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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, the authors 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.

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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, political and geopolitical spheres, at the world level. More changes are inevitable and the pace of change will probably accelerate[1].

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, 2018) demonstrate that even when increases in labor productivity in an industry are associated with a within-industry reduction in employment (direct negative effect), they also generate a cross-industry increase in employment (indirect positive effect). This cross-industry increase in employment can be 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"). As we can see in Figure 1, these positive effects tend to outweigh the within-industry fall in employment, concluding in a modestly positive net effect of productivity growth

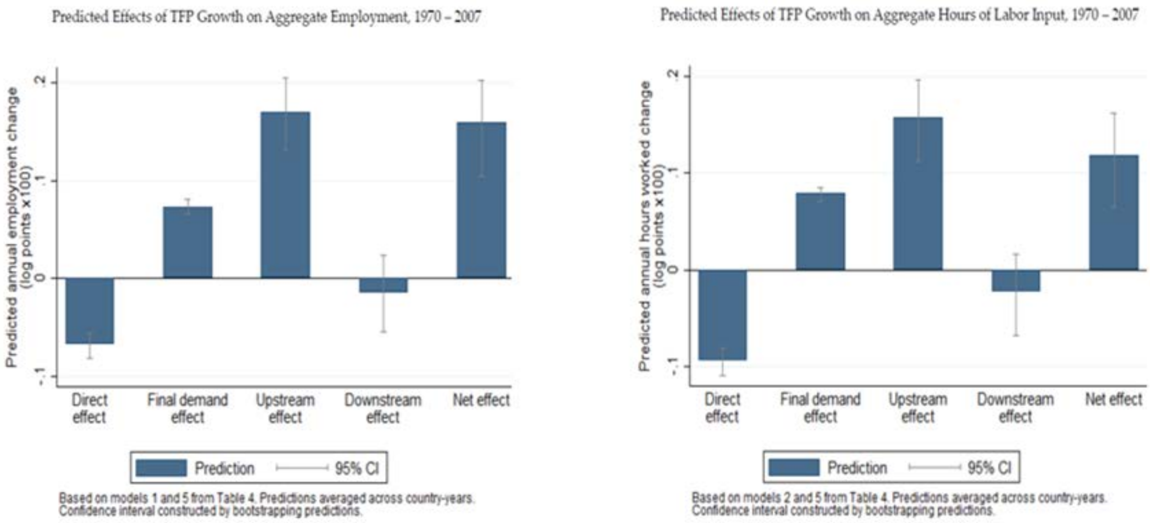
[1] National Academies of Science, Engineering and Medicine (2017), *Information Technology and the Status of the US Workforce*, Committee on Information Technology, Automation, and the U.S. Workforce, Computer Science and Telecommunications Board, Division on Engineering and Physical Sciences, The National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

over employment, in line with the relative stability of labor aggregates in developed countries.

- *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[2]. Figures 2A and 2B document this employment polarization trend in recent decades both for a wide set of European countries and the United States.

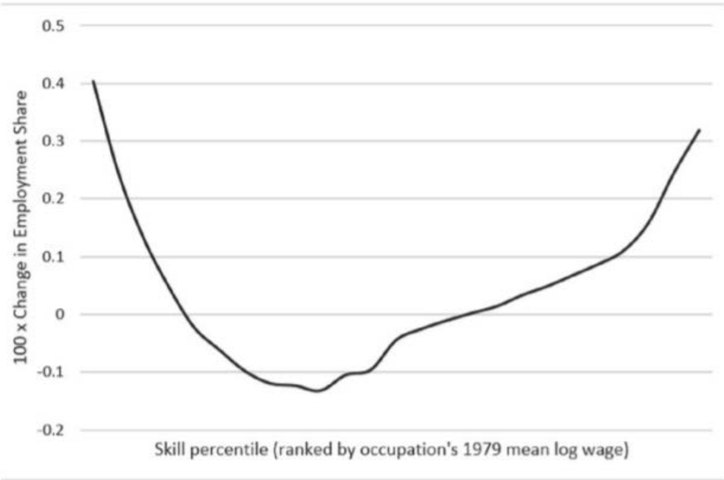
Figure 1: Predicted effects of TFP Growth on Aggregate Employment and Aggregate Hours of Labor Input (19 developed countries, 1970-2007)



Source: Autor and Salomons (2018)

