flexibility@work 2018

sustainable growth

in the age of cities.

randstad

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preface.

Cities are hubs for human and economic development. For urban development to be sustainable and inclusive, access to information, education and decent work are key. So what should cities do to make sure that they stay both competitive and inclusive for all residents?

As part of the Flexibility@work series, our 2018 publication "Sustainable growth in the age of cities" explores how cities have grown from being silo-oriented to the complex ecosystems they are forming today. We find a similar pattern in the development of businesses, citizens and indeed labor relations. The networks connecting people across continents are becoming denser, faster, and more extensive every year. Mutual dependence and transnational connections of cities, businesses and citizens alike lead to a need for policies that cater to these complex ecosystems.

Cities are attractive to both high- and low-income individuals. That is why large cities often have high levels of inequality. Much of this inequality can be traced back to residents' potential on the labor market, which is highly affected by technological advancements. Routine jobs are the most vulnerable to technological advancement. While in most advanced economies, highly skilled non-routine work has increased considerably, routine jobs are generally disappearing, regardless of skill level. Interestingly, non-routine low-skilled jobs are also on the increase, particularly in sectors that are still hard to automate, such as care and personal services.

This is demonstrated in the first part of this Flexibility@work publication, where research by Maarten Goos et al. shows how every new highly skilled job in technology can be a catalyst for up to five new unrelated jobs, both low- and medium-skilled. This publication also demonstrates how most of these new jobs are created in cities where there is a large low-skilled workforce present that can be upskilled.

In the future of work, a competitive city's value proposition is not confined to its ability to attract businesses. A competitive city offers opportunities to all residents, seeks to reduce inequalities, and protects the vulnerable. Skills, including soft skills, are essential for an inclusive urban labor market, or as the OECD put it in 2016: "Labor market and skill policies as well as tax and benefit schemes will need to be adapted to promote skills adaption as well as labor mobility while at the same time ensuring that work, even low-paying work, provides a sufficient income to escape poverty".

By investing in education, labor mobility, and targeted public-private partnerships, cities can be both competitive and inclusive for all their residents. Only then can we create the skilled workforce and agile, inclusive labor market that will be key to sustainable urban development.

Jacques van den Broek

acknowledgements.

local high-tech job multipliers

By: Maarten Goos, Jozef Konings, and Marieke Vandeweyer

Professor Maarten Goos obtained his PhD from the London School of Economics (LSE) and is currently full Professor at Utrecht University in the Netherlands. His research focuses on labor economics, including job polarization, technological progress, worker competencies and job tasks, labor market intermediation and matching, labor market policies, inequality and institutions.

Jozef (Joep) Konings obtained his PhD in Economics at the London School of Economics in 1994, where he was a student of the Nobel prize winner Christopher Pissarides. Konings' research focuses on firm dynamics and globalization, international trade and micro channels of macroeconomic fluctuations.

Marieke Vandeweyer holds a MSc in Business Engineering and a MSc in European Politics and Policies, as well a PhD in Economics from the University of Leuven (Belgium). Her PhD covers topics related to the future of work, including labour market polarisation, local job multipliers, skills and minimum wages.

the age of cities

By: Pieter van de Glind, Harmen van Sprang, and Pieter de Jong

Pieter van de Glind and Harmen van Sprang are the founders of shareNL, an independent agency specialized in the fields of the sharing and platform economy. Together with their teams, they provide strategic advice and create new concepts for both the public and private sector worldwide. They also contributed to hundreds of events and various publications, including a business book titled Share.

Pieter and Harmen have been working with cities for years, directly advising city leaders on how to make the most of the opportunities of the sharing and platform economy (social cohesion, economic resilience, sustainability), while also dealing with their challenges (unfair competition, inequality, zoning, taxation, regulations). In May 2017, they founded the Sharing Cities Alliance. In this foundation, cities like Amsterdam, New York, Barcelona, Seoul, and Singapore are working together at (deputy) mayor level to make platformization work for their citizens.

Utrecht University

SHARE NL

part I: high-tech job multipliers.

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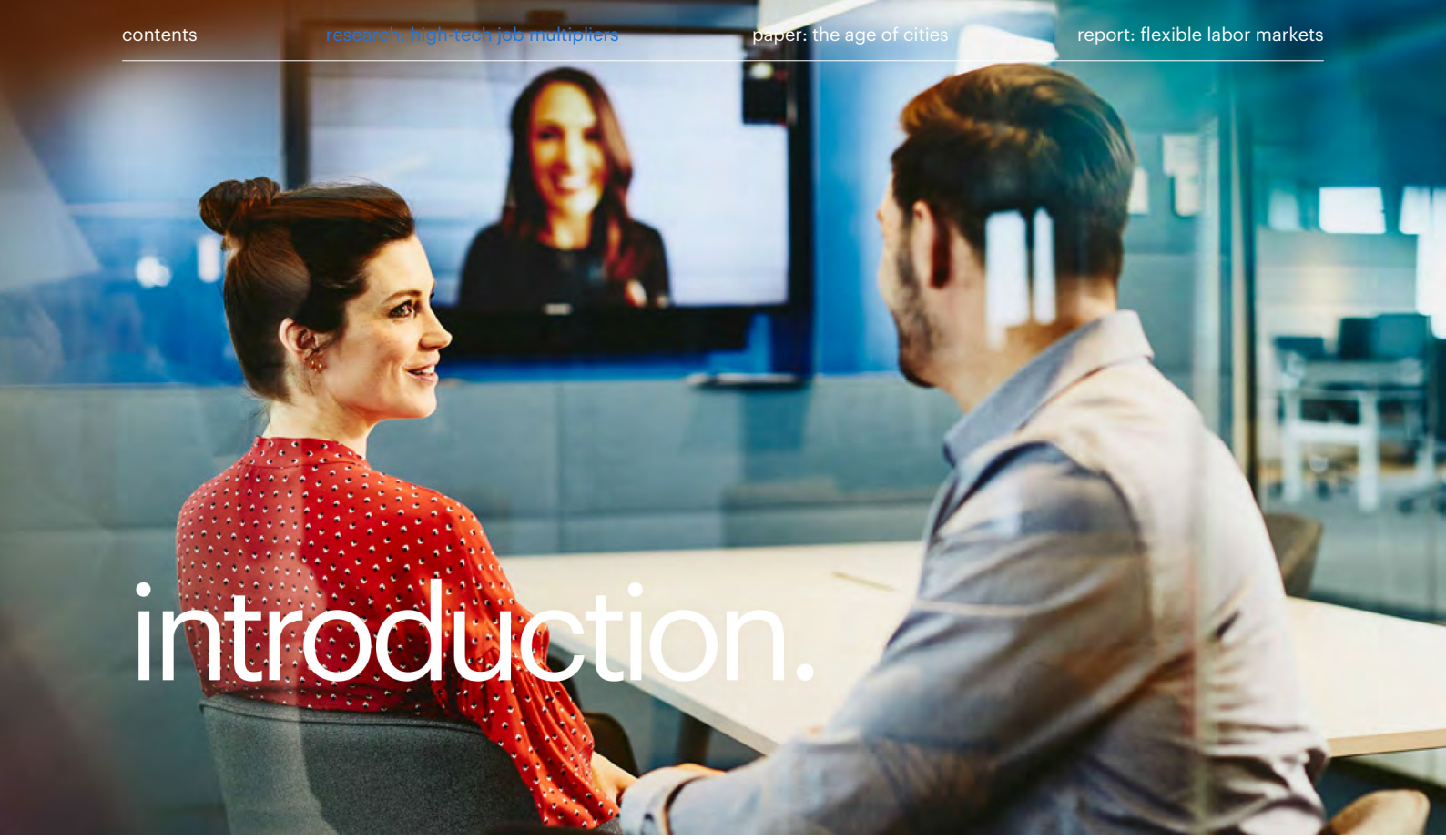


introduction.

The future of work is changing rapidly as a result of developments in digital technology, globalization, demographic changes and other fundamental changes in the organization of work. These forces are reshaping labor markets drastically and raise challenges to public policy in new, unknown ways. To understand the change currently taking place in the labor market we review two related stylized facts: deindustrialization and job polarization. Job polarization refers to the growing importance of the least and most paid occupations in the economy at the expense of middle-paid ones. These phenomena capture the shifting composition of the labor market, which is a typical feature of a labor market in transition. Just as the introduction of the combustion engine, general plumbing and electricity forced society to review not only (labor) economic policy but also how we think of labor markets more generally, the current wave of technological change challenges us to reconsider the traditional structures and institutions in place.

In 'Future of Work in the digital age'[1] we explored this development and found that deindustrialization and job polarization are two related phenomena that capture rapid changes that are currently taking place in the labor market. Specifically, job polarization captures how changes in the employment share of high-paid, low-paid and middle-paid jobs can be linked to technological change which are masked by the traditional distinction between manufacturing and non-manufacturing employment.

Secondly we found that the role of technology can be understood by looking at the ICT capital intensity of a sector and the share of STEM employment. Both of these provide evidence that technological change drives between-sector job polarization. Moreover, we found that job polarization also takes place within narrowly defined sectors, which is consistent with technology being the underlying driving factor.

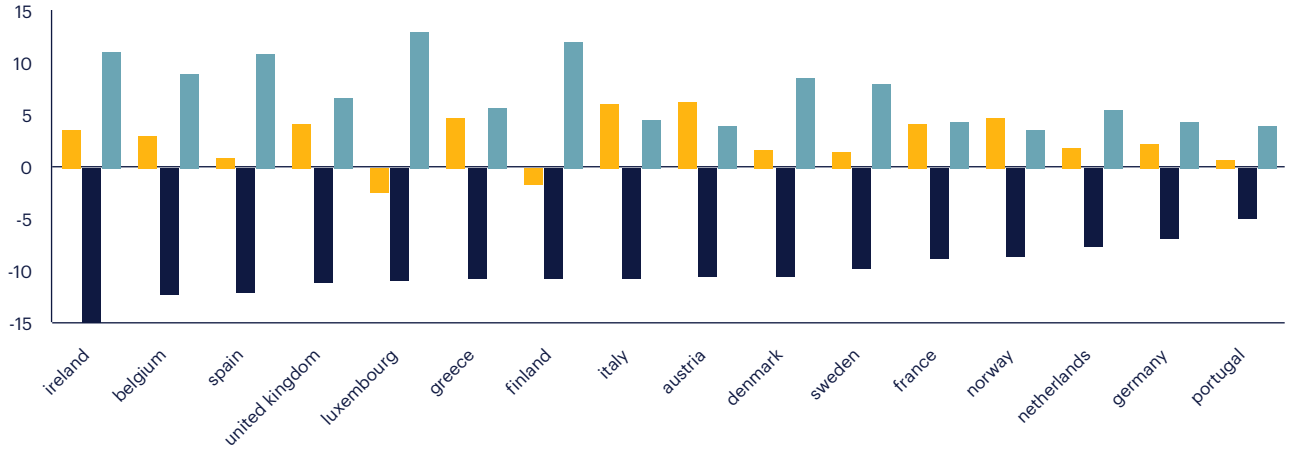
And thirdly it became clear STEM employment is more resilient to economic shocks. During recessions they tend to be associated with higher levels of productivity, productivity growth and employment growth. This confirms the Schumpeterian view of creative destruction: Recessions are times that new technology and innovation is being implemented which impacts on the type of jobs and amplifies polarization.

The evidence showed that in order to understand the current changes in the labor market, both researchers and policy makers should move away from the traditional distinction between manufacturing and non-manufacturing employment. Rather the focus should be on key enabling technologies, how they interact with employment and which type of occupations play a key facilitating role.

[1] Goos, M., Jozef Konings and Emilie Rademakers, "Future of Work in the Digital Age", Randstad Flexibility@work 2016

figure 1: change in occupational employment shares in low, middle, and high-wage occupations

1993-2010

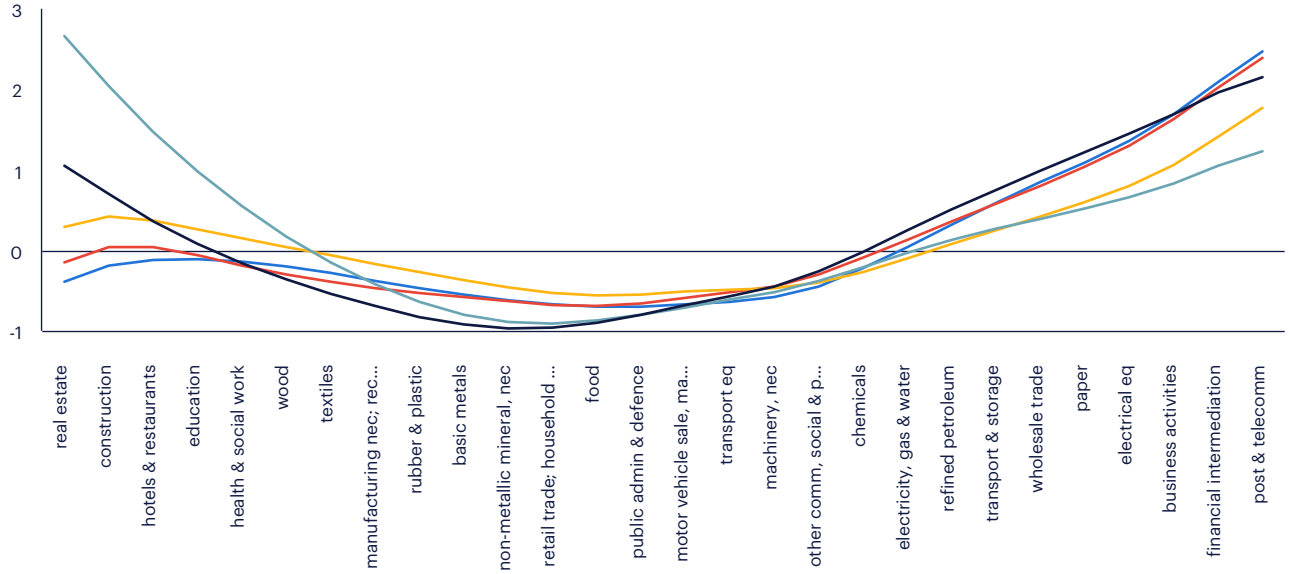


low paying middle paying high paying

source: Goos, Manning and Salamons [2014, Table 2] - notes: Starting from 2 digit ISCO classified occupations, 'Low' is defined as the employment in the four lowest paying occupations, 'Middle' as the nine middling occupations and 'High' and the eight highest-paying occupations.

figure 2: between-sector job polarization (sectors ranked in ICT capital intensity)

1980-2007, smoothed %point changes in employment share

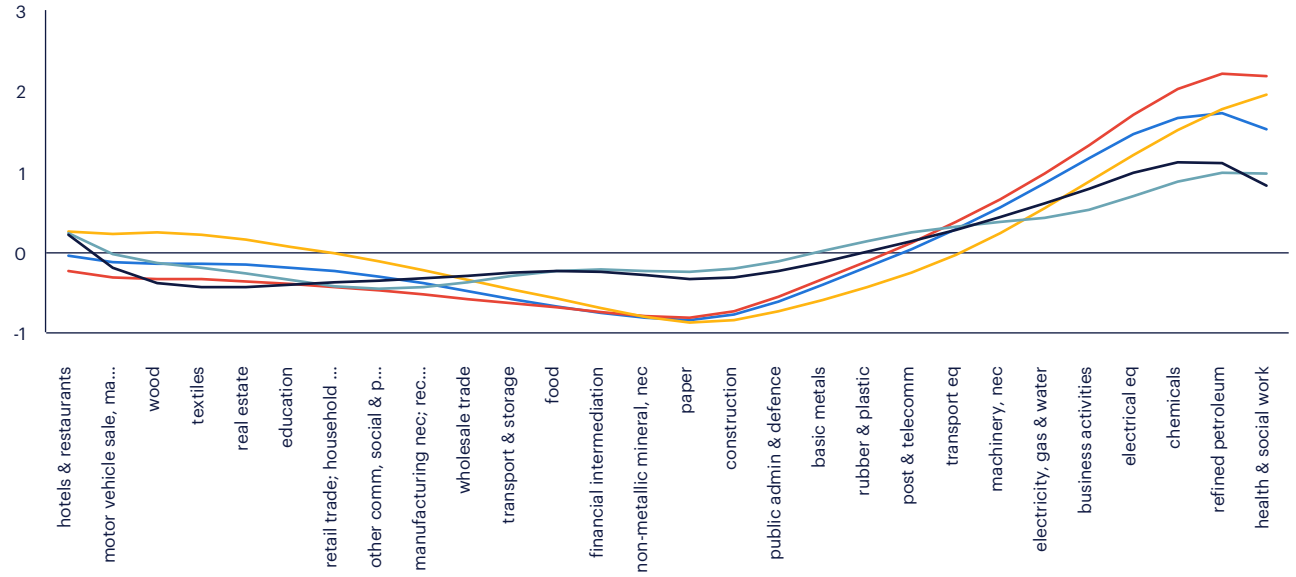


netherlands belgium germany spain italy

source: EU KLEMS 2011 Release - notes: Employment is expressed as share in total employment. We plot the percentage point change in the employment share between 1980 and 2007. The primary sector (Agriculture and Mining) and Private household employment are left out. Smoothing is done on 28 observations with bandwidth 0.8.

figure 3: between-sector job polarization (sectors ranked by STEM share)

1980-2007, smoothed %point changes in employment share

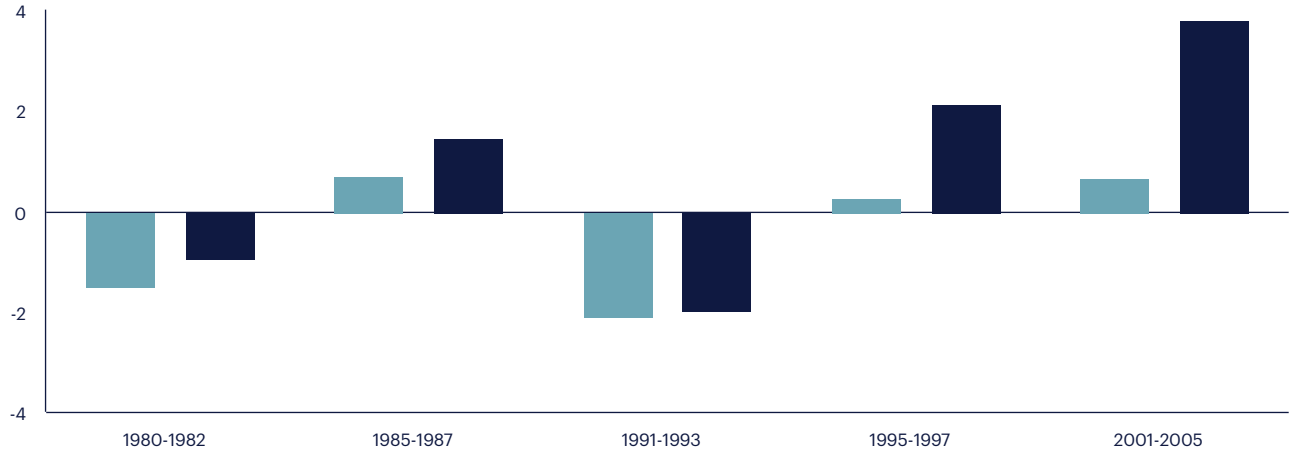


netherlands belgium germany spain italy

source: EU KLEMS 2011 Release and EULFS 2005 - notes: Employment is expressed as share in total employment. We plot the percentage point change in the employment share between 1980 and 2007. The primary sector (Agriculture and Mining) and Private household employment are left out. Employment shares for European countries is a cross-country average. The ranking of sectors is based on the average share of STEM employment in EU countries. For a definition of STEM employment, see AI. Data Appendix. Smoothing is done on 28 observations with bandwidth 0.8.

figure 4: evolution of employment during recessions (europe)

change in sector employment in %



non STEM intensive STEM intensive

source: EU KLEMS 2011 Release and EULFS 2005 - Notes: Employment is expressed in millions of hours worked as a cross-country average. We plot the growth in employment within different episodes of recession. Periods of recessions has been determined by the OECD through a leading indicator for countries. http://www.oecd.org/std/leadingindicators/CLI-components-and-turning-points.pdf. Episodes for Europe are based on Germany. Stem intensity is defined at the sector level where sectors are characterized as STEM intensive if the share if STEM employment is more than 13,5%. This accounts for 22% of all employment in 1980, increasing to 30% of employment in 2007.

job multipliers.

