchange and share information and ideas in virtual communities (Ahlqvist *et al.*, 2008). They expand social networks between individuals or groups and can be categorized as "relational goods'. Creation and bridging, bonding and maintenance of social capital are for instance eased by Facebook (Johnston *et al.*, 2013; Antoci *et al.*, 2012b). Potential of virtual sharing economy (concerning car-pooling, accommodation sharing, etc.), where access overcomes property, is still mostly unknown and unexploited.

Evidence shows that backward environments are characterized by cultural segmentation factors, such as local idioms and oral traditions (unfit for codified recording and transmission of information), which slow down diffusion of social media. Lack of access to technology preserves rural environments from contamination but also segregates digital leftovers, preventing intangible-driven development. Assimilation of new technology depends on the technological level of the country, and the absence of education leads to poverty traps and economic stagnation of innovation laggards (Lopez *et al.* 2011).

Communication and the networking enabled by information and communication technologies (ICTs) are proving to be economically, socially, and politically transformative. The spread and appropriation of ICT has been a critical aspect of globalization and these technologies have central roles in openness and multi-task innovation.

The most remarkable change has been explosive growth in mobile phone access, giving ubiquitous access to people at the "bottom of the pyramid" by means of very low-margin, high-volume business models (Spence and Smith, 2010). Rooted in the notion of inclusive capitalism, the Bottom-of-the-Pyramid approach (Prahalad, 2006; Ansari *et al.*, 2012) argues for the simultaneous pursuit of profit and social welfare by creating markets for the poor. New consumers and innovative business models may contribute sorting out the latent goodwill that is naturally embedded but still unexploited in the poorest.

Innovation, initially stimulated by selfish monopolistic returns, eventually trickles down to the benefit of larger social networks, inspiring unprecedented business models.

Social media create an immaterial framework where horizontal relationships prevail over vertical ones, unsettling clan hierarchical legacies and tribal bondage that cause backward isolation.

Although the impact of new social media on poverty still lies under-investigated (and its analysis goes far beyond the already vast perimeter of this paper), it is evident that they are both an opportunity and a threat to underdeveloped ecosystems. Just to mention a few issues that may symbolize its importance, it may be recalled how libertarian and viral networking facilitated the instant diffusion of news, as it happened with YouTubers during the Arabian spring that shook Maghreb and Middle East since 2011.

Social networks, mobile phones, and other web applications are reshaping – not always for the better - the lives of billions of people, everywhere. Their invasive ubiquity is spreading even in rural areas, with earth-quaking effects on social capital.

Information asymmetries, for instance, may be consistently softened by the IT transmission of news, even with increasingly affordable smart-phones, improving awareness, accountability, knowledge, but also threatening privacy and confidentiality.

Mobile Apps connected to delivery platforms (such as iOS Apple or Google Store) provide B2B or B2C products and services. B2C social apps may conveniently link MF institutions with borrowers, cutting operational costs and boosting outreach.

Daily experience in Western countries of the pros and cons of breathless social media is potentially even more intrusive and challenging in unsophisticated environments, less complemented by other opportunities.

Social networks, with their virtual paradigms, reshape home-ground social capital, affecting its intangible critical components but also its real back-grounding 'hardware', such as physical wealth creation, sharing and storage. These three phases are interdependent and synergic, since sustainable and value-adding wealth creation is enhanced by proper social sharing and wise storage.

Diaspora networking, with social media and family chats, such as WhatsApp, reduces distances and eases composition of deported clans.

Since viral development necessarily relies on electricity, partnering MFIs with the energy sector may contribute opening new financial and energy markets, attract new clients to financial services and existing clients to energy services, and help poverty alleviation (Morris *et al.*, 2007).

MF, crowd-funding and peer-to-peer (P2P) lending increasingly contribute in backing seeding entrepreneurship (Bruton et al., 2014). The Internet has created new opportunities for P2P social lending platforms to emerge that have the potential to transform the way microfinance institutions (MFIs) raise and allocate funds for poverty reduction (Riggins and Weber, 2011).

Conclusions and policy recommendations

Development economists (Aghion and Durlauf, 2005; Sachs, 2005; Collier, 2007; Helpman, 2004; Pick and Sirkin, 2010) and historians (Landes, 1998) share a common vision that the wealth of nations is mostly attributable to long-term cumulated growth, averaging unavoidable ups and downs but eventually grasping stable upside patterns. Development is sustainable if it can prevent deceiving brief boom followed by destabilizing long gloom.

The inspiring chemistry of growth depends on a balanced interaction of labour and capital, cemented by technological innovation and levered by (micro)finance, to boost productivity with a sustainable cultural upgrading. Within this context, education and technology improve the best use of scarce means to satisfy social ends, eventually overcoming poverty traps. Social intelligence is a "brainy" software, represented by spicy cultural differences that are uneasy to be customized by technology.

Progress is the overall sum of many small achievements, occasionally catalyzed by path-breaking inventions. Opportunities to leapfrog technologies allow skipping certain phases of development, although jumping ahead requires prolonged effort and persistent stamina.

