MILAN – Digital technologies are once again transforming global value chains and, with them, the structure of the global economy. What do businesses, citizens, and policymakers need to know as they scramble to keep up?

Digitally enabled supply chains initially increased efficiency and dramatically shortened lead times. Capital was mobile; labor less so. Economic activity (production, research, design, etc.) moved to any accessible country or region that had relatively inexpensive labor and human capital. With only a slight lag, complexity became manageable, and global supply chains’ linear model (something produced in country A is consumed in country B) gave way to a more complex model with more fragmented but more efficient supply networks.

Meanwhile, a dramatic shift occurred on the demand side, as emerging economies grew and became middle-income countries. Developing country producers, who in an earlier era accounted for a relatively small fraction of global demand, became major consumers.

Global supply networks shifted again, accommodating fragmentation and dispersion on both the supply and demand sides of their structure, a process sometimes called technologically enabled atomization: the division of supply networks into finer and finer parts, breaking the bonds of proximity and the resulting transaction-cost constraints that previously prevailed.

For example, many services related to intermediate and final demand require knowledge, expertise, information, and communication for their delivery. What they do not require is geographical nearness or the physical movement of goods. They represent a large share of the global economy, and they are gravitating rapidly toward the tradable sector, with increasingly powerful digital and information technology chasing imperfectly mobile human resources and new rapidly growing markets.
In the course of this transformation, millions of people joined the global economy, with wide-ranging consequences – many of which remain challenging – for poverty, prices, wages, and income distributions.

Now comes a second, potentially even more powerful, wave of digital technology that is replacing labor in increasingly complex tasks. This process of labor substitution and disintermediation has been underway for some time in service sectors – think of ATMs, online banking, enterprise resource planning, customer relationship management, mobile payment systems, and much more. This revolution is spreading to the production of goods, where robots and 3D printing are displacing labor.

It is important to understand the economics of these technologies. The vast majority of the cost comes at the start, in the design of hardware (like sensors) and, more important, in creating the software that produces the capability to carry out various tasks. Once this is achieved, the marginal cost of the hardware is relatively low (and declines as scale rises), and the marginal cost of replicating the software is essentially zero. With a huge potential global market to amortize the upfront fixed costs of design and testing, the incentives to invest are compelling.

In other words, unlike the preceding wave of digital technology, which motivated firms to gain access to and deploy underutilized pools of valuable labor around the world, the driving force in this round is cost reduction via the replacement of labor.

This transformation has important side effects. For physical goods, there are costs associated with logistics and lead times, owing to inventories and poor forecasts of the market. With digital capital-intensive technology, however, production will inevitably move toward the final market, wherever it is. This re-localization constitutes a major shift in the structure of global supply networks.

An extreme form of this may be coming in the form of 3D printing, a technology that makes it possible to produce an astonishingly wide and growing range of products by printing them one layer at a time. Examples include buildings, athletic shoes, designer lamps, aircraft wings, and much more.

As the costs of this technology decline, it is easy to imagine that production will become extremely local and customized. Moreover, production may occur in response to actual demand, not anticipated or forecast demand. In some sense, this represents the ultimate compression of supply chains, as firms
produce to final demand with minimal delay.

Meanwhile, the impact of robotics (another technology with digital foundations), is not confined to production. Though self-driving cars and drones are the most attention-getting examples, the impact on logistics is no less transformative. Computers and robotic cranes that schedule and move containers around and load ships now control the Port of Singapore, one of the most efficient in the world.

Developing countries in the early stages of growth need to understand these trends. Labor, no matter how inexpensive, will become a less important asset for growth and employment expansion, with labor-intensive, process-oriented manufacturing becoming a less effective way for early-stage developing countries to enter the global economy.

Re-localization will be seen everywhere, including lower-income countries. Production will not vanish; it will just be less labor intensive. All countries will eventually need to rebuild their growth models around digital technologies and the human capital that supports their deployment and expansion.

The retail sector, too, is being transformed. Online retail and supporting logistics is expanding in a wide range of advanced and developing economies. In China, where the expansion is occurring extremely quickly, estimates suggest that only part of the expansion is at the expense of traditional retail.

In fact, online retail appears to be accelerating the expansion of the overall consumer market. Knowledgeable participants expect the new retail model to be an integrated form of online and physical retail, each modified by the presence of the other. Think again of the 3D printing model, a potential form of demand-driven mass-customization, and its combination with online mobile payments systems and social media. The integration of sourcing with logistics and retail will become the third leg of the stool.

The world we are entering is one in which the most powerful global flows will be ideas and digital capital, not goods, services, and traditional capital. Adapting to this will require shifts in mindsets, policies, investments (especially in human capital), and quite possibly models of employment and
distribution. No one knows fully how all of this will play out. But attempting to understand where the technological forces and trends are leading us is a good place to start.

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