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Alleviating Poverty by Empowering Women through Business Model Innovation: M&SOM Insights and Opportunities

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Abstract

M&SOM has published papers of importance for poverty alleviation. Yet, rich opportunities for impactful research remain as yet untapped. OM insights suggest business model innovations that alleviate poverty by simultaneously empowering women, protecting natural systems or mitigating pollution, increasing incomes, and creating low-cost, high-quality products or services. OM researchers can help empower women and overcome poverty by developing, testing, refining and disseminating such business model innovations.

Keywords: Business model innovation; poverty; women’s empowerment; research opportunities; operations management.

1 Introduction

In celebration of the 20th anniversary of *M&SOM*, this article highlights *M&SOM* publications of importance for poverty alleviation and untapped research opportunities to push back poverty through business model innovation and empowerment of women.

Business model innovation creates value by identifying new ways to make, sell or deliver products and services. It stems from out-of-the-box thinking about operations. Many examples of business model innovation arise in business settings (e.g., see Girotra and Netessine 2014, Cachon 2018, and Cachon et al. 2019 in this Special Issue). Yet every organization – community, public sector, business or NGO – has a business model. An organization’s business model is, in essence, its recipe for creating value. Hence business model innovation is applicable to all organizations.

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This article examines opportunities for business model innovation to help the poor – in three interrelated ways. One way is by protecting natural systems and mitigating pollution. The poor suffer disproportionately from climate change that, among other negative consequences, threatens homes and food supplies by amplifying floods and droughts (see Atasu et al. 2019 in this Special Issue). The poor also suffer disproportionately from pollution, e.g., 40% of children in low-income countries suffer lead exposure that damages their brains (Prüss-Ustün, 2004) and reduces their lifetime earnings; the resulting losses in productivity amount to \$252 billion per year in Bangladesh and India alone (Attina and Trasande 2013). Each year diarrhoeal diseases kill 780,000 people, mostly children, and reduce the productivity of many more – because 4 billion people lack toilets and 2 billion lack safe drinking water (WWAP 2019).

The second is by increasing incomes. People can be compensated for protecting natural ecosystems. Eliminating pollution also increases incomes, by improving peoples’ ability to work. New business models that achieve these ends or restructure how work is done can increase the incomes of the poor. The vast majority of people in developing countries are self employed and lack resilience to recover from disruptions (Anderson et al. 2019). Financing and business model innovation can improve the resilience of micro-businesses.

The third is by providing low-cost, high-quality products and services. Providing the bare necessities of housing, electricity, healthcare, clean water, food and clothing, as well as consumer goods and services, directly improves standards of living. Providing access to education, transport, information, and to products and services that free up people’s time for work indirectly improves standards of living. Access to contraceptives, in particular, is crucial to enable women to work and to feed and educate the children that they choose to have. More than 200 million women in developing countries want to avoid pregnancy but lack access to contraceptives (UNFPA 2019) as do low-income women in parts of the U.S.; Texas recently reduced access to contraceptives, which increased childbirth by women on Medicaid by 27% (Stevenson et al. 2016). Worldwide, 40% of pregnancies are unplanned, and women in many countries have more children than they want (Sedgh 2014). Anthropogenic greenhouse gas emissions are proportional to the population size. Hence, in addition to directly alleviating poverty, providing access to contraceptives could greatly mitigate climate change.

Our focus in this article is on OM-inspired classes of business model innovation that help the poor in all three ways and especially help women. Empowering women is crucial for poverty alleviation, because women more than men invest their earnings into education of their children and family health (Dufflo 2012, Kalkanci et al. 2018). In many

impoverished parts of the world, women lack access to education, information, financing, mobility, and the best jobs. Kalkanci et al. (2018) discuss innovation through inclusion, of women in particular; please read their article before the remainder of this one.

In the remainder of this article, §2 presents business model innovations that can alleviate poverty, §3 reviews M&SOM publications of importance for poverty alleviation and highlights new research directions, and §4 draws some conclusions.

2 Business model innovations for poverty alleviation

Fundamental OM insights motivate three types of business model innovation with promise for poverty alleviation.

Moving down the diagonal of the product-process matrix

Business models of this type stem from applying product-process matrix thinking (Hayes and Wheelwright 1979) to sustainably provide low-cost, high-quality products and services plus work opportunities, especially for women.