Well-being and the accumulation of social capital fundamentally depend on both material and relational goods and technology plays a crucial role in supporting a "socially sustainable" economic growth (Antoci *et al.*, 2012a). Financial, social, and human capital relationships are mediated by innovation and may be fuelled by MF (Bradley *et al.*, 2012). Development-enhancing productivity, embedded in pro-growth cultural attitudes, may so be properly exalted with technology and levered by suitable financial instruments such as MF.

All over the world, the population in rural and semi-urban areas is a major concern for policy makers as they require technology enablement to upgrade their living conditions (Chakraborti and Sugata, 2015). IT applications disrupt and re-engineer business models, easing mobile payments. Their impact on MF is astonishing, even if still underexploited.

To the extent that technology and MF can be suitably combined (Venkateswara and Hanumantha, 2012), they may lever scalable productivity, in a way similar to Metcalfe's exponential upsides. This may happen for instance with M-banking (Moro Visconti and Quirici, 2014), within a 'digital culture' environment.

Both MF and technology - the two core ingredients of the development 'recipe' proposed in this paper - are due to pander developmental strategic goals.

Anthropologists, sociologists, psychologists, together with economists, policymakers, and financial experts may contribute shaping developmental scenarios. Their common denominator should be inspired by cultural patterns, the primordial ingredient behind sustainable social development.

References

Acemoglu D., Robinson J.A. (2012) . *Why Nations Fail: The Origins of Power, Prosperity and Poverty*. London, Profile books.

Addison T., Hulme D., Kanbur R., eds. (2009) . *Poverty Dynamics. Interdisciplinary Perspectives*. Oxford, Oxford University Press.

Aghion P., Durlauf S.N. (2005) . *Handbook of Economic Growth*. Amsterdam, Elsevier.

Albert P.J., Werhane P., Rolph T., eds. (2014) . *Global Poverty Alleviation: A Case Book*. Berlin, Springer Verlag.

Antoci A., Sabatini F., Sodini M., (2012a) . The Solaria syndrome. Social capital in a growing hyper-technological economy. *Journal of Economic Behavior & Organization*, March.

Antoci A., Sabatini F., Sodini M. (2012b) . See you on Facebook! A framework for analyzing the role of computer-mediated interaction in the evolution of social capital. *Journal of Socio-Economics*, October.

Ansari S., Munir K., Gregg T. (2012) . Impact at the 'Bottom of the Pyramid': The Role of Social Capital in Capability Development and Community Empowerment. *Journal of Management Studies*, February.

Armendariz De Aghion B., Morduch J. (2010) . *The Economics of Microfinance*. Cambridge, MIT Press.

Bakhrun, A., Suhardi, Ramadani, L., (2014) . IT value implementation at microfinance sector, International Conference on Information Technology Systems and Innovation (ICITSI), , Nov. 2014doi: 10.1109/ICITSI.2014.7048267

Banerjee A.V., Bénabour R., Mookherjee D. (2006) . *Understanding Poverty*. Oxford, Oxford University Press.

Banerjee A.V., Duflo E. (2007) . The Economic lives of the Poor. *Journal of Economic Perspectives*, Winter.

Beck T., Demirgüç Kunt A., Levine R. (2007) . Finance, inequality and the Poor. *Journal of Economic Growth*, pp. 27–49.

Bowles S., Durlaf S.N., Hoff K. (2006) . *Poverty traps*. Princeton, Princeton University Press.

Bradley S.W., Mcmullen J.S., Artz K., Simiyu E.M. (2012) . Capital is not enough: innovation in developing economies. *Journal of Management Studies*, June.

Bruton, G., Khavul, S., Siegel, D., Wright, M. (2015) . New Financial Alternatives in Seeding Entrepreneurship: Microfinance, Crowdfunding, and Peer-to-Peer Innovations. *Entrepreneurship: Theory and Practice.* Vol. 39, Issue 1, pp 9–26, January

Castiglione D., Van Deth J.W., Wolleb G. (2008) . *The Handbook of Social Capital*. Oxford, Oxford University Press.

Chakraborti S., Sugata S. (2015) . Heuristic Algorithm using Internet of Things and Mobility for solving demographic issues in Financial Inclusion projects, http://arxiv.org/ftp/arxiv/papers/1503/1503.00369.pdf

Chantarat, S., Barrett, C.B. (2012) . Social network capital, economic mobility and poverty traps. *Journal of Economic Inequality*, September, Volume 10, Issue 3, pp 299-342.

Collier P. (2007) . *The Bottom Billion: Why the Poorest Countries are Failing and What Can Be Done about It*. Oxford, Oxford University Press.

Collier P. (2013) . *Exodus: Immigration and Multiculturalism in the 21st Century*. Oxford, Oxford University Press.

Collins D., Murdoch J., Rutherford S., Ruthven O. (2009) . *Portfolios of the Poor: How the World's Poor Live on $2 a Day*. Princeton, Princeton University Press.