Evidence shows that both low-paid, low-tech and high-paid, high-tech employment is growing in importance in the economy. This implies that our policy should not only be geared towards training more STEM workers, but also to support this low-tech service employment to respond to the increased demand. Still, the evidence of complementarity between the two suggests that it could be enough for policy makers to create policies that stimulates STEM employment in order to boost both target groups. This is contrary to the consideration in public debates that investing in STEM only creates employment at the top while destroying employment at the bottom.

The evidence in 'Future of Work in the digital age' showed that both employment and productivity growth can be associated in particular with STEM employment. Moreover, STEM employment provides a better buffer against employment loss during recessions than non-STEM employment. However, employment growth is not restricted to STEM employment, which can be found both in manufacturing and service sectors. The drop of employment in low-tech manufacturing sectors is also absorbed by an increased employment share in low-paying, low-ICT intensive service employment which tends to be the least STEM intensive sectors in the economy. This suggests that some complementarity exists between STEM and non-STEM intensive employment which is necessary to explore in order to understand the full impact of innovation and targeted policies on the economy-wide employment.

There are several interacting factors which may contribute to this complementarity. We have already given evidence on one aspect of this by showing that there is a positive association between STEM and non-STEM employment at the firm level. In this section we have a closer look at how this plays out at the local level and also provide empirical evidence present in the current literature.

First, we provide a theoretical framework which links innovation to the growth of both high-tech employment as well as employment in local services through a combination of interacting demand and supply effects. The mechanism described is in line with the arguments presented by Autor and Dorn (2013) for the US and Goos, Manning and Salomons (2014) for countries in the European Union underlying the phenomenon of job polarization.

Innovation increases demand for high-tech jobs because of existing complementarity of these jobs in the production of high-tech goods. In addition, the decrease in the relative price of these high-tech goods (in accordance with the idea of Baumol's cost disease) may increase the demand for employment in high-tech production. Secondly, innovation leads to an increase in demand for local services following an increase in the average income in the region. This demand-side effect may be sizeable given the evidence that demand for services is relatively income elastic but also price demand inelastic. Consider, for example, the increase in demand for household services, childcare, restaurant, schools, etc., as the average income in developed countries increased. In addition, we can expect this increased demand to remain even in the case of increasing relative prices. For example, the demand for education is likely to increase even if consumers are facing increasing prices. We can expect this increased demand for services to be translated in increased employment demand given that these services cannot be readily automated due to their non-routine content or outsourced. The non-tradable aspect of services can be related to the fact that these local services also tend to be in-person, such as waiting on someone in a restaurant or cutting someone's hair in a barbershop.

This mechanism may explain why there is growth in both high- and low-tech employment and more specifically, why a local high-tech job multiplier may exist given that the increased demand for non-tradable, in-person services can be expected to have local effect. A local high-tech job multiplier would capture that for every additional job in high-tech employment, more than one additional job is created within the region.

Evidence for such a local high-tech job multiplier has been presented by Moretti (2010) for US cities. Moretti estimates that for every created tradable job, 1.5 non-tradable jobs are created within the same city. This estimate increases to 2.5 in non-tradable local goods and services when considering only the creation in skilled jobs. The estimated local multiplier increases further to 5 when considering urban high-tech employment in two specific sectors: "machinery and computing equipment"; and "electrical machinery and professional equipment". Moretti and Wilson (2014) provide further specificity by exploring the impact of local R&D subsidies in multiple states. They present even larger local job multipliers which have particular impact

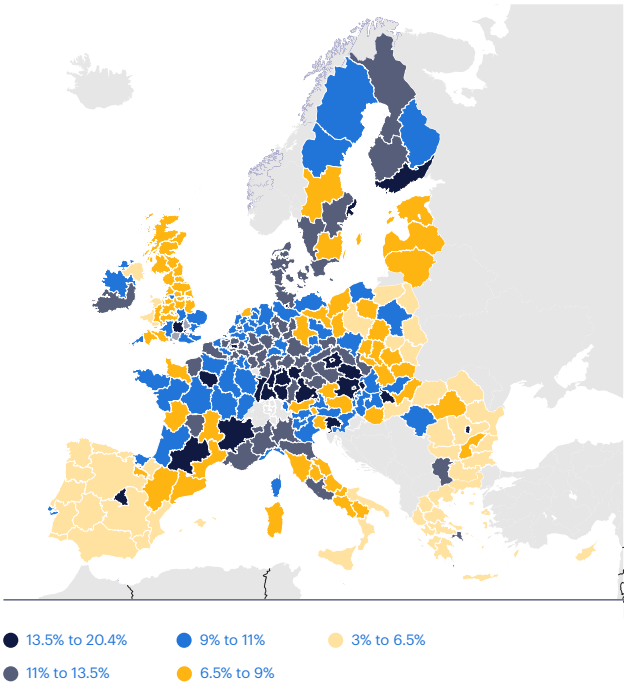
job multipliers.

on the growth of employment in construction, for job creation in bio-tech companies. This evidence has been extended to Sweden using information on 72 local labor markets in Sweden. The multiplier following an additional job in skilled tradable employment is 2.8 for non-tradable employment in that region. This number decreases to 1.1 when considering and additional job in high-tech manufacturing.

The fact that local spillovers between high-tech jobs and low-tech jobs, or alternatively, 'abstract STEM type of jobs' and 'service non-routine jobs' becomes clear from Figure 5, which shows that high-tech employment is often regionally concentrated. Typically these tech hubs are in major urban areas throughout the continent and in regions with highly skilled workforces.

figure 5: high-tech intensity per NUTS-2 region

high-tech jobs share in %, 2011



Goos et al. (2015) consider therefore the existence of a local high-tech job multiplier with regional data at the NUTS 2 level of 27 countries of the European Union. Moreover, the authors expand the definition of high-tech employment. Starting with the high-tech employment at the sector level, it includes all workers employed in manufacturing sectors defined by a high ratio of R&D expenditure over value-added and in knowledge-intensive services characterized by a high share of tertiary educated workforce. In addition, high-tech employment is determined by employment in STEM occupations which are located across both high-tech and other sectors. This implies that high-tech employment is captured both through the specificity of the occupation itself or the innovation character of sector activity. For example, we consider an engineer to be high-tech employment regardless of the sector he or she is working in because it is a STEM occupation. On the other hand, a manager, which may not be regarded as high-tech per se, is considered as such if he or she is working in a high-tech sector. This generates four components of high-tech employment: STEM occupations in high-tech sectors, STEM occupations outside high-tech sectors, and non-STEM employment in high-tech sectors.

To take into account that the interpretation of the empirical results may not be causal if, for example, there are shocks at the regional level which affect both high-tech and other employment, the authors suggest a correction in constructing Instrumental Variables. The instruments are based on taking the average growth in high-tech employment in the country, excluding the growth of the region for which the instrument is calculated. In addition, this instrument is expanded to the four different components of high-tech employment based on their definition. See Goos et al. (2015, p6-7) for further details.

The authors report the results for the OLS and IV specification using either or both of the instruments described for 5-year growth periods. The OLS estimates suggest that the creation of one high-tech job leads to the creation of 2.57 jobs in other employment within that region. The IV specification provides substantially larger estimates. Regardless of the specified instruments, the estimated local multipliers suggest that for every high-tech job, 4.75 other jobs are created in the region. This is robust to restricting the growth in high-tech employment to STEM occupations. That is, if we consider growth in high-tech employment only as the growth in STEM occupations and exclude non-STEM employment in high-tech sectors, the estimated local multiplier still equals 2.8 when applying OLS and 4.45 when making use of the introduced instruments.[2] The

[2] These results can be found in greater detail in Table 3 of Goos et al. [2015].

definition of high-tech employment, which is more specified towards the presence of innovation may explain the difference in magnitude of the estimated job multiplier with respect to the previous evidence.

In sum, regional growth in high-tech employment can be connected to an even stronger growth in other employment, which may be explained by the presence of complementarity in consumption and spillover effects in demand. This can explain why there is growth also beyond STEM occupations as a second order effect of innovation taking place. The estimates suggest that, on average, with the introduction of one high-tech workers between 2.5 and 4.4 jobs are created outside high-tech employment. This also implies that policies geared towards high-tech employment can boost both employment groups which we know are under increased demand due to technological progress and their non-routine nature. Contrary to what is sometimes considered, the boosting of high-tech employment helps rather than hurts growth of employment at the bottom.

variations of job-multipliers in europe.

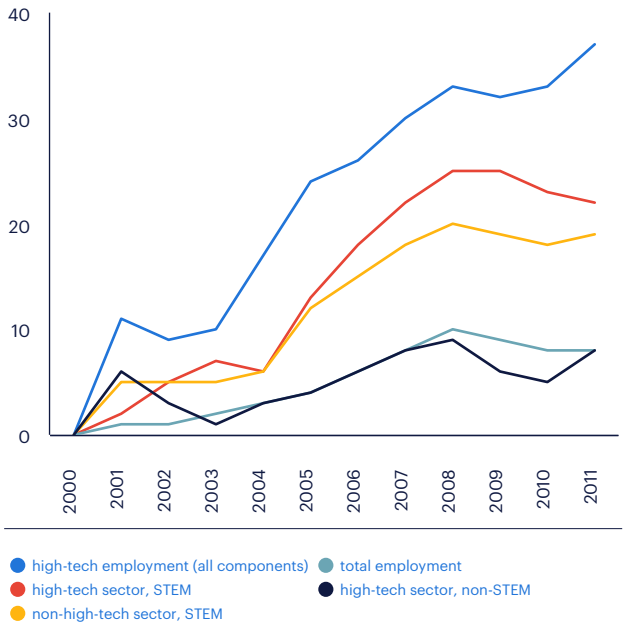
This chapter is based on recent research by Goos, Konings and Vandeweyer (2018)[3] and documents that there exist important differences in the size of the local high-tech job multiplier that are persistent across regions. In particular, we find that the multiplier is larger in regions with higher immigration, an abundance of less-skilled workers, and lower gross output per capita. At the country level, we also show that this results in local high-tech job multipliers that are larger in Southern European countries than in the rest of Europe.

The solid lines in Figure 6 show the cumulative percentage growth in total and high-tech employment in the EU-27 between 2000 and 2011: 19% versus 8% respectively. The faster growth of high-tech than total employment implies that the share of high-tech in total employment increased over time from 9% in 2000 to 10% in 2011. Moreover, the dashed lines show the importance of different components in the definition of high-tech employment. The fastest job growth can be observed for STEM workers in high-tech sectors, growing by a cumulative 37% between 2000 and 2011. Also, workers in STEM occupations outside high-tech sectors grew faster than overall high-tech employment, by 22% versus 19% respectively, whereas employment of non-STEM workers in high-tech industries only increased at the pace of European-wide total employment, by 8% between 2000 and 2011. These figures clearly show the importance of STEM workers outside high-tech sectors, as employment in STEM occupations has been the main driver of total high-tech employment growth.

The faster growth of high-tech than total employment implies that the share of high-tech in total employment increased over time from 9% in 2000 to 10% in 2011. The EU-wide high-tech employment share of 10% in 2011 masks large differences in high-tech intensity between countries and regions in Europe. To illustrate this, Table 1 gives the top (Panel A) and bottom (Panel B) 15 regions in terms of their high-tech employment share that are of sufficiently large size, i.e. with an employed population of at least one million in 2011. The top regions include large capital regions, such as Paris, London, Berlin and Stockholm, as well as regions with a strong sectoral specialisation, such as Midi-Pyrénées (aerospace, ICT and agro-food) and Stuttgart (mechanical engineering). The lagging regions are mainly located in Southern Europe and Romania.

figure 6: cumulative employment growth: total vs. high-tech components

in %, EU-27, 2000-2011



notes: In the years before total country coverage (2000-2004) EU-27 employment in the high-tech components is calculated as the employment share of the components in the covered countries multiplied by total EU-27 employment.

While high-tech employment grew in the large majority of European regions, it is interesting to see in which regions high-tech growth was strongest. For example, stronger growth in regions that initially already had higher shares of high-tech employment would suggest a lack of convergence in high-tech employment across regional labour markets in Europe. To see whether this is true, Panel A of Figure 7 shows between 2000 and 2011 the interquartile range in high-tech employment intensity between regions remained constant, suggesting pervasive differences between regions, and between countries.

To illustrate this further, Panel B of Figure 7 shows that the within-country interquartile range in high-tech employment shares across NUTS-2 and NUTS-1 regions within countries remained constant over time, suggesting that also within countries regional differences remained pervasive. In sum, European regions have been able to create high-tech jobs, but that these high-tech jobs remain highly concentrated in regionally clustered high-tech hubs.

[3] Goos, M., Jozef Konings and Marieke Vandeweyer, "Local High-Tech Job Multipliers in Europe", Industrial and Corporate Change, 2018, 1-17.

table 1: top and bottom high-tech intensity regions

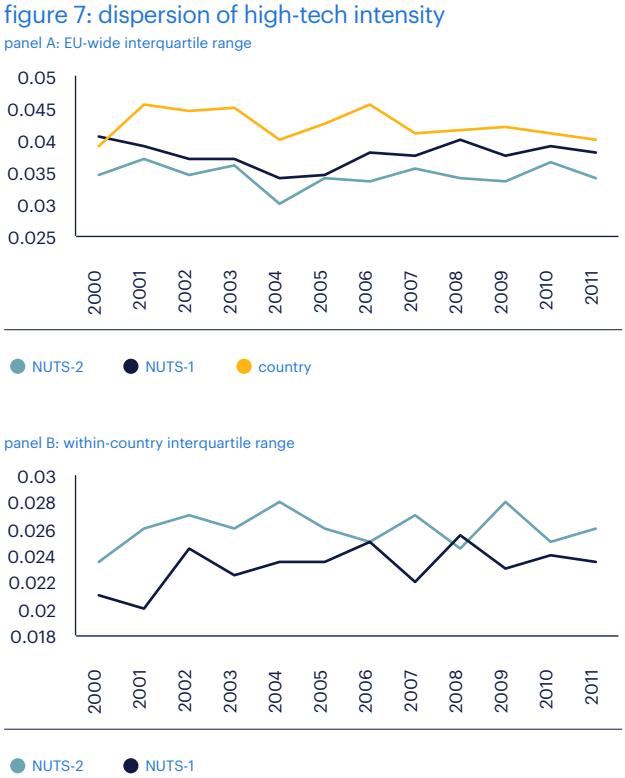
2011

	NUTS-2 region	Total employment in 2011	High-tech employment share in 2011
	panel A: top-15		
1	Stockholm (Sweden)	1101	18.0%
2	Île de France (France)	5228	17.6%
3	Bucuresti - Ilfov (Romania)	1058	15.7%
4	Midi-Pyrénées (France)	1232	15.4%
5	Karlsruhe (Germany)	1334	15.4%
6	Etelä-Suomi (Finland)	1307	14.9%
7	Rhône-Alpes (France)	2578	14.9%
8	Oberbayern (Germany)	2241	14.4%
9	Stuttgart (Germany)	1987	14.4%
10	Közép-Magyarország (Hungary)	1243	14.3%
11	Comunidad de Madrid (Spain)	2813	14.0%
12	Freiburg (Germany)	1248	13.8%
13	Berkshire, Buckinghamshire, Oxfordshire (United Kingdom)	1306	13.6%
14	Köln (Germany)	1999	13.0%
15	Lombardia (Italy)	4263	12.4%
	panel B: bottom-15		
1	Centro Region (Portugal)	1103	3.6%
2	Nord-Est (Romania)	1731	4.3%
3	Norte (Portugal)	1695	4.7%
4	Sud-Est (Romania)	1106	5.2%
5	Andalucia (Spain)	2774	5.3%
6	Communidad Valencia (Spain)	1889	5.5%
7	Sud-Muntenia (Romania)	1306	5.6%
8	Galicia (Spain)	1082	5.7%
9	Sicilia (Italy)	1431	5.9%
10	Nord-Vest (Romania)	1164	5.9%
11	Puglia (Italy)	1232	6.2%
12	Wielkopolskie (Poland)	1412	6.3%
13	Sud-Vest Oltenia (Romania)	1024	6.5%
14	Lietuva (Lithuania)	1369	6.6%
15	Attiki (Greece)	1535	7.0%

The analyses in the previous chapter already showed that the local high-tech job multiplier mainly creates jobs for non-STEM unskilled workers in low-tech sectors such as local services. An important prerequisite for the functioning of this local high-tech job multiplier is the availability of workers to fill these jobs. The increased demand for unskilled workers in low-tech sectors can be satisfied by available workers within the region, but also by attracting workers from outside the region. To see whether migration is an important channel through which the multiplier works, one can look at the link between migration and high-tech employment growth. In particular, Goos, Konings and Vandeweyer (2018) regress the net migration rate in a region, which is the difference between immigration and emigration as a percentage of the local population, averaged over the periods 2000-2005 and 2005-2010 onto high-tech employment growth in that region between 2000-2005 and 2005-2010. They find that there is indeed a positive relationship: Regions with strong high-tech employment growth have higher net migration rates. An alternative approach to test for the importance of labour mobility is to see whether the local high-tech job multiplier is higher in regions with higher net migration. Goos, Konings and Vandeweyer (2018) show that this is the case indeed, corroborating the idea that labour mobility is an important channel for the functioning of the local high-tech job multiplier.