"*Assembly line*" production – an efficient high volume process to deliver a standardized product or service at a low cost – is outperforming traditional project-style building methods in delivering high-quality, low-cost, green homes. BoKlok (joint venture between Swedish firms IKEA and Skanska) designed a standard two-bedroom home for low-income single mothers with children. The home is composed of two modules, each sized for transport by a flat-bed truck. The two modules (complete with bathroom, kitchen appliances, cabinetry, and all interior and exterior finishes) are factory-built, trucked to the home site, then rapidly put together by crane. BoKlok initially outsourced production to wood-working job shops, updated its product design based on feedback from customers, then invested in its own factories with worker-paced assembly lines. BoKlok purchases land and immediately sells the land with a completed home, reducing discounted cost relative to a traditional developer's approach of purchasing land before beginning the time-consuming project of on-site construction. With rapidly growing demand, BoKlok has expanded its offering from 2-bedroom homes to 3- and 4-bedroom homes and multifamily housing, using common modules. Much like an automobile manufacturer, BoKlok offers a variety of interchangeable interior and exterior finishes without introducing variability into the assembly line process. Material costs are lowered through high-volume procurement, process optimization to reduce waste, and avoiding the weather-related damage inherent in on-site construction. BoKlok homes are highly energy-efficient (having a tight building envelope due to high conformance quality on the assembly line) which reduces energy costs for customers and reduces greenhouse gas emissions. Indeed, through material-

and energy-efficiency, BoKlok greatly reduces the greenhouse gas emissions over entire life cycle of a building, which is important because buildings contribute an estimated 30% of anthropogenic greenhouse gas emissions (Lepech et al 2018). BoKlok creates safe and well-paid work in the assembly process for low-skilled workers. Labor costs are lowered because work is better coordinated and is accomplished by lower-skilled workers on the assembly line than in traditional on-site construction. Whereas women account for less than 1% of traditional construction workers, women account for 20% of workers in BoKlok’s factories (Lessing, 2019). Another leader in factory production of buildings, Katterra, co-founded by a former CEO of Flextronics, transfers assemble-to-order and supply chain management methods from the electronics industry to the building industry. On a recent visit to the Katterra factory in Phoenix, the authors observed a majority of women among the workers. A teaching case (Lepech et al. 2018) describes how Katterra, BoKlok, Toyota and other innovators have moved down the diagonal of the product-process matrix, from the traditional construction project to assembly line production of buildings.

In 2009, a self-taught inventor from a poor village in Southern India, Arunachalam Muruganantham, developed a machine and simple assembly line process for making low-cost sanitary napkins. This is already deployed in more than 2,100 villages in India, wherein women produce and market the low-cost sanitary napkins to women who previously could not afford sanitary napkins – creating a very high volume of demand. In India, 600 million women (88% of all women) lack access to affordable sanitary napkins, causing them to drop out of school at puberty and to miss work during menstruation. Women use dirty rags as a substitute; too embarrassed to hang these to dry in the sun, they contract infections due to poor menstrual hygiene. Muruganantham’s product-process innovation has already spread from India to more than 12 developing countries including Nigeria and Nepal (Bhattacharjee 2016). In short, Muruganantham’s innovation employs women in many developing countries in a high volume process, supplying a product needed by many hundreds of millions of women to go to school and to work and to be healthy. It creates a huge market where there was none.

The Aravind Eye Hospital in India, the largest eye care provider in the world, serves about sixty percent of the eye volume of the U.K’s National Health Service at one-hundredth the cost (Health International 2011), with as-good-or-better outcomes. An assembly line approach to complex eye surgery is key to Aravind’s low cost and high quality of care – both of which are achieved through standardization, high volume, and labor efficiencies. A surgeon performs *only* those tasks that require a surgeon’s level of experience and expertise. Other tasks are done by mid-level-ophthalmic-professionals

– young women from rural areas who have a high school degree and a few years of experience at Aravind (Ramdas et al. 2012). It is very uncommon in rural India for young women to be permitted to live away from home, or, for that matter, to be formally employed. Aravind offers on-campus staff quarters to ensure safety, which also eliminates transportation and the associated environmental impacts.

Beleza Natural takes an assembly line approach to provide high-quality hair care at very low cost. Beleza has grown rapidly in Brazil by targeting a large, under-served market of women of African ancestry, and celebrating their curly, wavy hair (countering pressure for hair-straightening to achieve a mainstream ideal of beauty). Beleza employs many of its women customers. Beleza’s service also boosts women customers’ incomes by improving their presentability and self confidence; as one customer explained "it raises my self-esteem. I feel encouraged to try...a new job."¹ A teaching case (Besbes et al. 2012) describes Beleza’s business model and operations.

These high volume assembly lines mitigate climate change by serving customers with less building space (and associated CO₂ emissions). Aravind completes a much higher volume of surgeries per unit of operating space than traditional providers. A Beleza Natural salon serves many hundreds of customers per day, a much higher volume than a traditional haircare salon, without much more building space.