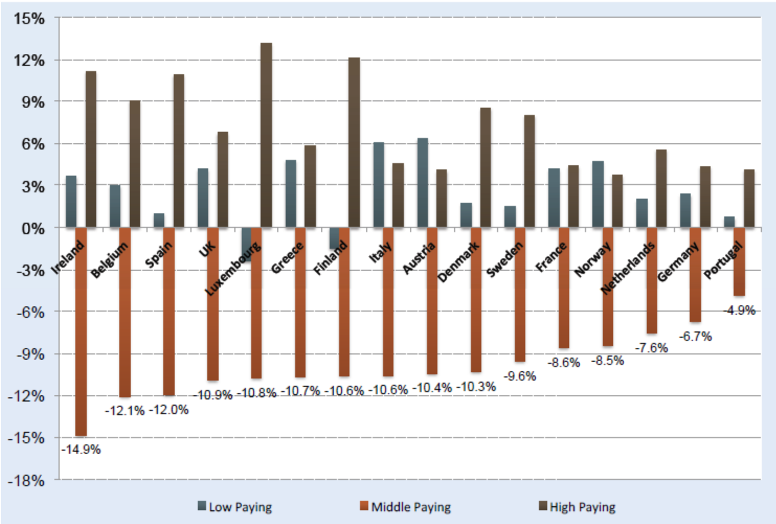
[2] This finding is very robustly documented by a vast set of academic works: Spitz-Oener (2006), Goos & Manning (2007), Goos, Manning & Salomons (2009), Mieske (2009), Autor (2010, 2015), Oesch & Menes (2011), Holmes & Mayhew (2012), Autor & Dorn (2013), Adermon & Gustavsson (2015). Using their initial 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.

Figure 2A: Smoothed changes in employment by occupation ranked by wage percentile (United States, 1979-2012)



Source: Levy Yeyati and Sartorio (2018) on the basis of Autor (2015)

Figure 2B: Change in Occupational Employment Shares in Low, Middle and High Wage Occupations (16 EU Countries, 1993-2010)



Source: Autor (2014) on the basis of Goos, Manning and Salomons (2014)

Indeed, polarization is explained by *Skilled Biased Technical Change* and *Task-Biased Technical Change*, much more than by the offshoring of jobs. 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. The Task-Biased Technical Change is the fundamental explanation of polarization, above others like the offshoring of middle-skilled jobs[3].

- *Automation and the secular downward trend in labor shares*

The decline of labor shares both in developed and developing countries during the last decades is a very robustly documented stylized fact[4]. TC and labor automation is strongly associated with this decline, fundamentally in developed countries but also playing a role in emerging markets. Even when the net impact of productivity gains is not necessarily negative, labor automation can lead to a labor share decline, widening the income gap between employees and employers. Figure 3 developed by Dao, Das, Koczan & Lian (2017) shows this negative contribution to the change in labor share.

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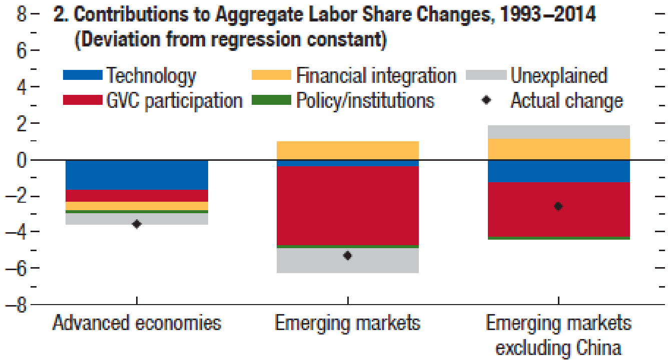
[3] See for example Autor & Dorn (2013), Autor, Dorn & Hanson (2015), Michaels, Natraj & Van Reenen (2014), Goos, Manning & Salomons (2014), Timmer & Ye (2014) and Akerman, Gaarder & Mofstad (2015). These studies corroborate the greater intensity in routine taks of middle-skill occupations and showed 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.

[4] See for example Karabarbounis and Neiman (2013), Piketty (2014), Dao, Das, Koczan & Lian (2017), Autor, Dorn, Katz, Patterson y Van Reenen (2017).

Figure 3: Contributions to Aggregate Labor Share Changes, 1993-2014



Source: IMF staff calculations.
Note: Panel 1 shows actual average annual changes in labor shares for countries with at least 10 years of data and predictions based on the aggregate trend regression model (see Annex 3.4). Derived contributions are scaled to show total changes over 25 years.

Source: Dao, Das, Koczan & Lian (2017)

- *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 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[5] . Frey & Osborne (2013) estimated that 47% of US employment was at "high risk", while Arntz, Gregory

[5] 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.

& 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.

Indeed, as pointed out by Levy Yeyati and Sartorio (2018) 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 cost effectiveness or social and legal factors can delay its effective adoption. 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.

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[6].

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[7]; 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[8]; 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

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

[7] 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.

[8]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

and prepare for these changes in the economy and society[9]. 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[10] .