While the EU-wide estimate of the local high-tech job multiplier discussed in the previous chapter gives an overall sense of the impact of high-tech job creation on the demand for other jobs in a region, there could be

figure 7: dispersion of high-tech intensity



notes: Only regions or countries with twelve annual observations are included. Within-country interquartile ranges in panel B are aggregated using employment weighted averages.

substantial heterogeneity in the size of the local high-tech job multiplier across regions. To see whether certain groups of countries have higher local high-tech job multipliers than others, once could estimate the local high-tech job multiplier for four country groups separately: Northern and Western Europe (Denmark, Finland, Ireland, The Netherlands, Sweden and the United Kingdom), Central Europe (Belgium, Germany, France and Luxembourg), Southern Europe (Cyprus, Greece, Italy, Malta, Portugal and Spain) and Eastern Europe (Austria, Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia). Goos, Konings and Vandeweyer (2018) show that the local high-tech job multipliers are only significant in Southern European countries.

Goos, Konings and Vandeweyer (2018) also show that local high-tech job multipliers are bigger in regions with relatively low levels of GDP per capita. One possible explanation for this finding is that high-tech employment in poorer regions is more low-skill intensive than in richer regions, and that regions that have low-skilled intensive high-tech industries find it easier to create or fill low-skilled jobs upon the creation of high-tech jobs. To test this, once could interact the high-tech industry multiplier with the regional share of non-STEM employment in high-tech industries. Goos, Konings and Vandeweyer (2018) find that this interaction is positive, corroborating the idea that regions with more low-skill intensive high-tech industries have bigger high-tech multipliers.

In sum, there exist important differences in the size of the local high-tech job multiplier that are persistent across regions. In particular, the local high-tech job multiplier is larger in regions with higher immigration, an abundance of less-skilled workers, and lower gross output per capita. At the country level, local high-tech job multipliers are larger in Southern European countries than in the rest of Europe.

STEM employment and human capital.

Evidence is given that there are positive spillover effects from high-tech employment to low-tech employment, especially in the form of in-person services. These spillover effects are larger in regions with higher immigration, an abundance of less-skilled workers, and lower gross output per capita. At the country level, spillover effects are larger in Southern European countries than in the rest of Europe. This provides evidence that policy boosting STEM employment may generate a positive impact reverberating across many occupations, including non-STEM.

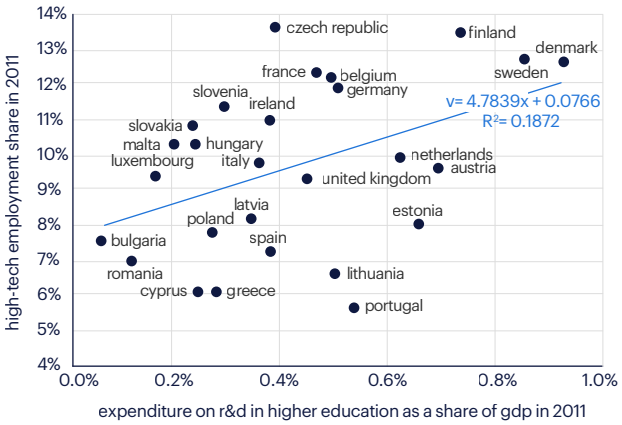
Suggestive evidence is given for the positive relationship between more and better investment in (higher) education and the share in STEM employment. This provides potential avenues for policy makers to focus on.

Given the evidence of positive spillover effects of STEM employment and its robustness to economic shocks, it becomes increasingly important to understand how we can gear policy towards supporting the growth in these occupations. This section tries to shed some light on the potential policy implications of the importance of STEM employment at the country level in creating higher levels of economy-wide employment growth which may also prove to be more resilient to negative shocks in the economy.

Policies on how to boost STEM employment may remain important as figure 3 shows that country level differences in the share of STEM employment are not decreasing. Goos et al. (2015) also present the existence and persistence of regional dispersion both at the country and regional NUTS-2 level. While they also argue that convergence between regions is taking place, it is very slow. At the rate that the authors estimate it would take Europe's lagging regions at least 60 years to close half of the gap with Europe's more high-tech intensive regions.

There exist many possible explanations for such regional differences, which are very difficult to detangle and to causally relate. This section provides some suggestive evidence taken on the importance of Human Capital growth for the share of high-tech employment. Figure 8 plots on the horizontal axis, a country's expenditure on R&D in higher education as a share of GDP in 2011.

figure 8: high-tech employment vs expenditure on R&D



source: Goos et al [2015, p31]

A clear positive relationship can be discerned between the expenditure in R&D in higher education and the share of high-tech employment across countries. However, the figure also suggests that some countries make better use of their investments than others. While countries like Lithuania and Portugal spend more or less equal amounts of investment in R&D as a share of their GDP as countries such as Belgium and Germany, their high-tech employment share is only half, which suggests a potential doubling of their high-tech employment share by spending their investments in R&D in higher education more effectively.

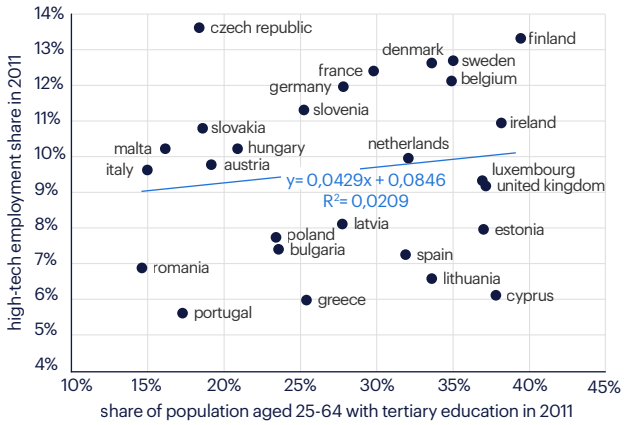
The authors provide a second indicator at the country level for the importance of high education to boost STEM employment: the share of tertiary educated aged 24-64 in a country. These results are reproduced in Figure 9.

Again, the relationship is positive, suggesting that a higher share of tertiary educated can be associated with a high share in high-tech employment. The correlation is relatively weak though indicating that increasing the share of tertiary educated is less effective in fostering the growth of STEM occupations in a country. One reason for this may be that the quality of the education rather than the quantity matters for the growth of high-tech employment. In other words, the 33% share of tertiary educated in Spain may have a different content that the 33% share in the Netherlands or in Denmark.

STEM employment and human capital.

figure 9: high-tech employment vs population with tertiairy education

2011



source: Goos et al [2015, p31]

In sum, low public investment in (higher) education both in terms of quantity and quality may be holding back growth in high-tech employment and is one of the reasons why there is such persistence in the differential growth of high-tech employment between regions. This suggests that regions should consider increasing their investment in tertiary education and in R&D in higher education in particular as means to boost their high-tech employment growth. Still, the presence of wide cross-country variation suggests that some caution is necessary. Not all expenditure in (higher) education is equal and countries should consider policy measures careful, also when adopting them from other, seemingly successful contexts.

conclusions and recommendations.

The current wave of technological change forces us to move away from the traditional classification of the economy into manufacturing and nonmanufacturing sectors. Rather we should think in terms non-routine tasks embedded in jobs versus routine tasks. With automation the latter are easily replaced or offshored to low-wage countries, while non-routine tasks are harder to substitute with robots.

By focusing on employment with high STEM intensity, the evidence reveals that these employment shares are not only associated with higher growth, but also with better performance during recessions than other employment and with higher levels of productivity, measured as labor productivity or TFP more broadly.

We have provided evidence of a structural link between STEM and non-STEM employment, especially in in-person services. This takes place because of positive spillover effects from STEM employment through demand in consumption for local services. These spillover effects are larger in regions with higher immigration, an abundance of less-skilled workers, and lower gross output per capita. At the country level, spillover effects are larger in Southern European countries than in the rest of Europe. Therefore, by supporting STEM employment, the other, expanding share of the market may also be supported.

While the cross-country variation in labor market institutions provide interaction effects which should be taken into careful consideration by policy makers, it is possible to make some general recommendation for policy makers. First of all, policy should not be blindsided by the traditional structures of manufacturing versus non-manufacturing as engines for growth. Innovation occurs in both camps. Therefore, the servitization of the economy need not be associated with long term declines in economic growth. It is more meaningful to distinguish between employment in the way it interacts with technology.

By focusing on employment which is STEM intensive, you can boost employment which benefits highly from the current technological change, it is more resilient during recessions and can generate higher levels of productivity. We have given one suggestion of possible avenue for economic policy by providing evidence of a positive association between better and higher investment in (higher) education and STEM employment.

part II: the age of cities.

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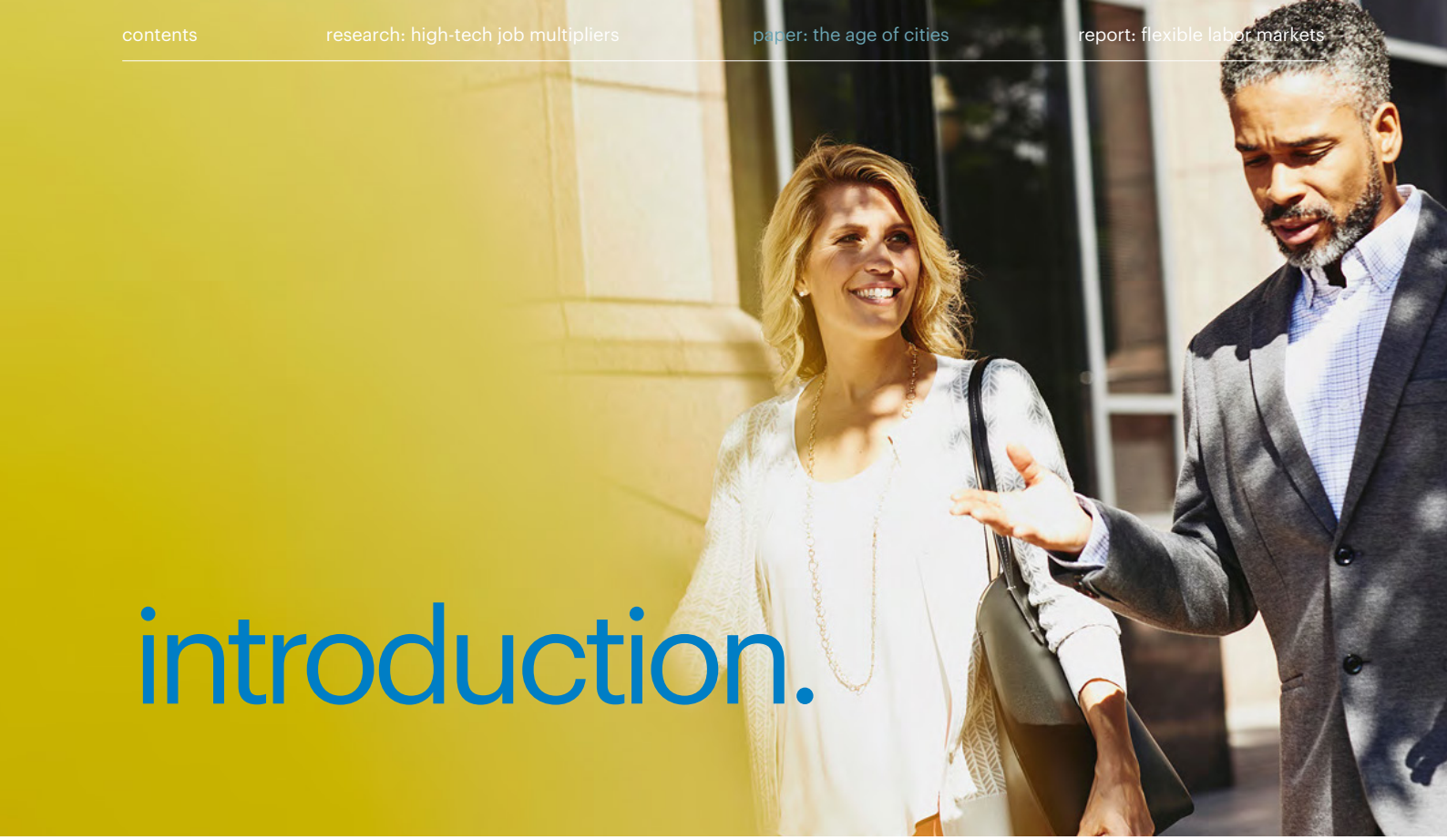
21 the age of silos
27 the age of value chains
38 the age of value ecosystems
49 conclusion and recommendations



introduction.

Cities are our future. Whether you are an economist, sociologist, business leader, researcher, or politician, cities are on your radar and you will have heard the following numbers and repeated them dozens of times: 200 years ago, most people lived in rural areas; 100 years ago, urbanization had started and twenty percent of the world's population were living in urban areas; 10 years ago, more than half of the world's population were living in cities; and by the middle of the 21st century, seven out of every ten people on earth will be living in cities. Global businesses are already beginning to plan strategy from a city, rather than a country, perspective. Cities generate more than 80% of global GDP (Economist, 2013). Cities are at the forefront of human progress. However, historically some cities have been doing better than others. What is causing this difference and what will make cities competitive in the future?

The current rise of the platform economy marks the emergence of a new era. In this section, drawing on the latest predictions about future labor markets and by extrapolating underlying patterns from the past into the future, we endeavor to paint a picture of what this new era and the cities within it will look like. We identify the characteristics sprouting from those underlying patterns in order to understand what will make cities competitive in this new age. Along the way, we will come across the age of silos, starting at the industrial revolution and ending at the digital revolution; the age of value chains, starting at the digital revolution; and the age of value ecosystems, which has only just begun, but will be prominent across OECD countries by 2030.

This is a story of technology and automation causing changes to the way we live, work, and play. But also a story about people gravitating toward each other to fulfill each other's economic, social, and environmental needs. And also a story within which some cities have historically been more successful in facilitating those needs than others. How can these differences be explained and what will make a city competitive in 2030?

the age of silos.

drivers in the age of silos (1800-1980)	
technological enablers	steam-powered engine
economic shift	industrialization
socio-economic shift	urbanization
competitiveness determined by	size
most competitive modus operandi	solid

the story of cities

The story of cities is a story about people gravitating toward each other to fulfill each other's economic, social and environmental needs. But it is also a story of technology and automation causing changes to the way citizens live, work, and play. This is a process that had been occurring gradually for a long time, but which started to speed up following the advent of the industrial revolution. What happened before that revolution? Urbanization started more than 10,000 years ago, when agriculture started to replace hunting and gathering as the dominant mode of work. The first permanent cities emerged 5,000 years ago after the invention of irrigation and soil tilling. Around that time, cities like Ur and Uruk, with more than 100,000 residents, were born in what is now Iraq.

The birth of cities led to numerous social and economic innovations. Having so many people living in close proximity required new forms of organization. This resulted in the first religious and political systems, which depended on effective bureaucracies and enforcement capabilities. This in turn led to more developed writing systems, schools, and urban planning. Historical evidence demonstrates how Uruk's city leaders planned grids, streets, zoning, water and waste systems. These early cities were able to provide the basics for living in terms of food, health, safety, education, and mobility. As a result, some citizens were now able to spend time on inventing new ideas, like the wheel, which in turn boosted overland trade. Long-distance trade routes such as the old Silk Road formed an ancient global ecosystem that allowed ideas and technologies to move across Eurasia.

For the 7,000 years that followed, cities emerged around the world at locations of economic and strategic significance. The most successful cities were well connected to trade routes over land and over sea, able to defend themselves, and located close to fertile farmlands. Innovations such as the plow increased the efficiency of farmers, and since these farmers produced more, fewer people needed to be farmers in order to meet demand. This resulted in more mobility, and people began moving to cities. Within these cities, people found ways to create economic value. Most of this value was created on a small scale, by small retailers and producers of goods and services. People's roles were quite fixed, and it was almost impossible to move from one social level to another. As a son, you would probably work in the same job as your father, your grandfather and your great-grandfather did.

In essence, these cities provided the same benefit as landlords in rural areas: safety. Cities, with their big walls and other defensive features, were an attractive place to work and be protected at the same time. All those people grouping together made things like trade much easier, so people started to produce goods for trading purposes only. However, in those early days, living in a city also had many negative sides. Bad hygiene and the lack of clean water led to the spread of infectious diseases such as the plague, which killed millions of people. Overall, growth in economic output per capita was limited, as agriculture remained the dominant industry and innovations that spurred productivity were scarce. All of this started to change about 200 years ago, with the advent of the Industrial Revolution. This revolution reshaped the way people work, spend time, and organize the cities they live in. It led to an era we can now look back on and learn from.

the age of silos

The age of silos was an age in which the economy, society and people's lives became organized in neatly separate boxes in time and in space. We define its time period from the start of the Industrial Revolution until the moment service industries surpass manufacturing. The age of silos was characterized by the interplay between rapid urbanization and an industrial and political revolution. The invention of the steam-powered engine allowed machines to take over part of the physical labor that was previously done by humans and horses. This significantly increased economic productivity for the first time in history.

Meanwhile, as printing press technology advanced, books and papers quickly became cheaper and started a democratization of access to information. These developments, combined with the growth of literacy,

made it possible to standardize knowledge and skills. This also triggered a change in existing power structures, leading to a political revolution that would define our modern-day nation states.