“*Shared delivery / batching*” of services is one subtype of a broad class of business models that stem from increasing the client-to-provider ratio in the traditional interaction between service provider and client (Ramdas et al. 2012). For example, in a shared medical appointment, patients with similar ailments meet with a doctor as a group. Each patient receives full one-on-one attention while the others listen in. Physician productivity increases, because common advice need not be repeated and the physician is not idled by no-shows and late arrivals. This business model is particularly suited to poorer communities where a greater likelihood of no-shows results in high wastage of one-on-one slots, and where the (often more affluent) doctor may know less about available lifestyle choices than peers. The Cleveland Clinic has found that shared appointments are a value-enhancing substitute for one-on-one appointments, improving patients’ health outcomes (Ramdas and Darzi 2017). Patients serve each other by asking questions, sharing information and providing support. Patients spend more time with the physician, while the physician’s time per patient decreases. For example, in cardiac preventive care, a one-on-one appointment slot is 30 minutes long and the typical wait is 6-8 weeks. In contrast, 6-10 patients can be seen in a 90-minute shared appointment for the same ailment, with a wait of a just few days. This prompt access to care also improves health.

¹<https://nextbillion.net/beleza-natural-valuing-brazilian-womens-self-esteem/>

Women often opt into less rigid work schedules than men do², so have flexibility to participate in a shared appointment without forgoing income – the Cleveland Clinic finds that more women than men attend shared appointments for chronic disease care. U.S. insurance providers currently pay physicians the same amount per patient in a shared appointment as in a one-on-one appointment because the construct of a shared appointment mirrors one-on-one medical care and quality. Thus shared appointments improve efficiency while both increasing providers’ revenues per unit of physician time and maintaining the care level of a one-on-one appointment. There is opportunity to explore new business models that share part of this value with patients to compensate them for providing their service and their time. Shared delivery could be adopted in other traditionally one-on-one services such as legal advice, tax services, etc., where the resulting lower costs would enable much wider access.

Services that provide advice, information and education through a phone or computer connection, rather than face-to-face, also can expand access and enable efficiencies of scale. Rural women and children stand to benefit from telemedicine, for example, because they face considerable difficulties travelling alone to a medical clinic, which for many requires several hours or even days of travel. Online education combines remote delivery with batching. §3 highlights M&SOM papers on business models that expand access to electricity and light – necessary infrastructure for telemedicine and education.

Batching and/or remote delivery of services increase incomes by improving health, education, and access to information. These business models use buildings more efficiently and can reduce transportation, thus lowering the environmental footprint of services.

Table 1 provides a summary of business models that alleviate poverty by moving down the diagonal of the product-process matrix. <insert Table 1 here>

Shifting organizational boundaries

In “*boundary-shifting*” some work involved in meeting clients’ needs is reassigned to a different service provider or to/from the clients themselves (Ramdas et al. 2012). OM thinking inspires valuable business model innovation through boundary-shifting. For example, process mapping from a customer’s perspective illuminates boundary-shifting opportunities to meet all the customer’s needs through a single “one-stop” service. Cardiac preventive care involves weight management, traditionally delivered through external peer-support groups such as Weight Watchers. Shared medical appointments for cardiac

²The longer time commitment for a shared appointment might conflict with work, particularly for those who face rigid work schedules. Women tend to engage in informal or part-time work that offers flexibility in work hours albeit at the cost of lower wage rates and benefits (Chen et al. 2006, Blau and Kahn 2017).

preventive care provide that peer-support service within the doctor’s office. At Cleveland Clinic shared appointments in inner-city and less-resourced communities, women patients learn from their peers and healthcare experts about how to buy healthy, within-budget ingredients at local supermarkets and form community-strengthening bonds.

Shifting boundaries results in better resolution of clients’ needs. Most hospitals examine patients who present themselves, and provide treatment without ensuring compliance to the treatment advice. Thus patients often come to the hospital in late stage of disease. This hurts outcomes, as does non-compliance with the prescribed treatment advice. To address these problems, Aravind has extended its organizational boundaries to include the entire care pathway. They run eye camps and have opened telemedicine centers in rural areas, to screen for early-stage eye disease. In their hospitals, they employ counselors – also young women from rural areas, with high school education and caring, outgoing personalities – to help patients understand the doctors’ orders and thus improve their compliance to treatment.

Boundary-shifting can also address a bottleneck. For example, in West Africa, women spend a great amount of time pounding yams into fufu – time during which they cannot generate income. A recently-invented pounding machine greatly reduces the amount of time needed to do so. An entrepreneur with the machine can pound fufu for women customers, freeing those women for income-generating work.

