THE FUTURE OF WORK AND EDUCATION IN THE DIGITAL AGE

Data, Measurement and Initiatives for Inclusive Digitalization and Future of Work

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Abstract

As the pace of digitalization and automation accelerates globally, and more disruptive innovations in machine learning, artificial intelligence and robotics are expected, new data sources and measurement tools are needed to complement existing valuable statistics and administrative data. This is necessary to better understand the impact of technological change on the labor market and the economy and better inform policy decisions for inclusive people centered growth. In accordance with G20 Roadmap for Digitalisation(2017), points 10, 5 and 7, we propose to: i) track technological developments globally in a multidisciplinary and coordinated fashion; ii) develop new methods of measurement for the digital economy; iii) harmonize occupational taxonomies and develop new sources of data and indicators at the international level; iv) Build International Collaborative Platforms for Digital Skills and the Digital Transformation of SMES.

Challenge

The new technological paradigm associated with progress in IT (information and automation technologies), or digitalization, is both singular and disruptive because of its reach and its exponential speed. It has transformed the way we work, play, communicate, interact, and exchange, impacting in the economy, production and globalization, but also in the social, cultural,z political and geopolitical spheres, at the world level. More changes are inevitable and the pace of change will probably accelerate[2].

The joint work of G20 in 2018 of three Working Groups, Employment, Education and Digitalization, underscores the importance of understanding the interplay of technological change with jobs, skills, wages and opportunity. More and better data and measurement are at the heart of this challenge.

1. What do we know already from recent history?

· Not yet a widespread substitution of human labor
The evolution of labor aggregates in developed countries does not reflect a steep disruption in their employment-to-population ratios. Autor & Salomons (2017)

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2 National Academies of Science, Engineering and Medicine (2017), Information Technology and the Status of the US Workforce, Committee on Information Technology, Automation, and the U.S. Workforce, Computer Science and Telecommunications Board, Division on Engineering and Physical Sciences, The National Academy Press, Washington D.C., www.nap.edu, Págs.1 - 3

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T20
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demonstrate that even when increases in labor productivity in an industry are associated with a within-industry reduction in employment (direct negative effect)[3], they also generate a cross-industry increase in employment (indirect positive effect). These positive effects tend to outweigh the within-industry fall in employment.

· Sharply disrupted composition of labor with large distributive impact: employment polarization

Technological change (TC) in developed countries, from the 80s and 90s, resulted in employment polarization (or hollowing-out) with a shrinking of middle skill jobs, white and blue collar, and an increase in the employment share of low and high-skill occupations[4]. Polarization is explained by Skilled Biased Technical Change and Task-Biased Technical Change,[5] much more than by the offshoring of jobs[6].

· A growing skill mismatch and massive workers transition

There is a growing "skill mismatch", i.e. lack of correspondence between the demand of skills of new employment and the supply of skills of workers whose jobs were substituted by technology, and a challenge for public policy to ease massive workers transitions. According to a Mc Kinsey (2017), an estimate of between 75 and 375

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3 The cross-industry increase in employment is stimulated by a combination of income effects resulting from an increase of the disposable income of consumers due to lower prices, and forward and backward linkages, which raise production and employment in industries not directly affected by the particular innovation ("indirect positive effect"). These positive effects tend to outweigh the within-industry fall in employment, concluding in a modestly positive net effect of productivity growth over employment, in line with the relative stability of labor aggregates in developed countries (Autor & Salomons, 2017).

4 This finding is very robustly documented by a vast set of academic works: Spitz-Oener (2006), Goos & Manning (2007), Goos, Manning & Salomons (2009), Mieske (2009), Autor (2010, 2015), Oesch & Menes (2011), Holmes & Mayhew (2012), Autor & Dorn (2013), Adermon & Gustavsson (2015). Using their initial mean wages as a proxy of the skill content of occupations, they observe the variation of the share in total employment during a specific period, documenting a polarization pattern with the corresponding fall in the share of middle-skill occupations and a relative growth of low and high-skill employment.

5 Following this hypothesis developed in Autor, Levy & Murnane (2003) and Acemoglu & Autor (2011), TC tends to automate "routine tasks" that follow easily definable procedures, and which are frequently characteristic of middle-skilled jobs. Nevertheless, TC has difficulties to replace both highly qualified abstract tasks like complex problem solving, creativity, leadership or negotiation and non-routine less qualified manual tasks highly dependent on personal interaction or visual and language recognition and which are very important in low-skill services and difficult to automate.