> "It was the best of times, it was the worst of times, it was the age of wisdom, it was the age of foolishness, it was the epoch of belief, it was the epoch of incredulity, it was the season of Light, it was the season of Darkness, it was the spring of hope, it was the winter of despair, we had everything before us, we had nothing before us, we were all going direct to Heaven, we were all going direct the other way – in short, the period was so far like the present period, that some of its noisiest authorities insisted on its being received, for good or for evil, in the superlative degree of comparison only." Charles Dickens, A Tale of Two Cities, Book the First, Chapter I.

The famous opening sentence of Charles Dickens' 'A Tale of Two Cities' describes the French Revolution and the drama within. But what happens next? At the end of the novel, a new social order emerges. The French monarchy is replaced by a republic, inspiring citizens around the world and leading to the decline of absolute monarchies, which are replaced by republics and liberal democracies. The period leading up to the French Revolution of 1789 was one of polarization. There was a sharp division between a small elite and the majority of the population. The French Revolution, at least partially, empowered citizens to change society. More and more people learned to read and write, enabling them to think and express themselves in new ways about their countries and themselves (McGowan, 2016).

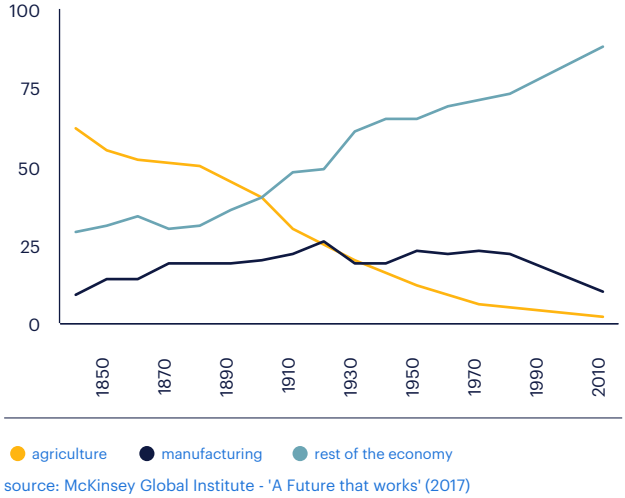
the changing nature of work

The number and size of factories grew rapidly as the newly invented steam engine replaced human and horse power, significantly increasing the productivity of workers in agriculture. In the first instance, this led to a surplus of agricultural workers. Many of these laborers found work in the new factories, where men and machines worked alongside each other, crafting goods much more efficiently than traditional craftsmen had done. As a result, from the 1800s onwards, factories started to replace people crafting goods in their homes or small workshops.

One of the earliest examples of a sector that industrialized in this way was the late-eighteenth-century textile industry in England. It started with Richard Arkwright, who opened what is now regarded as the world's first factory, in Cromford, England, after he patented his spinning frame in 1769. Soon he had over 300 employees, and in 1789 he was employing 800 people. Of those 800, only a few were engineers, while more than 95 percent were essentially unskilled workers, paid by the hour. This switch from high- to low-skilled work was caused by inventions such as Edmund Cartwright's mechanized power loom. The choice between high numbers of highly paid weavers or investing in the power loom proved an easy one for most factory owners. That is why in Britain alone the number of power looms grew from 2,400 in 1813 to over 250,000 in 1850 (Trueman, 2015). Many more 'skilled machines' would follow, reshaping small-scale craftwork into large-scale low-skilled factory work, often performed by children.

England's textile industry is a prime example of early industrial sector transformation that would soon after spread throughout Western Europe and the United States. It shows the effects of the Industrial Revolution on work, reconfiguring people's working lives. Before the advent of factories, people did everything themselves, from sourcing materials to crafting and trading. This meant they played many different roles. When factories became commonplace, however, people worked in well-defined shifts, performing a well-defined fraction of the production process. Similarly,

distribution of labor share by sector in the USA
1840-2010, in %



source: McKinsey Global Institute - 'A Future that works' (2017)

the sourcing of materials and the selling and trading of products became the responsibility of different departments. To optimize the performance of each of these 'silos' and the people within them, a hierarchy proved the most efficient method. To make those hierarchies run smoothly, organizations required proper administration, which was enabled by new technologies such as the typewriter. This in its turn resulted in new administrative jobs.

Companies within different industries had to compete with each other. The key factor in achieving a competitive advantage was size. Because every company had a set of fixed costs, the costs of producing a product decreased if the variable costs of labor and materials outweighed the fixed costs of physical assets, such as buildings and machines. As a result, factory owners and companies tried to get the most out of their assets by making optimum use of them. For workers, this meant long shifts (including night shifts), while receiving the lowest possible wages. Successful manufacturing industries depended on a neatly organized operation and the ability to invent and install machines that could take over skilled and unskilled work in order to reduce labor costs. The single measure of employers' success was the selling of finished goods at the lowest possible price.

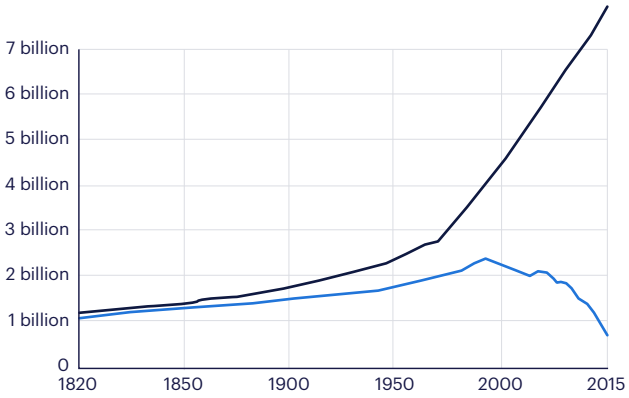
A snapshot of the distribution of labor share by sector in the United States tells the story of how the Industrial Revolution changed the world of work. It reveals that in the final years of the age of silos, less than five percent of the workforce was needed in the (by now) highly efficient agricultural sector. During the years of industrialization, mining and construction were on the rise, growing along with manufacturing. But as productivity in the industrial sectors grew, the demand for services also increased. Think of domestic servants, waiters, blacksmiths, cobblers, barbers and bankers. As average incomes increased, the demand for meals, repairs, grooming and financial services increased with it. This led to more and more workers being needed in the service sector. Increasingly, automation and higher productivity in factories pushed workers out of factories and mines, while pulling them towards service jobs.

changing lives of citizens

Citizens in the early years after the Industrial Revolution, now away from their farmlands, needed to work long hours just to be able to provide shelter and food for themselves. But as economies started to become more productive, slowly but surely life started to get better for most citizens. At the same time, inequality between groups of citizens increased. In the early stages of the Industrial Revolution, most people were still illiterate. They were easily replaceable cogs in the industrial machine, with no special knowledge or skills. Subsequent societal developments, such as universal primary education and mass media, fundamentally changed the way people perceived their 'world': "It was

life gets better for most citizens

1820-2015, in billions of persons

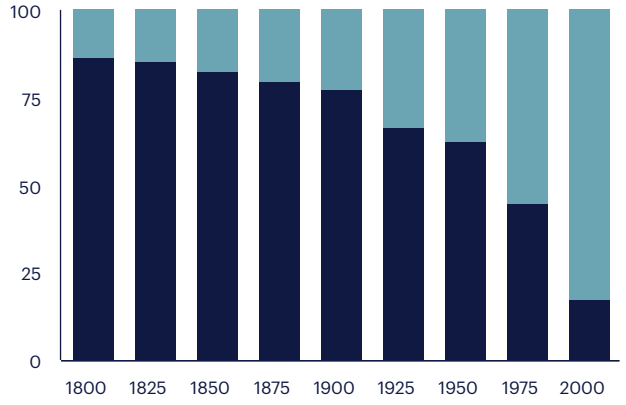


number of people not in extreme poverty
number of people living in extreme poverty

source: World poverty in absolute numbers - OWID based on World Bank (2016) and Bourguignon and Morrisson (2002)

literacy increases

1800-2000, in %-share of world population



illiterate world population literate world population

source: ourworldindata based on OECD and UNESCO (2016)

printing coupled with universal primary education and mass media, like newspapers and magazines (including books published in monthly installments), that truly pulled the minds of ordinary men and women into the new, abstract society." (Eriksen 2014:27-28).

In the early twentieth century, workers became more organized and started to stand up for their rights. This led to the introduction of labor regulations, which gradually led to a decrease in inequality and fairer pay for workers. The enormous rise in GDP per capita gave more and more people the chance to consume more. This meant they could actually buy the vacuum cleaners and other electrical appliances they themselves were producing in factories. Working hours dropped, the standard of living rose, and fewer people lived in extreme poverty. All this opened up new markets for 'luxury' articles and led to a shift towards consumerism, with people having more time and money to consume the things they enjoyed.

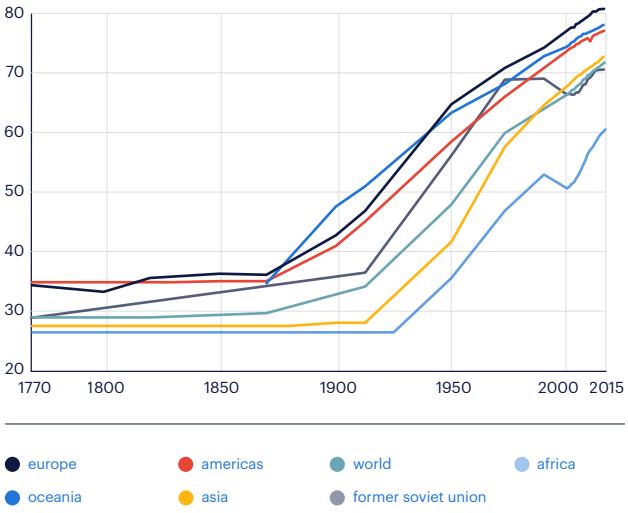
With this rising wealth and better quality of life, average life expectancy started to rise from about 35 in the early 1900s to 65 in the 1980s, almost doubling the average world life expectancy in under a century. The rise of manufacturing in the first half of the twentieth century changed the lives of the population drastically. The introduction of household appliances such as refrigerators, vacuum cleaners, and washing machines meant that hours spent on housework dropped significantly. Around the 1900s, housework still took up around 58 hours a week, but 50 years later it had dropped to less than 30 hours a week. New technology in the home made it easier for women, who were traditionally responsible for housework, to get a paid job outside the home. This led to a whole new influx on the labor market and reduced gender polarization.

governing urbanization

The rise of manufacturing jobs also changed the spatial distribution of the population, with people moving from the countryside to the cities. This is thoroughly documented in Great Britain, which became the world's first urbanized society. By 1851, more than half the population lived in cities. Britain's population also boomed during the 1800s, rising from about 9 million in 1801 to 41 million by 1901. This growth was particularly visible in cities. The city of Manchester, for example, experienced a six-fold increase in its population

life expectancy increases

1770-2015, life expactancy in years, globally and by world regions



source: Life expectancy - James Riley for data 1990 and earlier; WHO and World Bank for later data (by Max Roser)

between 1771 and 1831. The United States followed a similar pattern. By 1900, almost one-third of America's citizens lived in cities, and there were more than 40 cities with a population of over 100,000.

Citizens moved to cities to find jobs in order to provide for their basic daily needs. During the early years, these were mostly food and shelter, but as industries grew and working conditions improved, these needs included basic health care and education. However, access to health care and education was not distributed evenly. In a way, society itself was fragmented into different silos, living in different areas and working in different jobs. Some groups were much better off than others.

Cities were not used to handling the sudden influx of people and not everyone could be accommodated. Affordable quality housing was an incredible challenge, as building contractors sought to maximize profits and therefore often delivered housing units of deplorable quality. Many families lived in basement dwellings, and most houses did not have a shower, toilet, or running water. Dumping of waste on open land and an overall lack of hygiene led to the widespread occurrence of diseases like cholera and typhus.[4]

[4] www.historylearningsite.co.uk

great britain in the 19th century

A block of 40 houses would often have only six toilets for the entire neighborhood. It is estimated that, on average, nine people lived in one house, which would mean that these six toilets served 360 people! Emptying the toilet was the responsibility of the landlord, but since they had to pay a considerable amount for this, they kept it to a minimum. This often resulted in overflowing cesspits, creating considerable health risks. A proper drainage system would have resolved this, but that was expensive. The poor could not pay for it, and the wealthier inhabitants were unwilling to pay for such an expensive item if it did not benefit them directly.

Although living in cities in pre-industrial times was in many ways appalling, cities still kept continued to grow, as people needed a job, and the city was their best bet to find one. The concentration of economic production, which was previously done in people's homes, made it necessary for cities to engage in city planning. Pollution and overcrowding led city officials to rethink land-use. This started with laws that prevented polluting industries to be built in residential areas, and soon evolved into the functional separation of uses and zoning as we know it today.

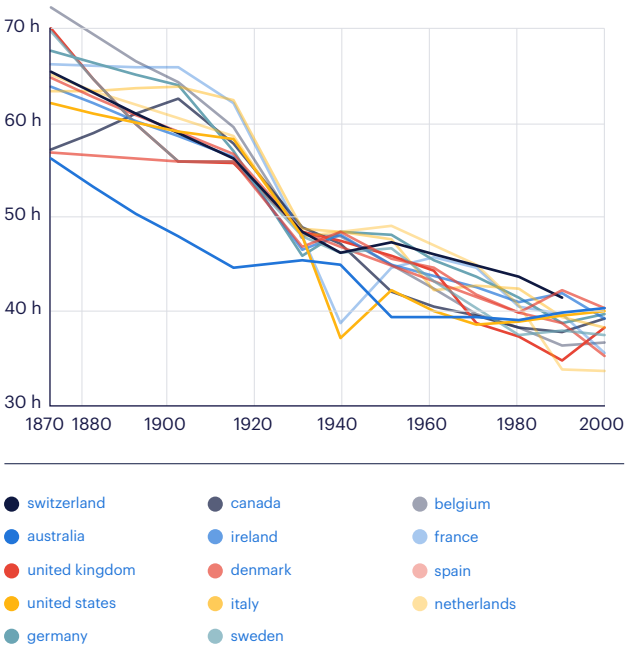
Cities provided work, and by doing so, they provided people with the means of buying food and water and arranging a house for themselves inside the safety of the city defenses. To start with, they only provided the basic needs for their citizens. Over time, cities got better in governing urbanization. As working and living conditions improved, citizens started to expect more from cities. They wanted their own homes with their own facilities, including electricity and sanitation.

Between 1900 and 1950, weekly working hours dropped from approximately 65 hours to 45 hours. This, in combination with household appliances reducing the amount of household work, enabled citizens to have weekends, evenings and holidays off – time that could be used to fulfill psychological needs, such as leisure activities with family and friends, or playing sports. Consequently, cities increasingly started to build facilities that would enable such activities.

As social welfare and environmental restrictions became more important throughout the Western world, factories underwent geographical shifts. Because an abundance of cheap labor was still important, factories in certain industries tended to cluster together, which in turn led to the rapid growth of urban areas in those areas. In many ways, factories became the 'raison d'être' for cities. This explains why cities were so eager to accommodate those factories.

weekly work hours decrease

1870-2000, work hours of full-time production workers (male and female) in non-agricultural activities



(source: Huberman & Minns (2007)

So, industrialization led to urbanization. In the dance that followed between economic and societal developments, many new cities emerged. Successful cities found ways of servicing both workers and work providers sufficiently to keep them in town. Although the requirements of both groups went up, their core needs and the ways in which those needs were fulfilled remained the same. Competitive cities were able to grow fast, while balancing and delivering the basic needs of citizens and work providers by dividing their territory into neatly separated silos, each with a promise to fulfill.

what made cities competitive in the age of silos

Size mattered in the age of silos. People moved to cities because of the high number of jobs available there. Businesses performed better if they were bigger than their competitors. At their core, competitive cities were

able to accommodate a labor force big enough to fulfill the needs of large employers. Simultaneously, cities had to be able to accommodate those employers to make sure there were enough jobs available for its growing number of citizens. The bigger a city became, the more attractive it would be.

Life was simple. Individuals and organizations had a single focus. Citizens wanted a job in order to fulfill their basic needs. Businesses wanted to sell their products at the lowest possible prices. Competitive cities focused on providing the basics required by their citizens and were able to accommodate employers by providing them with space near centers of population. At their core, these cities focused on the provision of water, infrastructure, and electricity, while keeping their citizens safe.

Everything had its own silo. Employees worked in shifts at their employer's premises, and slept and ate at home. And as they got more free time, they still spent it within their own social clusters. Businesses divided their companies into separate departments, each responsible for different parts of the business, and each part organized its activities in shifts in order to optimize performance. Roles up and down the hierarchy were clearly defined and executed based on sharply defined targets. Competitive cities essentially copied this factory model and neatly divided the city territory into industrial, commercial and residential zones, connected by roads and supplied with water and electricity. Zoning proved to be the most efficient way of accommodating both jobs and citizens, while limiting the negative effects of pollution and overcrowding.

the age of value chains.

drivers of growth in the age of value chains (1980-2015)	
technological enablers	internet of information
economic shift	digitalization
socio-economic shift	globalization
competitiveness determined by	value
most competitive modus operandi	reactive

The age of value chains has been one that saw the birth of the digital world, and the rise of unprecedented communication technologies that enabled economies, individuals, and governments to globalize. The Norwegian anthropologist Hylland Eriksen has described globalization as "[...] all the contemporary processes that make distance irrelevant" (Eriksen 2014:21). He identifies four characteristics that are useful in helping us understand how work, our social lives, and governance structures changed in the age of value chains.

The first of these characteristics is 'disembedding'. This refers to the disconnect of social life from its spatial context. It is a move from a concrete, tangible, local context to an abstract or virtual state. Money, for example, is disembedded value, clock time is disembedded time, and writing is disembedded language. In essence, anything that can be accessed anywhere is disembedded. It could be a clip on YouTube, an international agreement, a stock exchange rate, or a soccer game watched remotely. Disembedding allows people from all over the world to access a shared system of communication, production, and exchange.

global alpha cities

alpha cities according to the Globalization and World Cities Research Network

source: Globalization and World Cities Research Network - The World According to GaWC 2016

The second characteristic identified by Eriksen is standardization. This makes it possible for us to trade with people on the other side of the world. It requires comparability and shared standards, such as a common language, time zones, a currency exchange system, international agreements, trade agreements, and industry standards. The global spread of recognizable hotel chains and retail brands is also a form of standardization, making traveling around the world easier. There are also cultural preconditions for globalization. For example, if Turks living in rural areas had not known about wage work, they would not have migrated to Germany, and if middle-class Brazilians had been illiterate, they would not have been able to learn English at school. In fact, Eriksen argues, the modern nation states played a central role in the process of standardization, as they are the main actors behind the shared standards that govern the global economy and society (Eriksen 2014:58-59).