To mitigate lead poisoning in Bangladesh, we propose shifting the work of grinding turmeric. Widespread in Bangladesh, lead exposure causes anemia, weakness, nausea, depression, heart and kidney disease and other maladies, limiting people’s ability to earn income and burdening women who care for sick members of their families. Lead exposure is most problematic for fetuses and children, permanently damaging their brains and reducing lifetime earnings. In Bangladesh, turmeric roots are often polished with lead chromate before being ground to powder for final sale. The lead chromate intensifies the yellow color (and hence perceived quality) of the turmeric. Isotopic analysis matches lead in the blood of Bangladeshi women to that lead chromate (Forsythe et al. 2019). Lead chromate adulteration is visible by inspection of turmeric root, far more easily than in the powdered spice. Hence families could avoid lead by buying unadulterated turmeric roots and either grinding them at home (as women did historically) or watching a grinding-service-provider do so.

Turning to k-12 education in the U.S., we first identify needs for innovation and next propose a candidate, boundary-shifting innovation. Over the past 3 decades, U.S. public k-12 education has become increasingly segregated by race and socio-economic class and

increasingly inequitable³, and the U.S. federal government has retreated from its role in school desegregation (George and Darling-Hammond, 2019). Voluntary programs that transfer students into a better-resourced school can improve educational outcomes and equity, but must provide bus transportation free-of-charge to attract low-income families to participate (Brittain et al. 2019) though congress prohibits use of federal funds for transportation to desegregate schools (Kahlenberg et al 2019). Typically, to cut costs, a bus stops at multiple schools, and transfer students suffer long, chaotic bus rides and arrive at school late and unsettled (Lit 2009). In Boston, operations researchers redesigned school start times and bus routes to reduce costs and kids’ transit times, and give more sleep to high school students – especially economically disadvantaged ones (Bertsimas et al. 2019). Elementary schools would start and end earlier, to enable high schools to start later. Unfortunately, that would require elementary school students’ parents to change their work schedules or pay for after-school care – a particular challenge for low-income parents. Objections from parents and the NAACP and Lawyers’ committee for Civil Rights and Economic Justice derailed the changes. (Scharfenberg 2018)

We propose a boundary-shifting innovation: to engage parents in providing before- and after-school care and as bus monitors, creating flexibility to shorten kids’ bus rides and operate with fewer busses and drivers, thereby lowering bussing costs. In many cities, including Boston and Palo Alto, busses are age-segregated to carry elementary or older students, not both, even though multiple elementary schools are co-located with middle or high schools. Engaging a parent to monitor students’ behavior on a bus would enable the bus to carry all students from a neighborhood to co-located schools, as opposed to travelling a longer route with stops at more elementary schools in order to have a full load. Moreover, in the morning, a bus monitor could walk students from a bus stop to school, enabling a bus to release students that attend nearby schools at a single stop, rather than driving around in traffic to stop at all of those schools.⁴ Another

³The fraction of African-American students attending majority-white schools has fallen from 44% to 20%. The fraction of hyper-segregated schools (in which 75-100% of students are poor and either African-American or Latino) has increased to 16%. Those hyper-segregated schools offer disproportionately fewer math, science and college-prep classes, and have higher rates of students being held-back, suspended, or expelled. (US GAO 2016, Orfield et al. 2016, George and Darling-Hammond 2019). More generally, “schools where racial minorities predominate tend to be sites of concentrated poverty. This would not be so bad if schools attended by large proportions of poor kids still managed to provide decent educations to their students. Typically, they do not. The resources that are consistently linked to predominantly white and/or wealthy schools help foster real and serious educational advantages over minority segregated settings.” (Bridges, 2018).

⁴In Palo Alto, for example, Fairmeadow Elementary School and JLS Middle School are co-located, and the walk from Fairmeadow to Hoover Elementary School is 0.3 miles through a lovely park, without crossing any roads. Driving to stop at both Hoover and Fairmeadow would add 1 mile through heavy traffic and stoplights plus an additional stop, amounting to 15-20 minutes of extra work for bus and

opportunity is to engage parents to deliver before- or after-school exercise or supervised play, coordinated with bus routes and schedules. Online training for parents to lead a Build our Kids Success exercise program, for example, is free of charge. Whereas in many cities including Palo Alto a bus and driver deliver just one busload of students to school each the morning, establishing before-school exercise programs at selected elementary schools could double the bus and driver's productivity: a bus and driver could first deliver one load of elementary students then pick up and deliver a load of high school students. Imagine a hub-and-spoke system with a before-school exercise program at a hub elementary school; busses could transport elementary school students to the hub to participate in the exercise program and afterwards other busses could take students to their spoke elementary schools. Low-income parents and kids especially would benefit from extension of kids' productive day at school⁵. With a bus leaving earlier in the morning and departing later in the afternoon, some parents could more easily serve as bus monitors, riding the bus en route to and from their own workplaces. Engaging parents as bus monitors and providing before- and after-school care would promote community and connection among parents, teachers, and students, enabling them to brainstorm and cooperate to improve students' overall experiences before, during and after school. Insofar as mothers more than fathers are responsible for their kids before and after school, this boundary-shifting innovation could especially increase womens' incomes, either through the pay for providing before- and after-care and safe transport for a busload of children including their own, or opportunity to take a better-paying job during kids' extended school day.