6 The Task-Biased Technical Change is the fundamental explanation of polarization, above others like the offshoring of middle-skilled jobs. See for example Autor & Dorn (2013), Autor, Dorn & Hanson (2014), Michaels, Natraj & Van Reenen (2014) and Goos, Manning & Salomons (2014). These studies corroborate the greater intensity in routine taks of middle-skill occupations and showed that technological adoption was correlated with more rutinary occupations and with the consequent decline in their share in total employment while, in opposition, offshorability measure have little or no explanatory capacity when the effect of technology and routine intensity is controlled for. OECD (2017) analyses the relationship between polarization and de-industrialization (employing econometric techniques), and concludes that technology displays the strongest association with both polarization and de-industrialization. Although the role of globalization is less clear-cut, there also emerges some indication that international trade has contributed to de-industrialization in advanced countries.

million workers will transition from obsolete occupations to new ones by 2030.

2. Predictions related to Future of Work

Predictions of the risk of automation show significant variance[7]. Frey & Osborne (2013) estimated that 47% of US employment was at "high risk", while Arntz, Gregory & Zierahn (2016), using the same automation indexes by task, but considering within-occupation variability in the intensity of different tasks, concluded that only 9% of employment in US was at high risk[8]. Also, the net impact of automation will depend on the creation of new jobs, some of which we do not know or do not exist yet, still harder to estimate.

3. Dramatic Information Failures Impair Policy Responses

Dramatic information failures in the job market preclude understanding of the scale and depth of the challenge. These failures impair the capacity of governments and institutions to ease worker transitions, solve the skills mismatch problem and disrupt technological unemployment. Data and measurement are at the heart of this conundrum. Particularly, real time, more granular data regarding changes in occupations and skills demand is needed in order to make anticipated and better decisions in education, long life learning and training strategies as well as in the cushioning and facilitation of workers transitions.

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7 See for example Frey & Osborne (2013), Arntz, Gregory & Zierahn (2016), World Bank (2016), McKinsey Global Institute (2016). However, even future of work predictions show a high degree of variance, the relative comparison of the studies is useful. It helps to identify areas of consensus in relative estimates regarding differential susceptibilities for types of occupations, gender, social and demographic subgroups, productive sectors, and geographies. When analyzing how policy should respond it is critical to understand the implications for different groups and regions, notably the most vulnerable and those with the highest exposure.

8 Indeed, there are diverse obstacles in the forecast which generate biases and explain the variability in the estimates (that depend on indexes conditioned by both the subjectivity and knowledge of the experts consulted and the weighting methodology). In addition, defining with precision the degree of intensity in routine tasks needed to entirely replace an occupation can lead to radically different conclusions: while the McKinsey Global Institute (2017) estimates that no more than 5% of occupations are fully composed by susceptible automatable activities, more than 60% of occupations have at least 30% of automatable activities. The economic discipline has, therefore, limitations to predict with precision the timing and the specific magnitude of these phenomenom with a satisfactory level of confidence. Note that the "potential scope of automation" is a different concept than the "effective estimated impact of automation", since its cost effectiveness or social and legal factors can delay its effective adoption.

Proposal

Notwithstanding the data and measurement gaps, recent research on the Future of Work has highlighted both the great challenges and opportunities confronting governments and institutions. In order to provide the necessary rationale to our policy proposals, and complementarily to the challenges analyzed in the previous section, it is useful to summarize main findings in the following eight points:

1. **Technological advances associated with IT** (information and automation technologies), including machine learning, AI and robotics **will continue with exponential reach and speed.** Biggest innovations will still be introduced and new technological capacities will probably emerge[9].

2. **IT led technical change is Skill and Task Biased.** It has resulted and will further result in: i) the automation of routine tasks (cognitive and manual), typically middle skill, resulting in employment polarization in developed countries with new evidence of polarization as well in emerging countries[10]; ii) the augmentation of the capacity of workers to perform certain tasks, usually non-routine, where technology is a complement of work (not a substitute); y iii) the creation of new occupations, that we do not know and are difficult to predict[11]; iv) the object of automation is tasks not occupations, but the automation of routine tasks leads to the substitution of certain occupations and the regrouping of tasks in another occupations; v) the probability of automation decreases with the level education and income of the worker.