The third characteristic Eriksen discerns is speed. Instant communication and faster transportation options have made the globally interconnected world a reality. The speed of transport has increased significantly:

- 1500-1840 | (the best average speed of horse-drawn coaches and sailing ships was 10 mph).
- 1850-1930 | (steam locomotives averaged 65 mph, and steam ships averaged 36 mph).
- 1950s | (propeller aircraft, 300-400 mph).
- 1960s | (jet passenger aircraft, 500-700 mph).

Thanks to this faster communication, new technologies and related appliances have also been spreading faster and faster. It took forty years for the radio to gain an audience of fifty million, while it took fifteen years for personal computers to reach that milestone, and just four years for the internet. In fact, internet access has grown exponentially ever since. Between 2007 and 2013, for example, the number of people with internet access doubled from more than one billion to 2.4 billion. This means that, within two decades, more than a third of the world's population had access to the internet, as well as to devices enabling internet access (Eriksen 2014:43-44). All of this has accelerated production and consumption, allowing economies to grow and to conquer new markets, which are subsequently incorporated into the ever-expanding global economic network (Eriksen 2014:39).

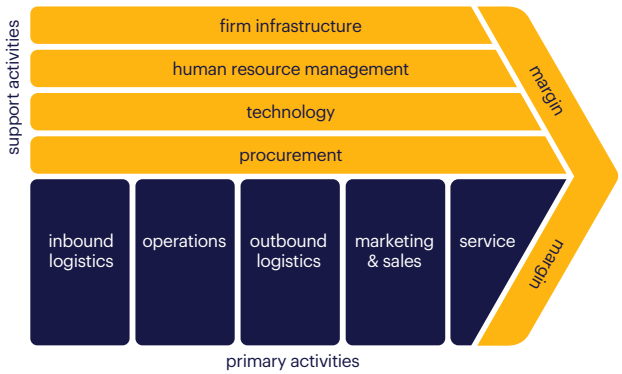
Finally, the fourth characteristic of the age of value chains identified by Eriksen concerns the connections formed between people and businesses. The networks connecting people across continents are becoming denser, faster, and wider every year. Mutual dependence and transnational connections lead to a need for more international cooperation, creating opportunities, constraints, and new forms of power (Eriksen 2014:7-9). Cities are the hubs in this world of increasing connectedness. An ‘inter-urban geography’ is emerging that connects major international financial and business centers in cities across continents, such as New York, London, Tokyo, Paris, Frankfurt, Zurich, Amsterdam, Buenos Aires (Eriksen 2014:83). Sassen (2016:107) has called these cities in the midst of the global hub Global Cities, defining them as "complex locations in a grid of cross-boundary processes". These Global Cities have taken a pole position.

How has work changed in the age of value chains? And what has this done to our lives? Have we succeeded in confronting social polarization and have we been able to boost social inclusion in a structural way? The answers to these questions help us to understand the changing socio-economic shifts cities have had to deal with, and thus what factors have increased or decreased their competitiveness.

global value chains

Michael Porter’s influential book ‘Competitive Advantage’, first published in 1985, shows clearly how the economy shifted as it entered the age of value chains. Porter essentially combined the various silos within companies and markets into a set of coordinated activities that an organization carries out to create value

value chain



for its customers. This concept unified the different building blocks needed to provide a product or service, providing businesses with a framework for increasing value and reducing costs. He called this concept a 'value chain', arguing that companies with a more effective value chain will have a competitive advantage.

In the context of globalization, it would only take a couple of years before the internet and all kinds of information systems related to the internet dramatically lowered the transaction costs of outsourcing all kinds of business activities. Enterprise Resource Systems allowed business leaders to control a globally scattered value chain of research, development, design, assembly, production of parts, marketing, and branding. This generated massive savings, and thus time and space for companies to innovate (Moore, 2012). It also led to a widespread use of the term 'global value chain', first coined in the early nineties in the context of industrial development (Gereffi, G., 1994).

offshoring and automation

The rise of global value chains heavily impacted the world of work. The offshoring of business activities across the global supply and value chain became the new normal. In many OECD countries, industrial jobs were relocated to low-wage countries (offshoring), and the service industry replaced the manufacturing industry as the economic center of gravity.[5] This tipping point occurred in the late twentieth century, and is often referred to as de-industrialization. The UK, for instance, experienced a rapid decline in industries such as textiles, shipbuilding, and coal mining, while service industries such as finance, retail, education, and tourism were fast becoming the country's main source of employment. Similarly, the distribution of labor share by sector in the United States clearly demonstrates how manufacturing went into decline when globalization kicked in, leaving less than ten percent of the population in manufacturing jobs.

However, it would be wrong to conclude that the prime cause of the decline in the share of manufacturing jobs is offshoring. Automation also plays a role. But what is the balance between the two? A research team from Ball State University examined job losses in manufacturing between 2000 and 2010 in the US. Their estimate is that automation and improved efficiency were responsible for the loss of 88 percent of manufacturing jobs in this period. Without this increased productivity, the US would have required 20.9 million manufacturing jobs in 2010 instead of the actual 12.1 million (Hicks & Deveray, 2017).

impact of productivity trade and domestic demand on manufactured goods

2000 - 2010

sector	production change per worker	actual job losses	share of job loss		
		in millions	by trade	by productivity	by domestic demand
all manufacturing	68%	5.65	-13%	-88%	1%
durable goods manufacturing	83%	3.74	-12%	-88%	1%
e.g. computer and electronic products	350%	0.69	-19%	-118%	37%
e.g. furniture and related products	6%	0.33	-40%	-81%	21%
nondurable goods manufacturing	49%	1.91	-12%	-90%	2%
e.g. apparel, leather, and allied products	46%	0.37	-45%	-59%	3%
e.g. printing and related activities	54%	0.32	2%	-102%	0%

source: Hicks & Deveray (2017)

An interesting tendency emerged during the age of value chains. Automation enabled by new technologies seemed to be catching up with offshoring. Thanks to efficiency gains, manufacturers increasingly decided to keep factories in the US rather than move them to China.

Over the past decade, manufacturing in China has quickly overtaken the US and the European Union. It is now the world's No. 1 manufacturing country. But not all companies are moving to China. Value chains have become more complex, often consisting of various actors. The amount of value that regions are able to add to products and services would therefore be a better indicator of economic performance and competitiveness. The degree to which different regions are able to create value for an entire value chain differs,

[5] Randstad and IZA Bonn: 'People to Jobs, Jobs to People' (2017)

the age of value chains.

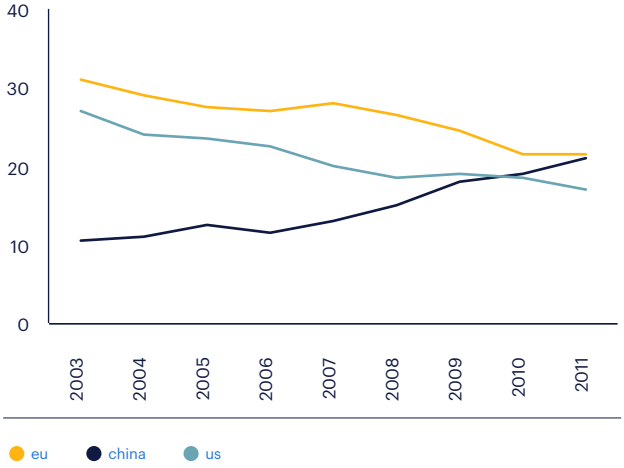
and some regions are more competitive than others in this respect:

"EU-manufactured exports have less embedded foreign value added than exports by countries such as China, South Korea, Japan and the US, which need to source high-tech intermediate goods from abroad to a greater extent than the EU. Conversely, the EU has a higher share of value added in the exports of these countries. According to the most recent figures available, around 86% of the value of EU exports is domestically produced, compared to 74% for China, 85% for Japan, 61% for South Korea and 84% for the US." (European Commission, 2013)

Firms operating in global value chains have to make their investment decisions in a highly dynamic world. Business leaders need to decide where to position different blocks of their value chain, and which elements should be outsourced. After decades of offshoring first industrial and then other elements of the value chain, current productivity gains and an increase of labor costs in traditionally low-wage countries are making each decision more complex. In some cases, industries that are quickly becoming technology-intensive are beginning to gravitate not towards cheap labor, but towards skilled labor instead. As a consequence, some companies are 'reshoring' manufacturing activities back to countries where labor is more expensive.

shares of global manufacturing output

2003-2011, in %



source: European Commission (2013)

renaissance in production, not jobs

According to Hicks and Deveray (2017), the industrial use of information technology can make a region more competitive. It ignited new levels of productivity in some sectors of manufacturing in the United States. Between 1998 and 2012, the manufacturing of computers and electronic products saw an increased economic output of 462 percent, while productivity grew by 829 percent. These are outstanding numbers, rising far above other sectors that saw a high increase of productivity in that same period (e.g., automobiles, transportation equipment, miscellaneous products, primary metals machinery, and electrical equipment).

average product of labor, productivity growth and GDP growth

1998 - 2012

sector	avg product of labor	change in APL	GDP growth
	2013	1998-2012	1998-2012
all manufacturing	$149,000	90%	32%
durable goods manufacturing	$138,000	130%	61%
e.g. computer and electronic products	$244,000	829%	462%
e.g. furniture and related products	$62,000	17%	-35%
nondurable goods manufacturing	$171,000	49%	3%
e.g. apparel, leather, and allied products	$46,000	63%	-50%
e.g. printing and related activities	$76,000	76%	4%

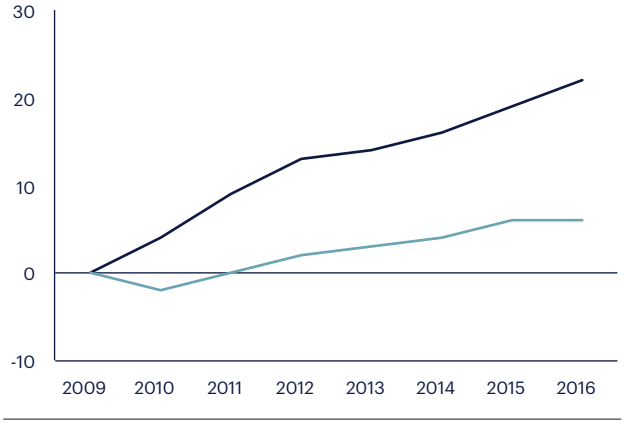
U.S. Bureau of Economic analysis

Since 2012, the quick growth of economic output of manufacturing has continued, while the total number of manufacturing jobs is growing only very slowly. This suggests that there is a renaissance in productivity, and not so much in job creation (Hicks & Deveray, 2017). This has important implications for low-, middle-, and high-skilled work opportunities. Automation is changing the nature of manufacturing jobs. The fact that this is happening in manufacturing proves how a fresh look at the types of jobs and wages is needed, and strengthens the argument made in Randstad's flexibility@work report (2016 edition): "Changes in the employment share of high-paid, low-paid and middle-paid jobs can be linked to technological changes, which are masked

the age of value chains.

renaissance in production, not jobs

2009-2016, in percentage points change since 2009



manufacturing output manufacturing jobs

source: Federal Reserve - Bureau of Labor Statistics

by the traditional distinction between manufacturing and non-manufacturing employment."

automation

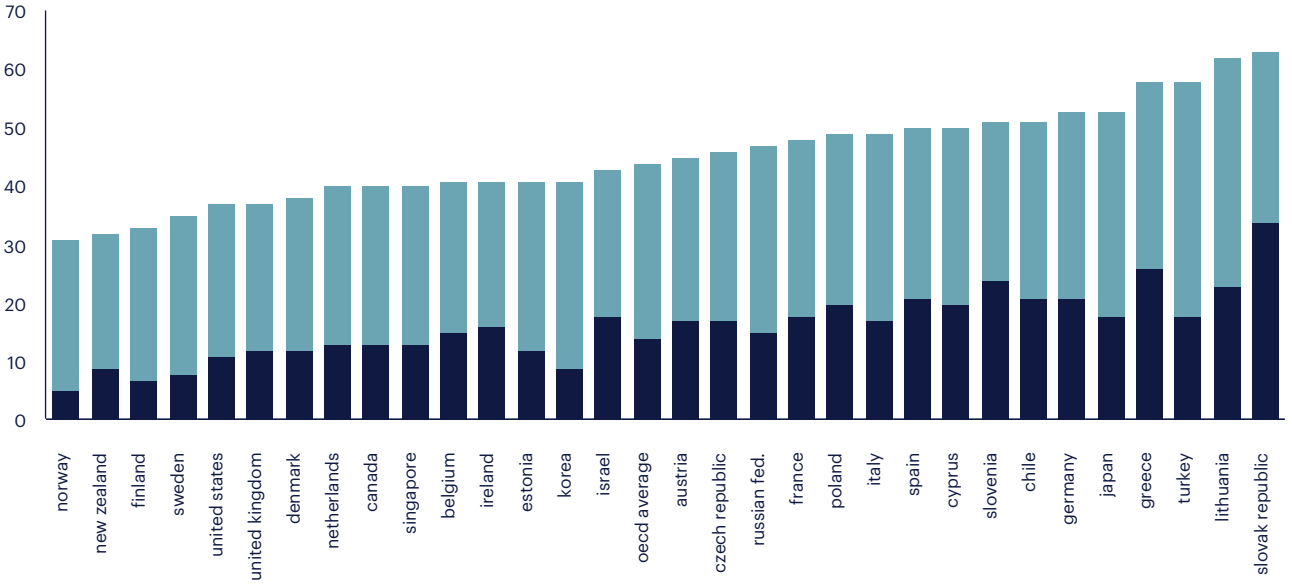
Automation will continue to play its role in the labor market, increasing productivity and changing the nature of the value chain. But how big is this role going to be?

The OECD made a comparative analysis of the risk of automation for jobs in 32 OECD countries. The results show that 14% of jobs are highly automatable, and 32% of jobs are between 50 and 70% automatable. Variance among different countries is large, with only six percent of jobs in the high-risk category in Norway, and 33% in Slovakia. Overall, jobs in the Anglo-Saxon and Nordic countries and the Netherlands are less automatable than jobs in Eastern and Southern European countries, Germany, Chile, and Japan (Nedelkoska and Quintini, 2018). This variance across countries can be explained for about 30% by differences in the structure of economic sectors, while the other 70% can be explained by different occupational mixes within sectors. This in itself may reflect differences in the extent to which automation has already changed jobs, as "countries where the adoption of labour-substituting technologies has not yet taken place would show a structure of job tasks that is more prone to automation." (Nedelkoska and Quintini, 2018) Although the risk of job loss is less substantial than sometimes claimed, many jobs will see radical change.

There are also significant differences between sectors. As Robert Solow famously put it in the late 1980s, "You can see the computer age everywhere but in the

share of jobs at risk of automation

in %-degree of risk



high risk of automation (>70%) risk of significant change (50%-70%)

source: OECD - Nedelkoska and Quintini (2018)

the age of value chains.

from pushing pipes to operating a robot

Tenaris is a supplier to the world's energy industry. The company supplies tubes and related services and is an example of a company shifting towards skilled labor instead of low-wage labor. In 2017, the company decided to open a $1.8 billion steel pipe plant in Bay City, Texas, adding 600 manufacturing jobs to the area. Being able to use advanced technology is what made manufacturing feasible for Tenaris. The key factor for this ability is a shift in what a typical Tenaris employee looks like. According to its President, Germán Curá, this has changed from "a person pushing a pipe to a person operating a robot. Our job as a manufacturing industry overall is to embrace something that's unavoidable and retrain workers." (CNN, 2017)

productivity statistics." This so-called 'Solow Paradox' was resolved in the late 1990s, when the IT boom happened and the impact of digitalization on productivity statistics became abundantly clear. In a recent McKinsey report (2018), the authors suggest that we are in a Solow paradox again, right in between the 2008 crisis and a promising new wave of innovation. However, while the IT, media, financial services, and professional services sectors are rapidly digitalizing, some of the largest sectors, such as education, health care, and construction, are lagging behind. As a consequence, "Europe overall operates at only twelve percent of digital potential, and the United States at eighteen percent, with large sectors lagging behind in both areas" (McKinsey 2018:73). This implies that, while a significant part of the economy is ready to enter a new era, another larger proportion is still largely stuck, unable to fully grasp the opportunities created in the age of value chains.

This constant process of offshoring, reshoring, and automation, and the varying speeds at which these changes occur in different regions and sectors, is leading to job polarization, a key issue that cities need to understand and resolve.

job polarization

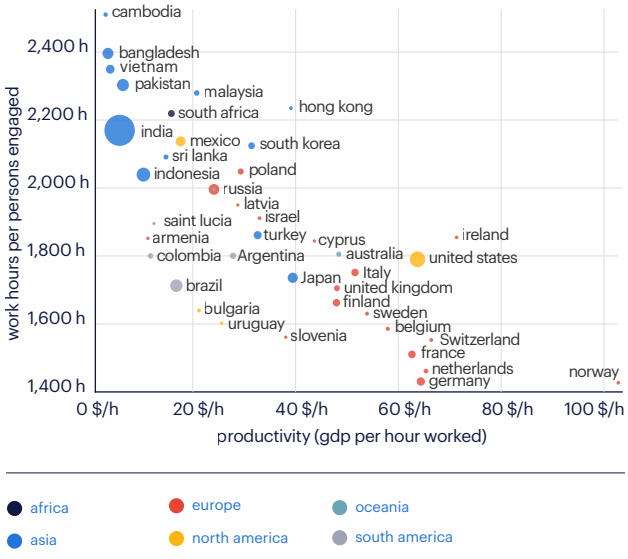
"The changes in the employment structure along the skill dimension could be explained by labour movements from less skilled to more skilled jobs, and the jobs created by growing sectors (first manufacturing, then services) more than compensated the job destruction in declining sectors (first agriculture, then manufacturing) in developed economies" (OECD, 2018). Despite the many predictions by renowned economists of the twentieth century, aggregate employment kept growing, even during structural sectoral and occupational shifts. However, recent studies indicate that technological change is driving between-sector and in-sector job polarization, with very high IT-intensive sectors and jobs outpacing the rest of the economy. (Randstad, 2016)

High-skilled workers and value chains in need of high-skilled labor tend to cluster in specific regions, mostly in big cities with a specialized industry. In Europe, where 86% of the added value in exported products is domestically produced, workers are more productive than their counterparts in low-wage countries. What sets them apart are higher skill levels, allowing them to handle more complex machinery, which leads to a higher production output. This means that they need to work fewer hours than their counterparts in Southeast Asia to reach the same productivity level.