Other innovators are engaging women in developing countries to hand-make exquisite garments, carpets jewelry, etc. for sale at high prices at high-end local or foreign retailers. In Afghanistan, where war destroyed male-dominated handicraft industries, NGO Turquoise Mountain trains women in making carpets, jewelry and other handicrafts for export. In Turkey, MOM&I trains older women who have never worked outside the home to make beautiful, labor-intensive necklaces using low-cost beads, for sale abroad⁶. In Kenya, social enterprise Soko trains artisans via video and an app on their cell phones to hand-make jewelry for export (Araman et al. 2019). In India, traditionally, men

driver and extra transit time for students on the bus.

⁵Low-income parents tend to lack flexibility in their work schedules and often struggle to find affordable before- and after-school care. For students, participation in sports and extracurricular activities is strongly associated with improved educational outcomes and lifetime earnings for students. In recent years, participation in sports and extracurriculars has increased among students from high-income families, whereas students from low-income families are lacking such opportunities. (Snellman et al. 2015)

⁶<https://momandibyek.com/>

wove fabrics at home on handlooms, and women did the lower-skilled supporting work like reeling thread. Today, men take up more lucrative jobs further from home so handloom fabrics production has plunged. Women, who are more home-bound, benefit from training to operate the idle looms. Handloom production may also be environmentally friendly⁷. All these business models raise operational challenges in the delivery of materials to women in their homes and collection of finished work from them. Operating with small batches and quick feedback improves quality and reduces inventory costs, but requires more frequent delivery and collection (Araman et al. 2019). Home-based work is usually unregulated, which can result in low pay, long hours and other inequities. Local NGOs have stepped in, in India, to monitor these important aspects of home-based production for international brands.

Table 2 contains examples of business models that push back poverty by redefining organizational boundaries. <insert Table 2 here>

Incentivizing local people to protect nature

Innovation is needed now to sustain and restore nature and the life-supporting services nature provides to humanity. Forests, for example, sequester carbon, harbor the pollinators essential for nearby agricultural production, and provide a smoothed flow of clean water to downstream communities. Yet deforestation is rampant in developing countries as local people, unable to capture the widespread value generated by forests, seek profit and livelihoods through agricultural or other uses of deforested land. Pollinator loss alone threatens \$577 billion in annual global crops. Many of the world’s poorest communities reside in the areas most impacted by losses in ecosystem function.⁸ Fortunately, these people could be incentivized to sustain and restore natural ecosystems and their services to humanity.

Business model innovation to sustain natural ecosystems can alleviate poverty in two important ways. The first is to pay or otherwise incentivize local people (often the rural poor) to restore and protect natural ecosystems. The second is to alleviate climate change, floods, droughts, and water scarcity and poor quality, which disproportionately impact the poor and can be cost-effectively mitigated through natural solutions (Atasu et al. 2019, WWAP 2018 and 2019).

⁷Exquisite, comfortable and classic, *one* handloom garment may substitute for *multiple* cheap, mass-produced “fast fashion” garments. Handloom fabrics often are made with natural vegetable dyes, cotton and silk, eliminating water pollution associated with synthetic dyes and fabrics. In-home production eliminates the need to build factories and for workers to travel to factories, eliminating the associated CO₂ emissions. An open question, however, is whether in-home production results in higher environmental impacts associated with transportation.

⁸<https://www.ipbes.net/news/Media-Release-Global-Assessment>

National governments in Costa Rica and China have innovated in providing incentives for local people to protect forests. The leader in paying people to protect and regenerate forests, Costa Rica transitioned from having the world's highest deforestation rate to achieving net reforestation. Responding to catastrophic floods and drought, dam siltation resulting in loss of hydropower, and other adverse consequences of deforestation, China's government has started paying 120 million households to convert barren land and cropland into forest and grassland, in areas spanning 45% of China; this financial transfer is also intended to alleviate rural poverty. (Guerry et al. 2015)

To halt illegal deforestation in Indonesia, multinational palm oil buyers could engage their suppliers, the palm farmers that live nearby and within the forests. Those farmers suffer from delay in payment for their palm fruit. To motivate forest protection, palm oil buyers could eliminate payment delays to farmers in communities wherein no illegal palm production occurs on newly deforested land, monitoring compliance via satellite (DeZegher et al. 2018).