3. The **final net impact** of these technologies **over employment is not predetermined.** The ultimate effects will be the result not only of TC per se, but of how it is used, and how people, firms, governments, institutions and international organizations respond and prepare for these changes in the economy and society[12]. On the other hand, notwithstanding the fear of the likely impact of disruptive innovations over employment, some studies indicate that we cannot conclude, on the basis of evidence, that technology has resulted in a net reduction of the quantity of employment[13].

9 National Academies of Science, Engineering and Medicine (2017), Ibid, Págs, 2, 8, 14, & 158.

10 Dutz, M., Almeida R., & Packard T. (2018). "The Jobs of Tomorrow: Technology, Productivity and Prosperity in Latin America and the Caribbean". World Bank Group, Washington D.C.

11 National Academies of Science, Engineering and Medicine (2017), Ibid; Nofal, Coremberg and Sartorio, Luca (2017); Jim Jong Kim (2018) "Building Human Capital", President of the World Bank, speech made in the IMF/WB Spring Meetings, April 21, 2018, www.live.worldbank.org

12 National Academies of Science, Engineering and Medicine (2017), Ibid; Nofal, Coremberg and Sartorio (2017).

13 Autor, David (2015) "Why Are There Still So Many Jobs? The History and Future of Workplace Automation". Journal of Economic Perspectives—Volume 29, Number 3, Summer 2015,Pags. 3–30. Also, the results of the WEF Business Survey in 2016, titled "The Future of Jobs", result in an estimate of a net positive impact of technological change of 2.02% in future employment.

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4. The **education system will need to constantly adapt** in order to prepare the workforce for the changing labor market. There is a certain consensus that as IT continues to substitute or complement many work tasks, workers will need both digital skills and transferable skills that emphasize creativity, adaptability, and interpersonal skills over routine information processing and routine manual tasks[14]. At the same time, IT offers significant opportunities to be used to advance educational and long life training strategies and delivery. IT also can be used to reduce the skill mismatch problem by building skills, matching opportunity with talent and addressing digital gender divides[15].

5. **IT is enabling new forms of work on-demand via apps and remote crowd-work,** through digital platforms which are growing exponentially and show significant potential for employment growth, labor inclusion, and transparency. However, there are potential risks and challenges of the gig economy, as pointed out in by ILO (2017), regarding social protection, employment security, earnings, hours, occupational health and safety, training and representation[16]. Similarly, Hunt (2018), from the standpoint of gender parity, points out that, given the existence of digital gender divides and discrimination (because of gender, race, or age) specific attention by policy makers is needed to ensure equality and non discrimination in digitally mediated work, and its link with the social protection system[17].

6. **TC has impacted and will continue impacting global value chains (GVCs) and globalization.** Progress in robotics technology is resulting in the re-shoring of some activities and the shortening of manufacturing GVCs. These trends could result in both future significant disruptions for emerging countries that are integrated in GVCs or limit the opportunities of lower income countries to climb the ladder by promoting manufacturing-export led development[18]. However, digitalization, and the increased services intensity of

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14 Linkedin, IDB with the collaboration of Beatriz Nofal (2018) "Presentation G20 Workshop: Building Opportunities for an Inclusive Future of Work" Presentation G20 Workshop of three Working Groups: Digitalization, Employment and Education. Buenos Aires, Argentina, April 12 2018. PDF version. A Summary is posted in Linkedin´s Economic Graph "Sharing Labor Market Insights in Latin America".

15 The G20 #eskills4girls Initiative is an excellent example of this in practice. Also, SheWorks.com is other example of a platform that addresses the gender digital divide and helps women´s labor inclusion as well as the building of women´s digital skills.

16 ILO (2017). "Inception Report for the Global Commission on the Future of Work", December 2017.

17 Hunt, Abigail (2018). An example of digital labor training and inclusion, in the province of Buenos Aires, Argentina, there is the case, implemented in Cooperative "La Juanita" by, social leader, Toty Flores and by, Oscar awarded, movie Director Juan Campanella ("El Potrero Digital") . Similarly, Arbusta, in Argentina, is a case of entrepreuneurial impact investment for digital skills in marginalized areas. Another example of how technology can at the same time help transparency in the execution of public purchases of computer based services, labor inclusion and productivity (translating in fiscal savings), is the platform TransparentBusiness.com

18 Hallward-Driemeier and Nayyar Gaurav (2017) Trouble in the Making? The Future of Manufacturing-Led Development, World Bank Group, Washington D.C.