Job polarization occurs not only between regions, but also within them. Adding to this polarization is the relative decline of middle-skilled jobs, such as clerical work and machine operation. The latest OECD Employment Outlook tells us that 22 of the 24 OECD countries experienced some degree of job polarization between 1995 and 2015. Hungary and the Czech Republic are the only exceptions. In all other countries, middle-skilled jobs are losing ground compared to both low- and high-skilled ones, pushing inequality higher on political agendas (OECD, 2017).

productivity vs hours worked

2014



source: ourworldindata.org

the age of value chains.

According to the OECD, the news is not all negative. In the majority of OECD countries, growth in high-skilled jobs and a relatively smaller growth in low-skilled jobs occurred during the same period. The combined growth of high- and low-skilled jobs have kept overall employment levels stable (OECD, 2017). There are, however, significant differences between industries. OECD data from between 1995 and 2015 demonstrate that the number of jobs in manufacturing continues to decline across OECD countries.

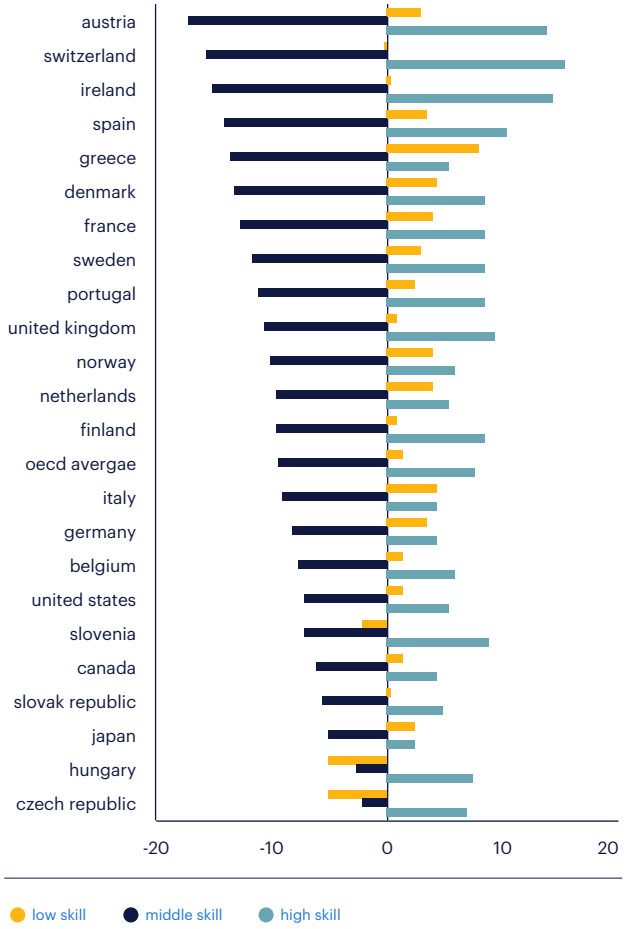
According to Stijn Broeke, a senior economist at the OECD, job polarization is contributing to increases in inequality in many OECD countries. He emphasizes, however, that it is the share of middle-skilled jobs that is declining. The situation differs per country. In some countries, growth in low- and high-skilled jobs may lead to a decline in the relative share of middle-skilled jobs, while the actual number of middle-skilled jobs is still growing (Apolitical, 2018).

Routine jobs are most vulnerable to automation. A closer look at middle-skilled jobs reveals an interesting contrast. The percentage-point change in employment shares in the European Union, Japan and the United States between 2002 and 2014 demonstrates that particularly middle-skilled routine jobs are giving way, while high-skilled, non-routine middle-skilled, and low-skilled jobs are growing proportionately. The job types concerned differ per region. In most advanced economies, high-skilled non-routine work has increased considerably, while routine jobs are generally disappearing, regardless of skill level. Low-skilled non-routine jobs are also growing in sectors such as health care or personal services, which are still hard to automate (OECD, 2016). This is in line with observations made by most 20th-century researchers, who considered technological innovation to be skill-biased: the more technological innovation, the higher the need for highly educated people, at the expense of lower-educated people (Nedelkoska and Quintini, 2018).

Cities are therefore presented with a complex labor market, which requires unprecedented levels of labor mobility, forcing both residents and labor markets to adjust to the automation of routine work. For cities to remain or become attractive hubs in global value chains, they will need to attract a labor force with the right skills. This may prevent polarization, while improving a city's competitiveness.

job polarization in OECD countries

1995-2015, change in employment share, in percentage points



source: OECD - Employment outlook 2017

governing globalization

In 2008, for the first time in history, the global urban population outnumbered the rural population. In 2015, close to four billion people, or about 54% of the world's population, lived in cities. In 2017, 149 countries were developing urban policies, indicating a recognition of the importance of cities at the national level (UN, 2017). Most intergovernmental organizations recognize the importance of cities, too. This includes the United Nations, which added Sustainable Cities to its 2030 Sustainable Development Goals. A lot of bets are being placed on cities, and the most competitive cities are able to follow and govern their territory alongside the shift to globalization.

"It is only a matter of time before the economic strength of numerous urban agglomerations is greater than that

the age of value chains.

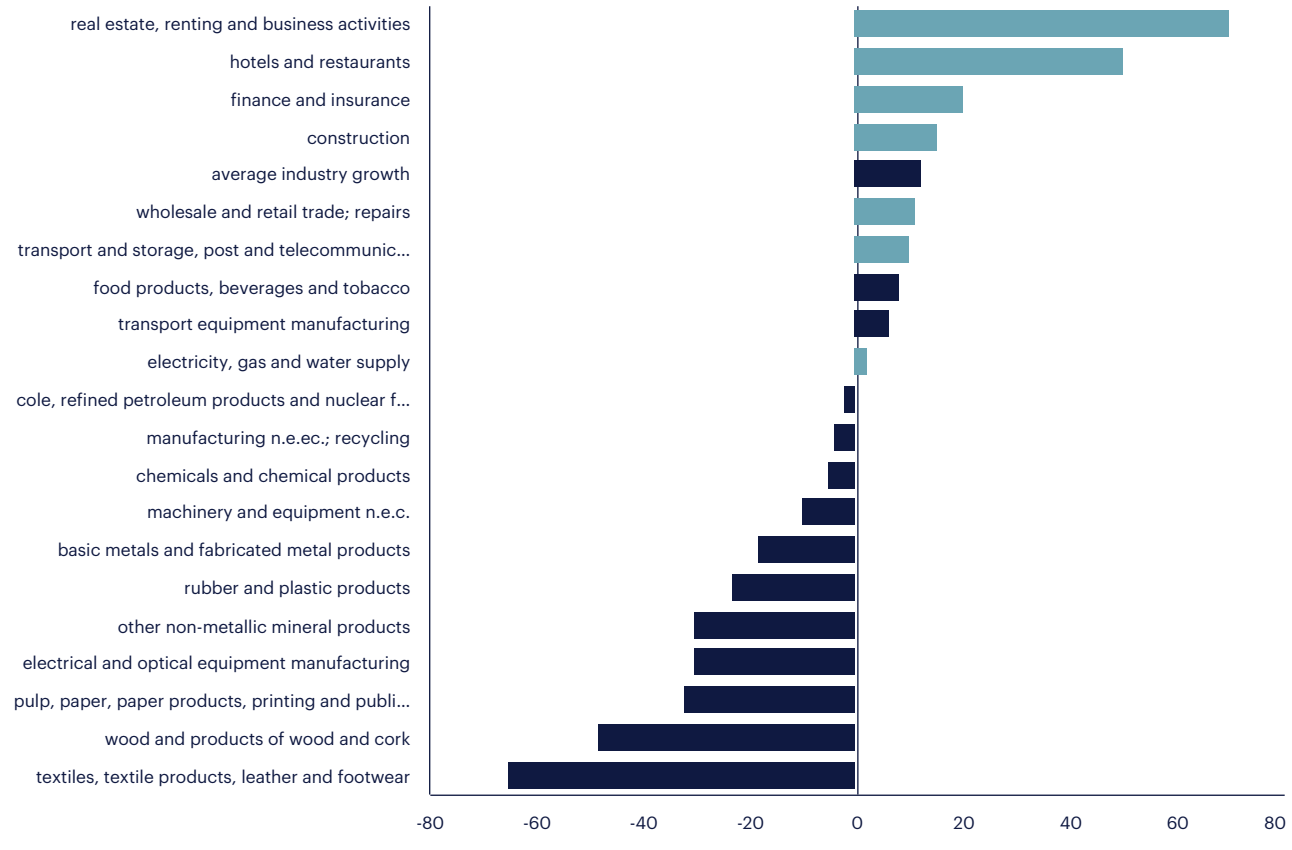
of most OECD countries" (OECD, 2015). The economy of large metropoles like Tokyo, Shanghai or Jakarta already match the economies of most OECD countries. Competitive cities are spreading their influence across borders, and are becoming 'Global Cities'. As Sassen put it in his influential book (2016): "[The Global City is] not a bounded unit, but a complex location in a grid of cross-boundary processes. Further, this type of city is not simply one step in the ladder of the traditional hierarchy that puts cities above the neighborhood and below the regional, national, and global. Rather, it is one of the spaces of the global, and it engages the global directly, often bypassing the national level (Sassen 2016:107)." In other words, cities are gaining in power on a global level, bypassing the countries they are part of, and instead increasing their own international network, partnering with other cities, and joining one of the 200 city networks that emerged during the age of value chains (TED Robert Mugah, September 2017).

public private partnerships

Similar to international cooperation, cities in the globalized world are also engaging in partnerships with other actors through Public Private Partnerships (PPPs). Most successful PPPs are about infrastructure. For example, in 2011, the US city of Denver, Colorado, set up a PPP to develop a stretch of 196 kilometers of commuter light rail. The cost of the project came in 300 million USD below internal estimates and was well received by all stakeholders. However, if the goals for all stakeholders are not aligned, PPPs can prove unsuccessful. The redevelopment of the old port area and the development of the TransOlimpica road and Bus Rapid Transit (BRT) system in Rio de Janeiro is an example of a PPP that generated a lot of criticism (McKinsey, 2013:20). According to Chris Gaffney, Professor of Urbanism at the Fluminense Federal University, the PPP did not lead to a desirable outcome for all. To make way for the new infrastructure, a lot of (poor) inhabitants

decline of manufacturing

1995-2015, percentage change in total employment within industry for select OECD countries

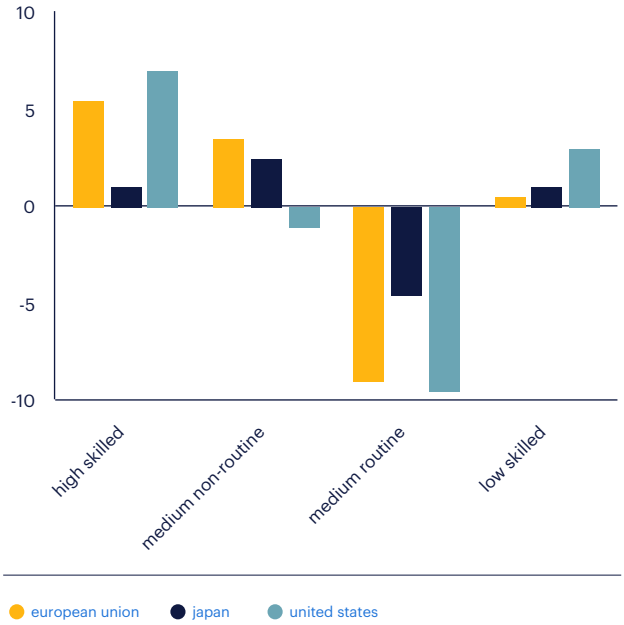


source: OECD - Economic outlook 2017

the age of value chains.

job polarization in the european union, japan and the united states

2002-2014, change in employment shares, in percentage points



source: OECD - Automation and Independent Work in a Digital Economy (2016)

were forcefully removed, and the chosen routes for the new bus lines did not match the city's dire transportation needs. In this case, the aim of the private contractors – maximizing profit – collided with the public goal of creating an accessible means of transportation for all and reducing the number of cars on the road.

According to McKinsey (2013), a successful PPP requires (1) a transparent and clear cost-benefit analysis to gain trust from citizens and businesses alike, (2) setting economic and socio-economic goals and performance metrics to avoid conflicts of interest, and (3) avoiding over-specification (McKinsey, 2013:20). Successful PPPs are inclusive, without unduly limiting the room for maneuver for individual stakeholders. The PPP illustrates how focusing on learning can 'save' a city from losing jobs to other cities and how residents can keep up with the changes on the job market.

In a world where leading value chains compete globally, cities need to provide their residents with the opportunities to change and improve their skill sets during their career, and in an inclusive way. Some policies, like subsidies to invest in training, can help improve workers' skills. However, subsidies usually favor high-skilled workers above middle- and lower-skilled workers, because employers tend to invest most in their

wichita: air capital of the world

The city of Wichita (Kansas, US) is known for its aviation industry and is nicknamed "Air Capital Of the World". Over the past few years, the Aviation leaders have had a pending problem on their hands. Like other cities with manufacturing-intensive industries, the city predicted the impending retirement of Baby Boomer workers, which would lead to a shortage of skilled workers to build the sophisticated parts that allow airplanes to defy gravity. This also worried the regional leaders, who thought that it could jeopardize Wichita's hold on an industry that shaped the city for the past decades. To help more young Wichita residents access the industry – while addressing an often aired employer concern about the need for "soft skills" – the National Center for Aviation Training (NCAT) launched an initiative in 2016 combining paid scholarships in priority areas with close mentoring and coaching. The program, which goes under the name "Wichita Promise", provides a pathway to training credentials and work-readiness certification that can open doors to potential jobs, personal career coaching, and a guaranteed job interview for participants who complete the program. NCAT has already begun to make a dent in the skills gap: since 2012, over 1,800 students have received at least one degree or certificate, and 92 percent of them have found a job or advanced to further education or military service. Over 4,000 students have completed a course for credit. (Global Cities Initiative, 2016)

atlanta: IT and legal

Atlanta's foreign direct investment plan outlines a strategy to deepen the region's specialization in information technology by attracting foreign IT startups with incubator/accelerator space and a suite of services, deepening engagement with Georgia Tech and other colleges and universities on corporate research, and boosting participation at relevant trade shows.

As the world's busiest airport by number of passengers, millions of people from across the world travel through Atlanta's Hartsfeld-Jackson International Airport each year. But regional leaders recognized that merely linking international travelers to another destination did not maximize local economic benefits. Through the Exchange, the Metro Atlanta Chamber and partners are exploring how to use this infrastructure connectivity to position the region as an easily accessible hub for global services and innovation. To that end, a new international arbitration center at Georgia State University leverages easy aviation access with the region's particularly strong legal services sector, enabling Atlanta to compete as the arena for resolution of international legal disputes. (Global Cities Initiative, 2016)

minneapolis-saint paul: medical technology

Minneapolis-Saint Paul's foreign direct investment effort elevates the region's medical-technology cluster, including informing a recently announced partnership of over twenty industry and economic development leads that calls for investments in workforce, supplier relationships, and infrastructure to support the cluster. (Global Cities Initiative, 2016)

high-skilled workers (Apolitical, 2018). There are, however, exceptions to the rule. In Norway, the gap between the share of low-skilled and high-skilled workers participating in training is the lowest of all OECD countries. Lifelong education and training is almost entirely free of charge in Norway. However, this system does require a significant budget and the necessary political commitment. Apart from the available budget, "labour market and skill policies as well as tax and benefit schemes will need to be adapted to promote skills adaption as well as labor mobility while at the same time ensuring that work, even low-paying work, provides a sufficient income to escape poverty" (OECD, 2016).

In a globalized world, city residents have more time on their hands and more money to spend, and therefore expect more from the city they live in. Competitive cities are able to provide not only quality jobs and opportunities for learning, but also a good quality of life. Cities need to accommodate leisure activities, such as through the creation of parks and by attracting and facilitating cultural, sports and arts centers. Research indicates that the feeling of well-being, or happiness, does not necessarily increase with a rising average GDP. Since 1972, the income per capita in the United States has more than doubled, while happiness has remained roughly unchanged.

John Helliwell identifies five major variables that help to account for happiness in a country: population health; the strength of social support networks; personal freedom; social trust; and generosity. "It seems likely that gains resulting from rising incomes have been offset by a decline in social capital and stagnating healthcare systems" (World Happiness Report 2018:146-160). People are becoming increasingly aware of the natural quality of their environment and those entrepreneurs and workers who are able to do so will choose healthier and greener cities. According to the UN, in 2014, "9 of 10 people who live in cities were breathing air that did not comply with the safety standard set by the World Health Organization" (UN, 2017). No wonder that green cities like Copenhagen are able to attract skilled people.

Governing globalization means governing a more complex economy, and more complex demands made by citizens, businesses, and other organizations, all of whom expect more than just zoning.

copenhagen: building the environment

According to Siemens' 'European Green City Index', the city of Copenhagen (Denmark) is the most sustainable city in Europe. The city has invested substantially in green infrastructure on different levels. It is trying to minimize waste in many ways, piloting carbon-neutral neighborhoods with energy-efficient residential and commercial buildings. Each district has a centralized heating system, (partially) powered with household waste that is converted into biogas and bioethanol. In addition, the city is replacing its entire water main network bit by bit, 1% each year, to minimize water leakage. And the living environment is not forgotten. Copenhagen has a well working public transportation system and also 388 kilometers of cycling routes within the city. There are estimates that up to 50 percent of the commuting trips are made by bike. (McKinsey 2013:12)

what makes cities competitive in the age of value chains?