Within increasingly many a watershed in Latin America and Africa, water-using firms (Coca-Cola, AB InBev, hydroelectricity generators, etc.), NGOs (WWF, The Nature Conservancy, etc.) and the local city government contribute to a water fund to increase quality, quantity and reliability in the local supply of water, by paying people upstream to conserve natural areas, remove invasive species, fence cattle away from streams, adopt sustainable farming practices, etc.⁹ (Guerry et al. 2015) Women have been largely excluded, as men predominantly hold the decision-making roles in business and government and the property rights to land and water. Yet women have distinct knowledge and abilities to contribute to natural resource management, and investing in women offers great returns in societal welfare.¹⁰ Women smallholder farmers have disproportionately little irrigation water, financing, or information about best practices. Women do most of the arduous, unpaid work of collecting water, preparing food, washing, and caring for relatives with water-related illnesses. Hence the innovative Upper Tana-Nairobi Water Fund in Kenya targets women, elevating women to leadership and decision-making roles and providing women farmers education and financing for soil and water conservation, thereby raising their agricultural productivity while improving the supply of water to Nairobi.¹¹ That water fund is one of many ways in which Coca-Cola profitably targets education

⁹<https://www.coca-colacompany.com/stories/water-funds-effective-solution-global-water-challenges>

¹⁰<https://unchronicle.un.org/article/women-and-agricultural-water-resource-management>
<http://www.ecosystemmarketplace.com/articles/water-funds-can-promote-gender-equality-br-but-not-without-a-nudge/>

¹¹<https://www.nature.org/en-us/about-us/where-we-work/africa/stories-in-africa/the-weight-of-water/>

<https://www.coca-colacompany.com/stories/water-funds-effective-solution-global-water-challenges>

and financing to women entrepreneurs in its value chain; Kalkanci et al. (2018, p. 9-10) describe others.

Table 3 summarizes business models that alleviate poverty by incentivizing people to protect natural systems. <insert Table 3 here>

3 Alleviating Poverty – Growth Direction for M&SOM

Especially in recent years, our *M&SOM* journal has published papers of importance for poverty alleviation. For example, (Kazaaz 2004, Boyabatli et al 2017, de Zegher et al 2019) address farming and commodity-processing in developing countries which, according to the World Bank (2014), is crucial for poverty alleviation because 78% of the poor live in rural areas and mostly work in agriculture. Motivated by the fact that a billion people lack electricity so burn kerosene for light, causing blindness and disease, Uppari et al. (2018) study a servicizing innovation: distribute a rechargeable electric light and provide recharging service, for a small fee per recharge. Another servicizing model is to distribute a solar photovoltaic system, collect frequent small payments for its use, and deactivate the system when a user fails to pay¹². Guajardo (2018) finds empirical evidence that operational efficiency is higher with servicizing than outright sale of solar photovoltaic systems. M&SOM publications also tackle crucial challenges for health care in developing countries (Long et al 2018, Deo and Sohoni 2015), in humanitarian operations management (Natarajan and Swaminathan 2014) and in enabling the rural poor to acquire cell phones (Yu et al. 2017). The rich M&SOM literature on CO₂ emissions reduction (surveyed in Atasu et al. 2019) stands to alleviate poverty by mitigating climate change. As poor populations suffer disproportionately from exposure to lead and other toxic substances, M&SOM publications on eliminating toxic substances from products (Babich and Tang 2012, Kraft et al. 2013), on responsible recycling¹³ (see Atasu et al. 2019) and on buying firms' auditing and other approaches to mitigate pollution, health and safety violations in factories in developing countries (Caro et al. 2018, Chen et al. 2019, Liu et al. 2018, Kalkanci and Plambeck 2019, Plambeck and Taylor 2016) also are relevant.

OM researchers have published papers of importance for poverty alleviation in other journals – more so in recent years – and much work is in-process. We cite just a few of

¹²<http://www.m-kopa.com/>

¹³Irresponsible recycling, particularly of lead acid batteries and electronics waste, causes deaths, disabilities and diseases in developing countries. <https://www.who.int/ceh/risks/ewaste/en/>
<https://apps.who.int/iris/bitstream/handle/10665/259447/9789241512855-eng.pdf;jsessionid=E81A2FF4D0663388C5239E04040E1577?sequence=1>