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[11]. 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[12].

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[13]. 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

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

10 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.

11 *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".*

12 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.

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

needed to ensure equality and non discrimination in digitally mediated work, and its link with the social protection system[14].

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[15]. However, digitalization, and the increased services intensity of 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**[16]. 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

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[14] 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 entrepreneurial 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

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

[16] National Academies of Science, Engineering and Medicine (2017)

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 strenghthen 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.

i) Proposal 1: 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 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 effors to these objectives

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

Developmen**t** 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[17], not just the XX century economy.

It is necessary to have an integrated and expanded approach to measure and analyse the impact of digital innovations on the economy. We have proposed as a methodology to use an Innovation Satellite Account (Coremberg, Nofal 2017) in order to integrate the impact of digital economy from the point of view of GDP accounts, growth accounting and welfare (See Box 1 and 2 below). This methodological approach follows the main proposals of Stiglitz, Sen Fittoussi (2009) to expand traditional accounts in order to measure welfare, growth and enviromental sustainability.

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.

[17] 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.

Box 1 - Innovation Satellite Account

The SNA approach allows theories and methodologies to be adapted to a phenomenon such as innovation, which needs to be defined and measured in a way that encompasses products and activities that are not necessarily compatible with traditional GDP classifications. This issue takes the form of so-called satellite accounts (SAs). To measure the potential impact of innovation on a country's economy, researchers tend to simulate what are known as "indirect and induced effects" through production linkages.

The standard classifications of products and industries (CPC and ISIC) arrange all industries and products at the same hierarchy level. The SNA is flexible enough to regroup them so that a key sector can be analyzed. By so doing, the standard supply and use tables can be estimated for the sector that one wishes to measure by expanding on details that do not appear in the standard presentation. This analysis is contained in the NAs: activities and products need to be regrouped based on a query or focus that usually touches on several activities or aspects of them.

The best-known international examples are the NAs for tourism and health. These experiences have focused on the supply side by including production activities that are associated with, connected to, and generated by the main activity. However, they do not fully calculate the demand side, for which they would need to include not just foreign trade flows but also consumption and investment.

Few NAs have been developed for knowledge, although significant work has been carried out by official NA bodies such as the CBS in the Netherlands and the Bureau of Economic Analysis (BEA) in the United States. In line with the 2008 SNA recommendations, the BEA has counted R&D and expenditures on intangible intellectual property assets as investments since 2013. These include the creation of entertainment, literary, or artistic originals and other intangible assets that have already been capitalized, such as software, adjusting estimates of GDP, savings, investment, and foreign direct investment. The OECD has also created work groups to measure the so-called knowledge-based capital (KBC), but it does so partially, only taking intangible assets and the capital of employees in certain jobs into account.

An exhaustive estimate of the knowledge NA would allow researchers to identify and quantify knowledge-generating production activities, but it would not quantify the impact of knowledge on productivity, employment, and trade in production activities that demand, acquire, and adapt innovation and knowledge but do not necessarily generate it. Similarly, although the 2008 NSA and the BEA have capitalized R&D and the creation of intellectual property assets, they continue to omit a series of intangible assets that have a major impact on firms' productivity, profitability, and competitiveness.

Box 2 - Knowledge Capital

Authors such as Brynjolfsson and McAfee (2011) point out that for innovation to generate increased productivity and profitability in firms needs to be accompanied by a reorganization of the production process and investment in intangible assets and human capital. The most productive firms reorganize their production processes, incentive systems, information flows, and other aspects of organizational capital to take maximum advantage of technology. This, in turn, requires a more skilled workforce. According to these authors, each dollar invested in hardware requires another ten to be invested in complementary organizational capital. For the organization to be successful, high levels of investment in intangible assets are needed, which organizational capital is part of. Intangible assets are generally much harder to generate and change, but they are also more important to the organization's success.

The 2008 SNA and the Measuring Capital OECD Manual (2009) include traditional capital assets within the asset boundary: tangible capital goods (machinery, constructions, livestock for breeding, etc.) and some intangible assets (software, goodwill, patents, etc.) and natural resources (subsoil assets, agricultural land) that are subject to property rights. Changes to the latest version of the SNA include the recommendation to explicitly measure capital services in line with recent advances in measuring productivity and the sources of growth: World KLEMS is the standard initiative used to measure and compare productivity internationally (and ARKLEMS+LAND is the Argentine version of this).

As Mas and Quesada (2015) mention, for investment in ICTs and R&D to have a positive effect on firms' productivity, profitability, and market value, a series of complementary investments need to be made to facilitate the efficient adaptation of the remaining components of the production system: education and worker training, brand creation and building, customer loyalty, and other expenses outlaid within the company or subcontracted on the market.