The Future of Work
and Education
for the Digital Age

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manufacturing, is enabling the participation, and maybe the leapfrogging, of developing countries through the export of knowledge intensive services.

7. TC and digitalization have a strong **distributive impact among workers and also among firms,** with the rise of "super star firms". All of this is opening a huge policy debate around the "redistribution" issue, which goes from universal income, to tax policy and competition policy.

8. To **better inform public policy,** private sector decisions and education and lifelong learning strategies it is necessary a **systematic, continuous and comparable international research effort to track new technological developments and their impact on employment, the workforce and the economy[19].** To this end are needed new statistical sources that should be comparable internationally, new data sources, new indicators and rigorous forms to measure the impact on the economy and society.

Until we can measure the size of the future of work challenges adequately, it will be difficult to attract the commitment of the resources needed, as well as the breadth of the multistakeholder engagement required to address them. Because of this and because of the difficulties to predict associated with the inherent uncertainty of technological change, the Future of Work is often considered as a "soft" issue.

Better data and better measurement will allow for better judgment and better policies necessary to ease workers transitions, to invest in people and to facilitate the digital transformation of SMEs globally so as to make digitalization work for all, increase productivity, and prevent new social divides. The G20 is the key international forum for the launching of these initiatives.

In conclusion, to effectively adress these Future of Work challenges and embrace the opportunities of digitalization, the G20 should both strenghten the international research agenda in, at least, the three main pillars indicated below and, at the same time, implement global multistakeholder initiatives to bridge the digital skills gap.

Proposal I: Track technological developments globally

Identification and tracking of technological developments by Governments and International Organizations in a multidisciplinary, collaborative, integrated and comparative world research program. Duplication of efforts among IOs should be avoided. More coordination and cooperation is needed. Also, research findings should

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19 National Academies of Science, Engineering and Medicine (2017).

be treated as a global public good and made open so as to facilitate different actors in society, public and private sectors, to conform the future of work for the benefit of all, for more inclusive growth. G20 Leaders can instruct IOs to continue and align their ongoing research efforts to these objectives.

Proposal II: Develop new methods of measurement for the digital economy

Development of new methods of measurement should be pursued so that the digital economy and innovation are integrally measured and reflected in macroeconomic statistics, and are consistent with the measurement methodology of GDP and National Accounts SCN08 from United Nations. The National Accounts System we are using must adapt to measure the economy of the XXI century[20], not just the XX century economy. Also, it is necessary to advance on an internationally agreed definition of digital trade and a form of measurement it. One of the difficulties to measure digital trade is that digitalization per se erodes the cross border frontier that traditionally defined the measurement of physically traded goods and services. The G20 Trade and Investment Working Group 2017 started to work on this issue of digital trade but no final conclusion was reached. Continuity of this work in G20 TWIG is strongly recommended in 2018 and beyond, as well as an instruction of G20 Leaders to update the measurement methodology of GDP and National Accounts to include the Digital Economy.

Proposal III: Harmonize the Occupational Taxonomy and Develop New Sources of Data and Indicators at the International Level

Development of new, more timely and granular sources of data and indicators, regarding occupations and workforce, that should be harmonized and comparable internationally, is required to better monitor, measure and anticipate the impact of technological change on the labor market. This will allow governments and institutions to make better informed decisions regarding education, training and and lifelong learning, as well as regarding active labor market and employment policies and workforce development.

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20 Stiglitz J., Sen A. and Fitoussi J.P. (2009) "Report by the Commission on the Economic Performance and Social Progress", http://ec.europa.eu/eurostat/documents/118025/118123/Fitoussi+Commission+report, and www.stiglitz-sen-fitoussi.fr. This report highlights that several economic phenomena that impact on wellbeing are not included in GDP. The measurement of new digital activities is under debate and also their impact on wellbeing and productivity, mainly because traditional methods on how to measure it have been questioned.

On the one hand, for international comparable research work on the impact of technological change on the labor market we need to have at the international level an harmonized occupational taxonomy and data base like the US O*NET or ESCO from Europe with detailed, standardized and quantifiable descriptions of tasks involved and skills required in different occupations. The international replication and harmonization of an occupational taxonomy and code system like O*NET or ESCO is necessary to analyze the impact of these phenomena globally as well as to be able to develop more rigorous indicators, for instance, that can measure the risk of automation of certain tasks, and also to analyze, on comparable basis, the impact of offshoring and international trade on the labor market. To the extent possible, policymakers should also encourage employers to use the harmonized taxonomy when describing the jobs opening and the tasks, skills and experiences required.