In the age of value chains, cities exist in a globalized world, connected through the Internet of Information. This leads to lower communication costs and a reshuffling of the economy from silos located in a single region to global value chains optimizing added value along those chains. Residents have also changed. They no longer just work, eat and sleep, but can afford to work less and form their own 'value chains', adding education, career paths and social activities to their lives. This is what makes cities competitive in the age of value chains.

Value added matters in this age of value chains. Time is money for companies, so any delay in the movement of people and goods within or toward the city hinders the optimization of value. Suboptimal infrastructure also reduces and potentially worsens the value for residents, as it leads to long commuting times and poorer air quality (OECD, 2015). It comes as no surprise that Economist's Competitive Cities Index set the quality of a city's physical infrastructure as the strongest indicator for city competitiveness (Economist, 2013:3). The most competitive cities offer superior transportation infrastructure as well as plenty of opportunities for residents to enjoy a high quality of life.

In the age ofvalue chains, the modus operandi of the world of work, residents, and cities is reactive. Businesses need to let every part of their value chain react to developments from within the value chain, as well as shifting opportunities outside of the value chain in order to optimize their added value. Similarly, residents need to react to shifting requirements on the labor market, making sure their skill sets match the

economic reality. And competitive cities also operate in a reactive way. They are forming local value chains with local organizations to achieve local goals; for example, through Public Private Partnerships. Importantly, competitive cities react swiftly to economic changes, maintaining both a healthy workforce and a healthy labor market.

Competitive cities in the age of value chains understand and are able to accommodate the needs of businesses, citizens and other organizations by providing the value they need in a way that is reactive to changes in the socio-economic landscape.

the age of value ecosystems.

drivers of growth in the age of value ecosystems (2015-)	
technological enablers	internet of things + artificial intelligence + blockchain
economic shift	platformization
socio-economic shift	collaboration
competitiveness determined by	access
most competitive modus operandi	fluid

The present age of value ecosystems is an age of blurred lines, in which the economy, society, and our lives are fluid, and the consumption and creation of value arises from constellations of smaller and larger, often temporary, consortiums of people and machines. It is an age characterized by collaboration, which means that fluidity is a fundamental characteristic of successful people, organizations, and cities. By fluidity we here mean the ability of individuals, organizations, and cities to change and take the form required to be successful at any given time.

Access to the means of providing value is more valuable than providing the value alone. An early example of this is the almost one trillion market cap of Apple, a company that connects thousands of companies to hundreds of millions of customers through its hardware, which can also be sold at a premium price because of the value embedded in it. For individuals, having a unique skill set is only relevant if they are connected to a big network, and the same is true for cities.

The key enablers in the age of value ecosystems are new communication and trade technologies and the automation of mental work. In the previous section, we saw how the Internet of Information fundamentally reshaped global commerce. Online platforms arose rapidly, marking the advent of a new era. These platforms, such as Facebook, WeChat, Alphabet, Apple, and Amazon, are constantly being visited by billions of people through smartphones and tablets. The largest online platforms will be part of people's private lives, learning what they need, and when and where they need it.

Any organization that is able to 'platformize' is taking pole position in its ability to accommodate new life-changing technologies. Why? Because in order to be effective, most of these technologies need an online platform, a community, and a strong data infrastructure . Blockchain technology will further reduce the transaction costs of connecting supply and demand on whatever scale. Artificial Intelligence will replace mental work, in the same way that machines have been replacing physical work since the industrial revolution. The Internet of Things will connect our homes, cars, work spaces, public infrastructures, and all kinds of assets into connected ecosystems. These technologies will be embedded into virtually all non-digital sectors of the economy, such as agriculture, manufacturing, services, finance, and health care (Hathaway, 2016).

value chains integrate into value ecosystems

In an ecosystem there is no 'artificial life'. Every stage of every organism has a function, creating a balanced system that is living up to its full potential. In this system, only the most efficient organisms survive. When applying this to work, the most successful organizations are able to find an optimum balance between men and machines. They are organizations that find the shortest lines when it comes to accessing and delivering value. Inventions like the plough increased productivity in food production, the steam engine inaugurated the industrial age, and information technology led to the dominance of service industries. Now, new inventions like Artificial Intelligence, blockchain technology, and the Internet of Things will again lower the transaction costs of human collaboration and increase our economic productivity. As a result, value chains will no longer be the most competitive mode of operation. Instead, value chains will become porous as they integrate into global and local value ecosystems, allowing external entities to add and take value. This will change the shape of the economy and the nature of work.

The contours of work in the future are already taking shape today. More and more sectors are being redefined by the word 'tech' (fintech, proptech, agritech, and so on), reducing the transaction costs, not only of collaboration but also of the production of goods and services, and therefore of complete sectors. Only the most complex products, such as cars, computers, and smart real estate, will remain recognizable as global value chains. Other products and services will be created by different 'crews', brought together to accomplish a specific goal. The solid core of companies will shrink, as most workers, regardless of whether they

are high-, medium-, or low-skilled, will move freely across the economy, providing an extended workforce. The economy will be like an ecosystem in which only the most efficient and collaborative organisms will thrive.

Although different regions will enter the age of value ecosystems at different times, our estimate is that most OECD countries will have reached that stage by 2030. The year 2030 is therefore the reference point for when we expect the situation described in this final section to have become reality. But what will make the difference between cities in the age of ecosystems? What will make some cities more competitive than others?

automation of work

Automation is a two-sided story. As most jobs will only be partially automated, the key factor for getting the most out of automation is to adapt human labor to the automated reality. McKinsey recently analyzed 2,000 work activities across 800 occupations and found that "about half the activities carried out by workers today have the potential to be automated by adapting currently demonstrated technology" (McKinsey, 2017). Although only a few occupations are fully automatable, technically speaking, some 30 percent of activities in about 60 percent of today's occupations are already automatable. How long will it take before the automation potential is reached in practice? As 2030 approaches, estimates vary from only a few percent in the late scenario to about 30 percent in the early scenario.

These numbers prove an important point: the theoretical possibility of job replacement is different from the reality, due to economic, legal, and societal hurdles. On the other hand, the sooner these hurdles are overcome, the more competitive a company, industry, value chain or region gets. There are many uncertainties as to when robots will outperform humans in various tasks, both in theory and in practice. What is important for the success of organizations is their ability to learn to work together with machines faster than their competitors, as this will allow them to be more productive and thus more competitive.

The same applies to individuals, who will be looking for cities where they can find economic and social opportunities. They will judge cities by their potential to help them fulfill their needs, looking at indicators such as access to quality housing, mobility, food, education, and health care. This process is likely to be subject to forms of exclusion and polarization, with some citizens being better off than others. Middle- and low-skilled workers will compete for fewer jobs, while providers of high-skilled jobs will have to compete for top candidates (OECD, 2016). As we have witnessed in previous eras, exclusion can be persistent across generations.

The richest value ecosystems will have reversed this tendency, however. In those ecosystems, individuals doing work that is at a high risk of automation will be given the chance to upgrade their skill set to grow along with the machines taking over parts of their job, or to re-school for work in another sector. Inventing, accessing and implementing new technologies in a natural way will be a crucial factor. The key success factor, however, will be having the right people with the rights skills to make the most out of innovative technologies. This factor depends on a value ecosystem's ability, and the ability of the organizations and individuals within it, to evolve with automation and to operate fluidly.

des moines: anticipating automation

The city of Des Moines (US) is an example of a city that has been able to transform its agricultural roots to become a heavyweight in the insurance industry. Des Moines is home to 81 insurance company headquarters, all of which operate in an industry that will be highly affected by automation. In an effort to remain a global hub, the city organized an insurance tech accelerator, together with the local industry and in connection with Des Moines' annual Global Insurance Symposium. The city attracted software engineers and coders from dozens of startups from Europe and Latin America to participate in a 100-day sprint to take their innovations to market. (Global Cities Initiative, 2016)

learning and innovation

It is not enough that employers invest in training their workers to increase the future productivity of their organization. Successful individuals will actively seek economic opportunities. Low-skilled workers will be attracted to jobs that combine learning and working. The latest OECD research indicates that, as the likelihood of automation increases, on-the-job training decreases, at first slowly in low-risk jobs, but more rapidly as the risk of automation surpasses the 30 percent mark (Nedelkoska & Quintini, 2018).

Individuals at the low end of the labor market will need both a social basis and opportunities to grow economically. The key success factor in managing the

labor supply will be to keep the gap between the low- and high-educated bridgeable. Cities will need to see automation and platformization as an opportunity for creating a culture of learning and innovation, while keeping their social basis close enough to the summit.

Competitive cities will have a dashboard of the current skill sets of their residents, as well as insight into which tasks will still need to be performed by humans in the near and far future. This allows cities to better prioritize learning, and create opportunities for workers at all levels. An early example of what such a dashboard could look like is a recent study on the labor market in the United Kingdom, carried out by the newly formed Centre for Progressive Policy, an organization that works with local and combined authorities to apply data-driven analysis and to pursue inclusive growth. This study suggests that addressing information failures on the labor market will "help to bring the supply of skills in line with demand from employers and enable people to identify routes into high-paying careers" (Centre for Progressive Policy, 2018).

Those cities which are better in matching the 'needs' and 'haves' on the labor market will be able to create a deep job market. Deep labor markets have the benefit of providing many high-skilled job opportunities. This is particularly relevant for households with two well-educated partners, who used to struggle to find adequate employment in smaller cities (OECD, 2015). Smaller cities are now better equipped than before to provide the high-educated with jobs that match their skill sets.

Some cities take an active role in connecting those needs and haves. For instance, in collaboration with local industry and educational institutes, they are creating career platforms for immigrants, giving them a chance to find a high-quality job as well as access to everything they need to get there. This includes practical information on how to access public services, as well as access to language classes, education, and on-the-job training programs. These projects are early stage and still on a small scale today, but they have the potential to use the power of the platform economy to connect multiple value providers around a single purpose that is moreover mutually beneficial for all contributors.

united kingdom: skills shortages

Skills shortage rates are ten to fifteen percent higher for skilled trades roles than all other occupations in the United Kingdom. Boosting the number of graduates, which has been a common strategy for many governments, is a typical strategy that fits the age of value chains, but not the age of ecosystems, within which skills shortages occur along various lines. More precise education and training would have a big impact. In the United Kingdom, there are 1.4 million technical job vacancies, with an average annual salary of GBP 34,800. If people choose to educate themselves for these jobs, they could move up more than GBP 20,000 a year, coming from living-wage occupations paying only GBP 13,650. A better distribution of skilled workers could yield similar results: "The skills shortage rates for skilled trades roles [middle-skilled segment], for example, is as high as 73 percent in the Black Country LEP, and as low as 26 percent in Cheshire and Warrington LEP." (Center for Progressive Policy, 2018)

In the age of value ecosystems, learning will be highly personalized. In the most competitive cities, the workforce will have an abundance of online and offline learning and skill training opportunities. Online, these cities are connected to the best the world has to offer. Today's Massive Open Online Courses will be actively made available to all residents. Offline, the city will close PPPs with both large and small organizations to enable apprentice programs that combine working and learning. City governments, meanwhile, will leverage their data, while monitoring automation in order to find out which tasks will be automated when. This will allow cities to better prioritize learning, and create opportunities for low-, medium-, and high-skilled workers. In fact, the latter have a carrier function. One high-tech job may create up to five other jobs (Goos et al., 2018).

Cities that have more power over the way education is organized in their cities will be better equipped than cities located in countries where national governments remain strong hierarchies, directing local policies related to working and learning. The world's city states, however, will have a more ideal position in achieving this. According to many predictions, small densely populated city states, such as Singapore (3rd) and Hong Kong (4th), will be among the most competitive places (Economist, 2013).

platformization

In the age of value ecosystems, value chains become fluid and the most effective organizations are those that are able to orchestrate or become part of a value ecosystem delivering products or services. Those economic value ecosystems consist of direct links

between all the actors that genuinely add something useful. The 'soil' of those ecosystems is formed by online platforms that had already started to take shape during the age of value chains. The age of value ecosystems began with the birth of the platform economy:

categories of online platforms

Platform	Function	Examples
Sharing economy platforms	Enable people to grant each other temporary access to under-utilized physical assets ("idle capacity")	Airbnb, Blablacar, Drivy, 3Dhubs, Peerby, Snappcar, Barqo
Gig economy platforms	Match the supply and demand of labor	Uber, Helpling, Deliveroo, Taskrabbit, Upwork, Amazon Mechanical Turk, Clickworker, Glovo, Fiverr, Freelancer, UpCounsel
Market economy platforms	Facilitate the trade of goods, services and money	Amazon, Apple Store, Ebay, Alibaba, Zopa, Fundingcircle

On top of these online platforms, some of the world's first value ecosystems emerged at the dawn of the age of value chains. Subsequently, all other organizations that became successful in the age of value chains followed. Why? Because online platforms are able to directly connect supply and demand, bypassing the middleman. In addition, platforms are well suited to be the first to incorporate the latest automation possibilities. Think of a large online platform like Uber outsmarting sellers of self-driving cars, who do not have data and information on mobility streams to the extent that Uber does.

For the same reason, online platforms are better placed to provide product service systems. That is why transport options are increasingly being connected to Google Maps, because Google knows when and to which destination you need transport. Platforms are the only entities whose transaction costs are low enough to let anyone be a producer or seller on the platform, as they are the organism that is most efficient in connecting the haves and needs. Last but not least, platforms are much better equipped than their hierarchical counterparts to engage in all kinds of collaboration with other organizations, both digital (connecting with each other through open APIs) and physical (through partnerships with traditional organizations).

The age of value ecosystems commenced with the birth of the platform economy, in which all economic activities are facilitated by online platforms. Online platforms are key facilitators of a fundamental shift in competitive advantage. The 'old' value chains could still win if they get their price, availability, and selection right, depending heavily on retail. However, these wholesale/retail value chains are likely to lose out, as a value ecosystem approach facilitated by online platforms is a much more effective way of sourcing and delivering value.

disintermediation

By 2030, most service providers that have helped customers navigate the marketplace will have been 'disintermediated'. Online platforms will simplify or bypass market complexities, while allowing for greater transparency between actors. Financial services, retail, advertising, and media have already experienced a dramatic reduction in traditional intermediate roles. By 2030, many other industries and citizen services, such as health care and education, will have followed (Moore, 2012).

According to new research by Accenture, "84 percent of executives agree that through technology, companies are weaving themselves seamlessly into the fabric of how people live today" (Accenture, 2018). Successful organizations will become 'user-centric' and evolve around the needs of people and organizations.

Within organizations and value chains, middle management will switch roles from managing internal processes to taking on more entrepreneurial roles in the outside world. The economy will be dominated not by the largest businesses, but by the most agile firms: "Even the most successful specialist contractors will not scale to anything like the size of today's behemoths – that would only increase their transaction costs. The optimum configuration of resources will be one which maximizes its number of external touch points and minimizes its internal overhead" (Moore, 2012).

Professionals and other workers will not be the only parties adding value. There will also be a fundamental change in the way products and services are produced. As consumers, we will not only be using products and services; we will also help to create those products and services by feeding information to the producers. Production is becoming a two-way street, and

producers and brands are developing personal relations with customers. This requires a new level of connection and trust. Only those organizations that establish a trustful relationship with clients will be able to gain a profound level of insight into their customers' lives and will thus be able to deliver integrated innovation (Accenture, 2018).

sharing economy

As the Internet of Information and the Internet of Things collide, most products are getting digitally connected (I-CIO, 2016). In the age of value chains, all products were supplied to the customer at the end of the supply chain, to be used and discarded by the end user. Now products are becoming 'living assets' that exist in our public spaces, workplaces and homes. Instead of owning a car, people are increasingly paying for a ride in a car. The 'as a service' concepts are early examples of how the user-centric value ecosystems are reshaping previously static assets, such as cars, into 'living assets' that are able to interact with customers. Mobility as a Service, for example, is the concept of an online platform offering supply based on the unique demands of individuals, incorporating all kinds of preferences, such as budget, time, convenience, and social needs. In such models, the focus of the supplier shifts from selling a product to selling an experience.

Joseph Pine and James Gilmore (1998) were the first to write about the experience economy. They encouraged companies to look at leading experience sellers, such as Walt Disney, and learn how to design, sell, and deliver experiences that customers will pay for. When products become services, it is no longer the sale of the product that counts, but rather the value of the product's functionality, which will define the user's experience and thus the user's satisfaction. This is at the core of what will make economic entities successful in the age of value ecosystems.

In the age of value ecosystems, successful entities have a raison d'être that is different from that of their counterparts in the age of value chains. They are selling an experience and everything that comes with it. How can we make sure your home treats you the way you want? What does insurance mean in an age of driverless cars? What is more important at your travel destination: the people who will be there, or the location itself? How can we get people to share data so that we can prevent them from getting sick? What is the best business model for accomplishing this? The entities that answer these questions best will define the markets they are in.

In 2012, Geoffrey Moore predicted that 'as a service' models would drive economic growth in the digital economy. Six years later, several industries, including media (Spotify, Apple Music, Netflix), software, and mobility, have already been transformed (or are in the process of being transformed) into service models. In the age of value ecosystems, the value of services relative to products increases. As products are increasingly becoming services that are accessed directly by customers, the world of work is also changing. Organizations that sell the services will need to provide great assets and great service. The degree to which they can provide great assets will depend on how effectively they can source those assets; the degree to which they can provide great service will depend on their ability to serve clients the right experience at the right time and in the right place. This is precisely what the most successful organizations do. They become partners who are available to their clients 24/7.

innovation by fluid organizations

In the age of value chains, innovation inevitably took place sequentially. Any idea had to be handed in and passed on between actors in the chain. As a result, it usually took months before any change was fully implemented, and only then would the organization be in a position to find out whether customers actually liked the experience they were offering. In the present age of value ecosystems, a small group of individuals can leverage the best of their local and global networks and quickly develop a new service. It is likely that both new and established tech companies will connect with traditional non-tech industries, with the aim of moving forward together. According to the Brookings Institution, "workers from nontechnology industries will be well positioned to identify and solve problems alongside technologists and entrepreneurs. This collaboration is central to the future of innovative solutions. Further, advances in cloud computing will allow startups to scale most anywhere – permitting these digitally enabled businesses to grow within established industrial centers" (Hathaway, 2016).

But it is not just the startups and new organizations that can make a difference. According to Accenture's annual outlook of global technology trends, visionary companies realize that, as they become tech

the age of value ecosystems.