those papers here. OM researchers have published conceptual frameworks for business model innovation (e.g., Cachon 2018, Girotra and Netessine 2014, London and Anupindi 2012, London et al. 2010, Ramdas et al. 2012), for increasing adoption of radical business models (Ramdas and Darzi 2017), and for exploring new research opportunities (Kalkanci et al. 2018, Sodhi and Tang 2014, Swaminathan 2018). Frameworks such as these highlight challenges in poverty alleviation and opportunities to use innovative business-model thinking to overcome them. OM researchers have evaluated the impact of new business models that target underprivileged populations (e.g., Parker et al. 2016 study an information service for poor Indian farmers; Delana et al. 2019 study telemedicine in India; Guajardo (2019) examines payment and usage behavior for rent-to-own solar lamps in developing countries in Asia and Africa; Kundu and Ramdas 2019 study how after-sales service impacts solar technology adoption in Uganda) and examined operational aspects of new business models using the needed methodologies (e.g., Acimovic et al. 2018 study mobile-money agents' training in Kenya while Araman et al. 2019 study quality feedback to artisans, also in Kenya; Jonasson et al. 2015 study optimized AIDS diagnostic testing in Mozambique; Chen et al. 2018 study healthcare products delivery in Africa). OM insight on how donors can best increase access to antimalarial drugs (Taylor and Xiao 2014, Kazaz et al. 2016, Levi et al 2017) could extend to increasing access to contraceptives. Uppari et al. (2019) use structural estimation to identify promising counterfactual business models, and test these in field experiments with a Rwandan rechargeable electric light provider.

Poverty, combined with climate change and population growth, poses huge challenges for humanity. OM researchers – and our journal M&SOM – have a special role to play in helping meet these challenges. Other disciplines – including economics, sociology and medicine – have a much longer history of research in poverty alleviation. Yet as OM researchers we bring a fresh perspective and create value through nitty-gritty process thinking. Also, unlike those other disciplines, we are in the business of training future business leaders. Given our close connections with business, we are uniquely positioned to work with businesses to help alleviate poverty.

Despite all the recent work to alleviate poverty by OM researchers, ample opportunities abound. For example, the OM community has not yet tapped the rich research opportunities to reduce the emissions of greenhouse gasses other than CO₂, adapt to climate change, provide sanitation and clean water, and more generally to incentivize local people to sustain natural ecosystems and their services to humanity. To the emerging science and practice of payment for ecosystem services, we as OM researchers have much to contribute, because we have expertise in providing incentives for suppliers, and in the

sorts of stochastic, dynamic modeling and analysis required to understand and protect natural ecosystems.

Most exciting to us is the untapped opportunity to focus on women as engines for poverty alleviation. Targeting women for inclusive innovation is crucial (Kalkanici et al. 2018). Focusing on the specific opportunities, challenges, and perspectives of women in developing economies opens new avenues for OM research. OM researchers, for example, have expertise essential to improve the distribution of contraceptives and the provision of education and healthcare to the benefit of underserved women.

We searched for the words “women,” “girls,” “female,” “gender” and related words in the keywords, titles and abstracts of all papers published in *M&SOM* between 1999 and 2018. Only three papers surfaced, all three focused on women-specific diseases. This indicates the wide open opportunity for research on women in OM, which is crucial for poverty alleviation in particular.

We conclude that poverty alleviation – particularly by empowering women – is a growth direction for *M&SOM*. Many OM researchers are energized and motivated to tackle poverty, as evidenced by the recent related publications, yet ample opportunities remain. The OM community has crucial know-how to help alleviate poverty, notably through innovative business models that empower women. Editor-in-Chief Chris Tang says that papers that tackle poverty are welcome in the *M&SOM* journal.

4 Concluding Remarks

Billions of women are a poorly utilized resource, with capability to create enormous value through OM-inspired business model innovations. These women can produce new and highly valuable products and services at low-cost, creating entirely new markets, as demonstrated by Murunganantham and Beleza Natural. Integrating women as workers can increase their incomes while alleviating a bottleneck at low cost, as in the examples of BoKlok and Katterra (who are hiring women into their home-building factories, as traditional competitors suffer a severe shortage of construction workers) and Aravind (who train women to supplement their surgeon-bottleneck). Engaging women in leadership, decision-making and the fundamental work is highly effective in protecting natural ecosystems and their services to humanity, as demonstrated through the success of the Upper Tana-Nairobi Water Fund in Kenya in improving agricultural productivity and the supply of water to Nairobi. Investing in improving women workers’ health, as multinational garment buyers and NGO BSR do through the HERHealth project for garment workers in Bangladesh, improves these women’s productivity and can thereby increase welfare and profits throughout the supply chain. At the Cleveland Clinic, women patients in

inner-city and underprivileged communities form community-strengthening bonds and learn how to improve their own and their families' health by attending shared medical appointments. Empowering women – by improving access to contraceptives, sanitary napkins, water, health, education, childcare, information about work opportunities, and other essential products and services – unleashes their potential.

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Table 1. Business models that move down the diagonal of the product-process matrix

Note: Factors relevant to women's empowerment are in italics in blue.