Corrado, Hulten, and Sichel (2005) define investment as "any use of resources that reduces current consumption in order to increase it in the future". Therefore, it follows that investment in both the generation and use of knowledge needs to be included alongside investment in infrastructure, machinery, and equipment, as we proposed in Coremberg and Nofal (2017): not only ICT but also intangible investment as expenditure on design and systems, advertising, market research, expenditure on redesign of organizational structure, and training of human capital18.

In this way, a series of outlays on intangible assets are included within the asset boundary for knowledge capital (see Table A).

[18] The inclusion of private-sector expenditure on intangible assets in the investment category has significant effects on both the aggregate value of the economy and macroeconomic investment. Mas and Quesada (2015) found that the inclusion of intangible assets increases developed countries' GDP by approximately 10%, doubles investment levels in the United States, and represents almost 50% of traditional net capital formation in the European Union.

TABLE A: KNOWLEDGE CAPITAL

TANGIBLE ASSETS	ICTS	HARDWARE
		TELECOMMUNICATIONS
INTANGIBLE ASSETS	ICTS	SOFTWARE
		DATABASES
	PROPERTY OF INNOVATION	MINERAL AND PETROLEUM EXPLORATION
		SCIENTIFIC R&D
		ARTISTIC AND ENTERTAINMENT ORIGINALS
		NEW PRODUCTS/SYSTEMS IN FINANCIAL SERVICES
		DESIGN AND OTHER NEW PRODUCTS/SYSTEMS
	ECONOMIC COMPETENCIES	BRAND VALUE ADVERTISING MARKETING
		FIRM RESOURCES STAFF TRAINING HIRED HUMAN CAPITAL ORGANIZATIONAL STRUCTURE

Source: Coremberg and Nofal (2017), Corrado et al. (2005), Mas and Quesada (2015).

Note that this definition expands the asset boundary beyond that used in the 2008 SNA: several factors that the SNA handles as running costs that form part of intermediate consumption are capitalized as production factors here, namely expenditure on design and systems, advertising, market research, expenditure on redesign of organizational structure, and training human capital.

Likewise, building on these proposals from Corrado et al. (2005) and Mas and Quesada (2015), we have included human capital stock in knowledge capital in the form of firms' investment in staff training and hired human capital, as firms demand and use skilled labor trained by other firms; through expenditure on staff training; the experience that workers have accumulated previously in the labor market; and the training they accrue through the education system.

What we are proposing here is for knowledge capital to include expenditure on both the tangible and intangible assets used to generate knowledge and innovation, along with assets that incorporate accumulated knowledge into production according to the classification set out in Table B.

TABLE B: EXPANDED KNOWLEDGE CAPITAL

EXPANDED KNOWLEDGE CAPITAL	TANGIBLE ASSETS	NON-ICTS	MACHINERY AND EQUIPMENT
			INFRASTRUCTURE
		ICTS	HARDWARE
			TELECOMMUNICATIONS
	INTANGIBLE ASSETS	ICTS	SOFTWARE
			DATABASES
		PROPERTY OF INNOVATION	MINERAL AND PETROLEUM EXPLORATION
			SCIENTIFIC R&D
			ARTISTIC AND ENTERTAINMENT ORIGINALS
			NEW PRODUCTS/SYSTEMS IN FINANCIAL SERVICES
			DESIGN AND OTHER NEW PRODUCTS/SYSTEMS
		ECONOMIC COMPETENCIES	BRAND VALUE ADVERTISING MARKETING
			FIRM RESOURCES STAFF TRAINING HIRED HUMAN CAPITAL ORGANIZATIONAL STRUCTURE
NONREPRODUCTIVE CAPITAL	REAL ESTATE		
	UNSKILLED LABOR (PRIMARY EDUCATION OR LESS)		

Source: Compiled by the authors.

Real-estate assets and unskilled labor are excluded, as they do not include or generate new knowledge. Consequently, we describe them here as “nonreproductive capital” in a way that is analogous to the exclusion of housing as capital, in that nonrental housing is not associated with production activity carried out by certain economic agents.

In this way, by including assets that generate knowledge and the organizational capital needed for knowledge to be used effectively within the production process, we are not only expanding the accounting method for a given country’s wealth but also identifying the production services that uses of these assets generate, which enables us to quantify the impact of knowledge capital on growth

iii) 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.

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[19] 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[20], in order to access new sources of data and to develop 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.

[19] 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.

[20] 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.

iv) 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[21] to educate and train people in digital skills and, also, to propel the digital transformation of SMEs[22]. 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[23] and in the years to come.

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

[21] 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"

[22] 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).

[23] 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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