De Soto H. (2003) . *The Mystery of Capital. Why Capitalism Triumphs in the West and Fails Everywhere Else*. New York, Basic Books.

Diamond J. (1997) . *Guns, Germs, and Steel: The Fates of Human Societies*. New York, Random House.

Dichter T., eds. (2008) . *What's Wrong with Microfinance?*. London, Malcolm Harper.

Easterly W., ed. (2008) . *Reinventing Foreign Aid*. Boston, MIT Press.

Economist (2014) . Wealth without workers, workers without wealth, October 4th, http://www.economist.com/news/leaders/21621800-digital-revolution-bringing-sweeping-change-labour-markets-both-rich-and-poor

Ferguson N. (2011) . *Civilization: The West and the Rest*. London, Penguin.

Friedman T.L. (2009) . *Hot, Flat, & Crowded*. London, Penguin.

Fukuyama F. (1999) . *Social Capital and Civil Society*. The Institute of Public Policy George Mason University, October.

Harrison A. ed. (2007) . Globalization and Poverty. NBER, Chicago, University of Chicago Press.

Harrison L.E., Huntington S.P., eds. (2000) . Culture Matters. New York, Basic Books.

Helpman E. (2004) . *The Mystery of Economic Growth*. Cambridge, Harvard University Press.

Johnston K., Tanner M., Lalla N., Kawalski D. (2013) . Social capital: the benefit of Facebook 'friends'. *Behaviour & Information Technology*, vol. 32, 1, pp. 24-36.

Landes D.S. (1998) . *The Wealth and Poverty of Nations: Why Some Are So Rich and Some So Poor*. New York, Norton & Company.

Levaï D., Rippey, P., Rhyne E. and Allderdice A. (2011) . *Microfinance and Energy Poverty: Findings from the Energy Links Project*. Center for Financial Inclusion. Publication No. 13

Lopez S.M., Molero J., Santos-Arteaga F.J. (2011) . Poverty traps in a frictionless world: the effects of learning and technology assimilation. *Structural Change and Economic Dynamics*, June.

Moro Visconti, R. (2014a) . Clan governance and landless social capital: an anthropological stakeholdership model. *Corporate Ownership & Control*, Vol. 11, Spring 2014, pp. 477-484.

Moro Visconti, R. (2014b) . *From microfinance to business planning: escaping poverty traps*, Stuttgart, Ibidem Verlag.

Moro Visconti, R., Quirici M.R. (2014) . The Impact of Innovation and Technology on Microfinance Sustainable Governance. *Corporate Ownership & Control*. Vol. 11, Spring 2014, pp. 420-428.

Moyo D. (2009) . *Dead Aid: Why Aid Is Not Working and How There Is a Better Way for Africa*, London, Penguin.

Pick S., Sirkin J.T. (2010) . *Breaking the poverty circle*. Oxford, Oxford University Press.

Prahalad C.K. (2006) . *The Fortune at the Bottom of the Pyramid*. Philadelphia, Wharton School Publishing.

Riggins F.J., Weber D.M. (2011) . *A model of peer-to-peer (P2P) social lending in the presence of identification bias*, Proceedings of the 13th International Conference on Electronic Commerce, http://dl.acm.org/citation.cfm?id=2378127

Sachs J.D. (2005) . *The End of Poverty: Economic Possibilities for Our Time*. London, Penguin.

Spence R., Smith M.L. (2010) . ICT, Development, and Poverty Reduction: Five Emerging Stories, USC Annenberg School for Communication & Journalism, http://itidjournal.org/itid/article/viewFile/616/256.

Srinivasan, S. (2007) . Microfinance for Renewable Energy: Financing the Former Poor. World Review of Entrepreneurship. *Management and Sustainable Development*, Vol.3, No. 1, 79-89.

Tongia, R., Wilson III, E.J. (2011) . Network Theory. The Flip Side of Metcalfe's Law: Multiple and Growing Costs of Network Exclusion. *International Journal of Communication*, vol. 5, 665-681.

Venkateswara K.S., Hanumantha R.S. (2012) . The paradigm shift in micro finance – Role of information and communication technology (ICT), *Asian Journal of Research in Business Economics and Management,* vol. 2, iss. 12.

Vong, J., Song I. (2015) . Mobility Technology Solutions Can Reduce Interest Rates of Microfinance Loans, in Emerging Technologies for Emerging Markets, Springer verlag, Berlin

World Bank (2008) . *Finance for All? Policies and Pitfalls in Expanding Access,* policy research report, Washington D.C., in http://econ.worldbank.org/.

World Meteorological Association (2014) . *Atlas of mortality and economic losses from weather, climate and water extremes (1970–2012).* http://www.wmo.int/pages/prog/drr/transfer/2014.06.12-WMO1123_Atlas_120614.pdf

Yunus M. (2007) . *Creating a World Without Poverty*. New York, Random House.