Examples	Low-Cost, High-Quality Products and Services	Increased Income	Protecting Natural Systems Eliminating Pollution
BoKlok and Kattera - Assembly Lines for Buildings	Efficient high-volume production of standardized, high-quality, low-cost homes.	High-value-creation work for low-skilled workers, <i>especially women who do not participate in traditional construction work.</i>	High conformance quality yields tight buildings that require less energy for heating and cooling. Less waste of materials.
Sanitary Pad Production on Simple Assembly Lines	<i>Efficient high-volume, standardized process using local materials, serving local women in Indian villages</i>	<i>High-value-creation work for low-skilled women. Pads enable women to continue in education after puberty (increasing future income) and enable women to work while menstruating</i>	local production with local materials eliminates transportation
Aravind Cataract Surgery Assembly Line	Division of labor reduces costs, enabling high volume. High volume drives high quality.	<i>Rural women gain employment: Low-skilled women workers co-work with high-skilled surgeons in high value tasks. Safe, on site quarters enable women to work.</i>	Extremely low waste. Efficient use of building space reduces greenhouse gas emissions. Workers live on site, eliminating transportation.
Beleza Natural Assembly Line for Hair Care	<i>Efficient high-volume, low-cost delivery of standardized care for women's curly hair.</i>	<i>High-value-creation work for low-skilled workers, especially women</i>	Efficient use of building space reduces greenhouse gas emissions
Shared Medical Appointments	Batching reduces cost per patient and increases time with doctor. Peer-provided information and support. <i>Timid patients (more likely women) gain information. Patients' attendants (mostly women) find peer support. Women most able to commit the greater time needed.</i>	Healthcare <i>(including access to contraceptives)</i> enables employment. Future refinements can redirect some of the value created to patients who serve each other by providing information and support.	Lower environmental footprint due to more efficient use of building space. Lower transport cost per patient served, when clinicians who travel to remote areas run shared appointments.
Communal Kitchens / Communal Child Care	Sharing resources reduces cost. <i>Working together promotes community networks, particularly among women, who usually perform these tasks.</i>	<i>Relieving women of these tasks enables them to seek paid employment. Co-op model compensates women for "home" work.</i>	Resource-sharing reduces environmental impact, enables use of costlier, less-polluting technology. <i>Women benefit most from the reduced health hazards.</i>

Table 2. Business models derived from redefining organizational boundaries

Note: Factors relevant to women's empowerment are in italics in blue.

Examples	Low-Cost, High-Quality Products and Services	Increased Income	Protecting Natural Systems / Eliminating Pollution
Local Grinding of Unleaded Turmeric	Buy unadulterated root and grind at home or with local grinder.	Avoiding sickness from lead exposure <i>improves</i> ability to work and <i>freed up women care-givers' time for paid work</i> . Avoiding brain damage in children increases their future income.	Eliminates incentive for adulterating turmeric with lead chromate
Efficient Fufu Pounding	Machine to efficiently pound fufu in local shop or home of entrepreneur.	<i>Eliminating the manual labor of pounding fufu frees up women's time for paid work.</i>	Promotes cassava, which requires less water, fertilizer and land per calorie than other cereals.
Bussing & Child-Care Innovation	Reduces time-cost for kids to attend a better-resourced, desegregated school. Extended productive day at school and exercise improve learning and health.	Improves future income prospects. <i>Mothers paid as care-givers and monitors, or have a longer work day.</i>	Reduced transport-related environmental costs
In-home Production of Clothing, Carpets & Jewelry	Unique, traditional handicrafts	<i>Women engage in high value-added work. Enables women to earn while at home. Better cared-for children succeed and earn more in learn life.</i>	Eliminates environmental impact of workers travelling to a factory. Eliminates environmental impact of building and operating a factory. Natural rather than toxic dyes.

Table 3. Business models that incentivize local people to protect nature

Note: Factors relevant to women's empowerment are in italics in blue.

Examples	Low-Cost, High-Quality Products and Services	Increased Income	Protecting Natural Systems / Eliminating Pollution
Governments of China and Costa Rica pay landowners to sustain forests	Pollination, carbon sequestration, biodiversity, tourism, clean and reliable water supply, protection from floods and droughts	Generates income for poor rural populations	Carbon sequestration mitigates climate change
Water Fund Schemes in Latin America & Africa	clean and reliable water supply, improved agricultural productivity, prevention of soil erosion, prevention of siltation in hydroelectric dams, electricity	Generates income for poor upstream communities; <i>Upper Tana-Nairobi Water Fund improves productivity by targeting women.</i>	Reverses water contamination. Often involves reforestation and soil restoration, which mitigate climate change
Palm oil buying firm incentivizes farmer-suppliers to prevent illegal deforestation	Financial service: immediate payment for farmers upon delivery of fruit to processor	Increases farmers' working capital, enabling farmers to improve productivity and income	Protecting tropical forests mitigates climate change and protects biodiversity