In 1988 the world agreed and introduced an Harmonized System of Commodity Descriptions (HS), of 5300 articles and product descriptions (in a six-digit code system), to classify traded goods on a common basis for trade and customs purposes. G20 leaders can now entrust competent IOs to engage in a similar and highly needed effort to harmonize an occupational taxonomy and codes so as to fill the statistical and data gaps and formulate evidence based policy responses for an inclusive digitalization and the future of work.

On the other hand, it is important to access to new real- time and more granular sources of data so as to develop new indicators related to changes in occupations and new employment creation and to the resulting changes in skill demand. For that purpose, the main sources of information is not statistical, survey or administrative but private data, mainly part of "big data" generated in digital platforms and professional social networks (like the case of Linkedin[21] and others, e.g. Google for Jobs). Therefore, it is necessary to explore possible collaboration or partnership arrangements among governments, international organizations and digital firms to obtain access to real time and more granular research data, respecting fully privacy and data protection criteria. In this regard, it is auspicious that already there have been initiatives of this sort of strategic partnership already implemented to share this valuable information. It is important to coordinate at the international level these collaborative public-private research initiatives, until now implemented in the form of individual cases[22], in order to access new sources of data and to develop

21 See Linkedin and IDB G20 Workshop Presentation together with Beatriz Nofal (2018) as a sample of the potential. LinkedIn, the professional network, has more than 550 million members, 20 million companies, and 14 million jobs on its platform. The activity of this network, analyzed in LinkedIn´s"Economic Graph," cumulatively generates billions of data points every day which are relevant to understanding and reacting to employment, skills and workforce trends.

22 For instance, the World Bank and the Inter-American Development Bank have agreed individually with Linkedin to work together to widen the understanding of present and future of work challenges.

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new indicators for real time monitoring of key employment, skill and economic trends. The G20 is a multilateral forum crucially relevant to launch and give impulse to this multistakeholder initiative.

Proposal IV: Build International Collaborative Platforms for Digital Skills and the Digital Transformation of SMES

In a complementary fashion, G20 Leaders could envisage developing a multistakeholder initiative with the technology companies, at the international level, in the form of a collaborative platform[23] to educate and train people in digital skills and, also, to propel the digital transformation of SMEs[24]. The strengthening of the digital capabilities and business models of SMEs would probably facilitate their contribution to meet the pressing and daunting employment challenges at present[25] and in the years to come.

The Future of Work is now. It is not predetermined: let´s act on it!

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23 As example of collaborative digital transformational platforms implemented by advanced countries Germany developed "Plattform Industrie 4.0", France "Industrie de Futur" and Spain "Industria Conectada 4.0"

24 SME´s represent, on average, 95% of the companies in almost every country of the world (WTO 2016), concentrate about 60% of jobs in developed countries and 80% in developing countries (World Bank 2013) and are estimated to account for 60 to 70% of global GDP (UN SDGS 2015-2030).

25 Hunt (2018) highlights that "Gelb and Khan (2016) have shown that the number of people seeking jobs may be ten times the number recorded as officially unemployed by most statistical systems – 2 billion people globally are classified as 'outside the labour force', meaning they are neither working nor looking for work. Critically, very little is known about this group – what is clear, however, is that about two thirds (68%) of them are women (ibid.), and the 2013 World Development Report (WDR) on jobs confirms that 'an unknown number' are 'eager to have a job' (World Bank, 2013, cited in Gelb and Khan, 2016)".

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The Future of Work
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T20
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**The Future of Work
and Education
for the Digital Age**

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About the authors: The author was Argentina G20 Sherpa in 2017, during Germany´s Presidency. The priorities for Argentina´s Presidency in 2018 were then defined. In the preparatory ministerial meetings, the author recommended that the Future of Work should be one of the G20 priorities in 2018. The systemic importance of this topic for the global economy emerged in previous research we did for INTAL (Institute for Latin American Integration, IDB). See Beatriz Nofal, Ariel Coremberg and Luca Sartorio (2017) "Ideas preliminares para el estudio del impacto de la automatización del empleo en América Latina y y el Caribe", Nota Tecnica, INTAL, Interamerican Development Bank.

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