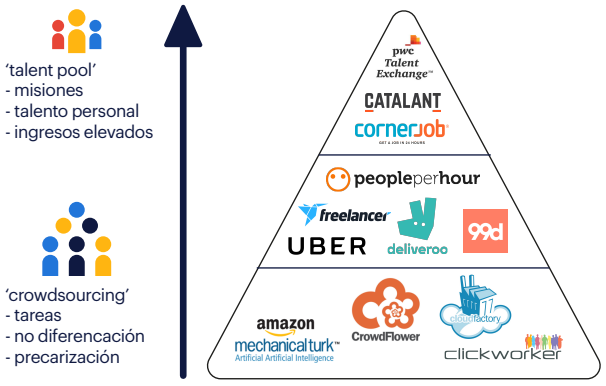
companies, collaboration can help them affect change on a larger scale. Leveraging the Internet of Things enables them to collectively offer new services and experiences while entering new markets (Accenture, 2015). We already see many examples of this today. For instance, retailer Home Depot is working with manufacturers to make sure new smart products are compatible with the Wink connected home system, thereby building its own connected home ecosystem on top of which various services can be offered. Philips is teaming up with Salesforce to grow an ecosystem that will change the way health care is delivered by building a platform on which new health care applications can constantly improve the collaboration and workflow between doctors and patients. And Fiat is one of the many car manufacturers to partner with technology companies such as TomTom and large online community platforms, like Facebook, to develop its own Uconnect platform. (Forbes, 2015)

There is no uniform answer to what fluid organizations will look like. What we do know is that they may arise anew, spin off from existing value chains, or a combination of the two. We also know that, in the age of value ecosystems, it is technically possible to quickly organize a large number of people towards a common goal. The sharing economy and gig economy platforms described above have already accomplished this. New technologies, like WorkMarket, combine machine learning, intelligent automation, and labor clouds, promising to facilitate an on-demand workforce.

Much of the value required to run the future organization smoothly will come from a network of external specialists instead of a cohort of employees. These specialists, as well as low- and medium-skilled workers, will increasingly be found through online platforms specialized in facilitating the labor market. In the age of value ecosystems, such platforms will become the glue of the labor market. Albert Cañigueral, one of the main platform economy experts in the Spanish speaking world, has created a model that helps to explain different forms of platform work and their implications (El Pais, 2017). He sees today's platform economy work as a pyramid, with a low-skilled bottom and a high-skilled top:

categories of platform workers

high-skilled platform workers	'mission workers'	Carrying out smaller or larger assignments for clients, often in teams. Platforms like Trinet, UpCounsel, TopTal, Vibuk and Catalant enable this type of matchmaking. Even PwC has created 'TalentExchange,' its own platform to connect with external consultants, enabling a flexible relationship with talented consultants.	
middle-skilled platform workers	'gig workers'	Offline examples are 'partners' driving for Uber, 'glovers' delivering for Glovo, 'riders' delivering food for Deliveroo, 'taskers' delivering tasks on TaskRabbit and many other examples. Online examples are platforms connecting supply and demand for work that can be done behind a computer such as Fiverr, 99 Designs, Freelancer, UpWork or PeoplePerHour.	On these online platforms, competition between individuals is global.
low-skilled platform workers	'click workers'	Provide their labor to online platforms such as Amazon Mechanical Turk, Clickworker, CloudFactory or Crowdflower.	Easily replaceable by other click workers. Likely to be replaced by Artificial Intelligence.



source: Retina - El Pais (October 2017)

the cities of the future

Thousands of individuals have reached the summit of Mount Everest, but not one of them would have been able to do so without having a base camp to start from. A base camp provides not only the basics for survival, but also the expertise and intelligence of how to approach the summit and engage the help of other experts to set up higher camps. In the age of value ecosystems, cities essentially work in the same way. If managed well, they will be able to provide every resident with a solid foundation for their lives. From this foundation, individuals may choose to help maintain the

the age of value ecosystems.

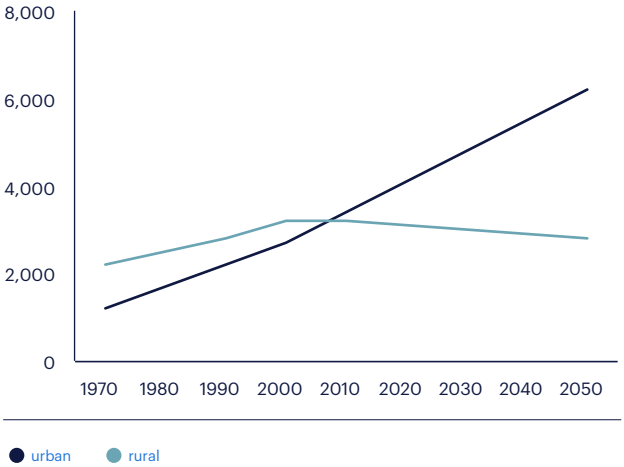
city's 'base camp' (mostly low- and medium-skilled work), to reach for the summit (high-skilled work), or to support those who are reaching for the summit (medium- and high-skilled work).

The key challenge for cities in the age of value ecosystems will be to make sure that individuals can decide for themselves whether they want to go for the summit or contribute to the base camp. To achieve this, cities need to provide everyone with access to the right gear, i.e., access to education and work opportunities. This will be a challenge, but it may also be one of the biggest opportunities in human history: giving every individual the opportunity to achieve full self-actualization. The city that is best able to provide these opportunities will be the No. 1 option of those capable of reaching the summit.

By 2030, two out of every three people on earth will live in a city and most OECD countries will be heavily urbanized. The fastest growing urban areas will be in Africa and Asia, where today the majority of people still live in rural areas (Allianz, 2015). So what will successful cities look like in 2030 and beyond?

urban and rural population of the world

1970-2050, in millions of persons



source: United Nations, world population prospects

The age of value ecosystems marks the end of the 'bigger is better' era, as cities of all sizes can now be competitive. According to the Economist's benchmark of future competitiveness of cities, there is no major correlation between a city's size and its competitiveness ranking in the index. Both Zurich, with its estimated population of 1.4 million, and Tokyo, with its 37 million inhabitants, will make it to the Top 10 by 2025 (Economist, 2013). McKinsey (2011) found that up until 2025 it will not be the 23 megacities (i.e., those with more than 10 million inhabitants), but the 577 fast-growing middleweights in McKinsey's City 600 that will contribute half of all global growth. How do all these middleweights outcompete the megacities? The success of cities will depend on their ability to enable a thriving local value ecosystem, while also enabling this local ecosystem to add value to the global value ecosystem. It is about the quality of the work that is done and not the quantity: "Expanding populations are not the largest drivers of urban growth. In most cities, rising per capita GDP is the major factor." (McKinsey, 2011)

takayama: rural revitalization

Many regions around the world are thinking about the economic revitalization of rural areas. They are finding the answer in connecting those areas with nearby cities. In Japan, the platform economy is seen as an opportunity to make better use of existing capacity in depopulating areas, so that public services can expand while lowering costs. At the same time, small rural towns and cities are looking for ways to add value to the economy of the large metropolitan areas nearby.

Takayama, a rural town with about 50,000 inhabitants, is putting its bet on a small cluster of gaming industry companies that happen to be present in the town. By making an effort to keep these in town and enriching the local ecosystem with a co-working space, Takayama hopes to attract young families and high-skilled jobs, while adding value to the big gaming industry in Tokyo. Other small Japanese towns are seeking partnerships with large employers in big cities nearby who are having trouble finding talented workers, by creating digital jobs for those companies in their own towns. In this way, skilled inhabitants do not need to move away to the big cities. If performed well, this phenomenon will make existing conglomerates stronger in the age of value ecosystems.

metropolitan areas

Many administrative boundaries within metropolitan areas still reflect old borders. However, human and business activities in the age of value ecosystems require a more flexible governance structure. When looking at productivity, current metropolitan areas with fragmented governance structures are worse off. On average, a metropolitan area with a given population size but twice the number of municipalities will have six percent lower productivity. If a governance body at the metropolitan level is in place, this would be only three percent (OECD, 2015).

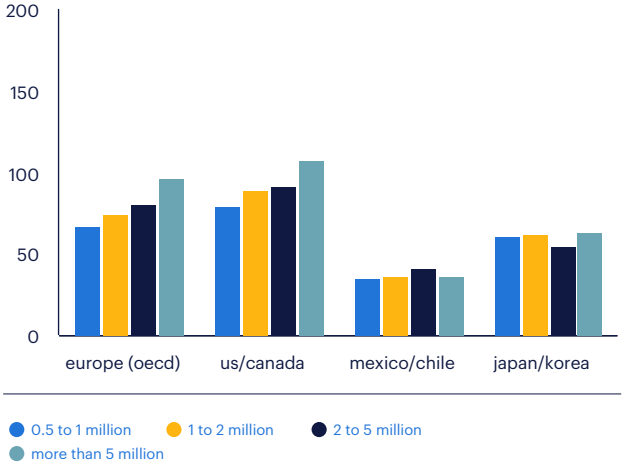
the age of value ecosystems.

The most competitive cities are able to leverage value in their physical conglomerates. Political boundaries are no longer the limit, but rather porous lines connecting what once was 'the city' with urban agglomerations and metropolitan areas. For example, New York City, with a population of 8.2 million, is situated in the New York-Northern New Jersey-Long Island metropolitan area, with a total population of 18.9 million people (Economist, 2013). The OECD has calculated that for each city doubling in population size, its productivity level increases by two to five percent. Factors causing this extra productivity are greater competition and deeper labor markets, but also a more intellectually diverse environment, a more diverse entrepreneurial ecosystem, and faster spreading of ideas (OECD, 2015). The difference between a city that only focuses on itself and a city that looks at itself as a part of a larger conglomeration is significant. The whole really is more than the sum of its parts. This makes a big economic difference, as it increasingly gives all actors in the city access to means of engaging, trading, sharing, and learning with each other.

Successful cities do not depend solely on the trade networks of their national governments, nor do they wait for those networks to change. Instead they collaborate with their agglomeration and partner cities in order to establish their own relationships with key regions. National embassies, consulates, and high commissions are often slow to move away from old habits. A shining example of this is Wuhan, in China. In terms of GDP, this city is ten times bigger than Auckland, New Zealand, and yet most countries have "an order of magnitude more diplomats in Auckland than they have in Wuhan – if they have any at all in the latter" (McKinsey, 2011). A smarter strategy for cities would be to aim for more cross-city collaboration. In his TED talk on building more resilient cities, megacities expert Robert Muggah actively invited cities to join one or more of the 200 city coalitions that exists in the world today. Why? Because cities are facing similar challenges and will benefit from city-to-city learning. Today's technologies for collaboration allow cities to get access to a high-quality experience and information at low costs.

labor productivity in metropolitan areas

average labor productivity in 1,000 USD, metropolitan areas by size of population



source: OECD (2015)

china: gigacities

According to Allianz (2015), the Chinese government is planning to create five integrated urban zones, which together would be able to house half a billion inhabitants by 2020. These urban zones would all be gigacities, with more than 50 million inhabitants each. In fact, four of these urban areas would each have more inhabitants than a country like Germany (82 million inhabitants). In theory, the greater Shanghai area alone would be home to a staggering 170 million inhabitants. (Allianz, 2015)

governing the city of the future

The globalized world will function as a dynamic whole, within which individuals, machines, and communities are constantly evolving socially, economically, and technologically. The same applies to cities. Some will do better than others, as has always been the case over the past 200 years. In many ways, city governments have followed technological and economic change. In the age of silos, cities – like factories – zoned their production changes into neatly separated boxes, in which people and products all had their role to play at the right time and in the right space. Institutions were born and city halls, schools, and hospitals were all organized according to the factory model. In the subsequent era of value chains, governments again followed the changes, focusing on their position along the value chain in a globalized world and forming value chains with companies through public private partnerships.

Today, the most successful cities are woven into value chains, governing their territory accordingly, providing citizens not just with a place to work and live, but also with a chain of educational, professional, social and leisure activities. These cities provide local value chains

for their citizens and good positions for employers to connect with the global value chains they operate. In the present age of value ecosystems, the most successful cities will simply adjust their modus operandi to a new economic and social environment once again. Cities will always be geographical clusters of people, organizations, and assets that benefit from their proximity to each other. In the age of value ecosystems, the most competitive cities will be the richest value ecosystems, able to push humanity forward while leaving no one behind. These cities will accommodate the world's richest value ecosystems by governing platformization well, by optimizing access for all entities to what they need, both locally and globally, and by operating in a fluid manner.

a new breed of mayors

Soon after former New York City mayor Michael Bloomberg was elected, he came across an overturned garbage can. Three of his aides all came with a different answer as to who should be notified to clean up the mess. Bloomberg felt this was bad service quality. After this incident, a 24-hour call line was introduced, providing citizens with an easy and fast way of finding information (McKinsey, 2013). This action is a good example of a new breed of mayors, running their cities as CEOs and looking at their residents as customers who need to be served well. In this way, city leaders shape a culture of well-being and innovation – a culture that ensures that people and organizations are heard and get what they need, fast.

Now imagine a city where needs and haves are connected in a way similar to today's most efficient marketplaces. In such a city, anything is possible. Does your company need extra office space for a few months? It is quickly arranged. Are you an immigrant looking for work experience? Done. Is the hospital in need of extra accommodation nearby? Sorted. At the city level, an effective digital layer can help different needs and haves to find each other quickly, safely, and smoothly. Some cities are already building city apps, promising to be there for citizens 'during every step of their lives', the same way Airbnb promises the traveler to be there during every step of their trip.

urban planning and digital urban planning

Cities in the age of value ecosystems strive to fulfill their full potential. This is only possible if the cities' digital infrastructure is taken as seriously as their physical infrastructure. The world's best-performing urban value ecosystems are strong urban planners, governing both their physical and their digital cities. This 'digital urban planning' includes the labor market, which is vital, as economic value ecosystems will gravitate towards skills rather than cheap labor. Cities will need to govern their territory as if it is a two-sided marketplace, managing their labor supply and demand.

Taking good care of the physical infrastructure means optimizing connections. A city's No. 1 asset is the physical concentration of people and assets. As a result, a city or conglomeration will be as big as the area that can be reached within a reasonable amount of travel time. The denser a city is and the better its road and transport networks are, the more connections can be made, and the more economically and socially successful the city will be. When we speak of physical infrastructure, we also refer to the physical networks that are necessary in order to have excellent digital connectivity and reliable data storage facilities. Almost all future trends affecting our social, work, and public life will crucially depend on that infrastructure (Accenture, 2018).

City residents and organizations will consider city services from the value chain era to be the bare minimum. They will expect basic elements to be in place, such as good governance structures, effective coordination of land use and transport planning, smart road transport policies, integrated public transport provision (universal ticketing schemes), a good balance between protecting existing neighborhoods and new construction, and a well-functioning system to deal with unexpected events and disasters (OECD, 2015). On top of this, residents will expect the city government to be a trusted ally throughout their social and professional lives. They will expect that the digital city will be taken care of, just like the physical city. And just as cities make sure that their streets and squares are well looked after, enabling entrepreneurs and shop owners to receive customers in a fair and regulated way, cities should also take care of the digital city and safeguard public interests by setting rules, protecting data, and providing a level playing field both for small and medium-sized local enterprises and for large global companies.

Sharing economy platforms provide early examples of how some cities are better able than others to govern their digital territory. Some cities have a hard time responding to a sudden influx of tourists in areas where a lot of private homes are being rented out through platforms such as Airbnb. Other cities struggle with the sudden dominance of transportation platforms like Uber, impacting local mobility systems. But there are also cities that take a more proactive approach, such as

Toronto, Amsterdam, and Seoul. These cities have developed strategies for dealing with the rise of digital platforms that impact their physical city and find ways to stay in command.

citizen centers

Building on the concept of the digital service hub as described in Ericsson's report on the next age of megacities (Ericsson, 2013), we believe that the traditional service desks and public spaces will still be flourishing in the age of value ecosystems. These physical hubs will be key in successful cities' effort to confront polarization. Government services, banking, tax institutions, legal services, and health providers will have their digital service interfaces seamlessly integrated into shared community centers: "These centers would bring opportunities for more transparent communication with public services, a more efficient use of resources, and a strengthened community with increased empowerment. The location and capabilities of these service hubs are carefully planned, based on city data and citizen needs, to ensure a positive effect for the community and its sense of belonging in the megacity" (Ericsson, 2013). As a consequence, residents will not only be able to arrange things 24/7 online, but they may also visit a community center to run various errands at once. Public service will be easily accessible for both the savvy citizen, and the citizen who would like or needs help from staff. In both cases, service will be personal.

Optimized public services give these governments the advantage of having both online and offline access to their residents and their opinions. Operating as a combined online and offline platform, cities will be able to optimize the living experience of their residents. The presence of physical hubs empowers city governments to explain and discuss how data is (or may be) used. The most successful cities will be able to grow a trustful relationship with their residents, which will improve the capabilities of those cities further to strategize and meet immediate needs (Ericsson, 2013).

In line with Ericsson (2013), we recommend that cities build a 'knowledge and reasoning layer' as well as dynamic city operations centers. Such centers may help cities to steer through the inevitable automation, but also to shape the combined skill set of the people in the city. This will bend towards innate human skills, such as social and emotional capabilities, providing expertise, coaching, and creativity (McKinsey, 2017). For these reasons, automation can help to make work in the city more human, as repetitive work will be done by machines. For many OECD countries, this will be most visible in the care sector, as the human labor force is shrinking, while the number of older citizens in need of care will grow rapidly.

portland: green city

During the age of value chains, highly specialized city economies could yield large returns. But they also risked a severe downturn if the sector experienced an external shock or declined for other reasons (OECD, 2015). In the age of value ecosystems, the most resilient cities will be able to foster multiple strong sector and in-sector specializations. Specialization is important, as technologies and ideas are flowing more freely around the globe. The city of Portland, Oregon, is an early example of a city that has been able to connect its local ecosystem to the rest of the world: "Through its export planning process, Portland discovered an untapped market opportunity in leveraging its international image as a green, sustainable city with its unique cluster of regional firms providing sustainability products and services. From architecture and engineering to energy efficiency, technology, and water management, Portland proactively organized firms under the 'We Build Green Cities' initiative to identify and target markets dealing with urbanization and climate change. A resulting focus on post-tsunami Japan yielded a multi-million-dollar pipeline of projects to Portland companies. The Portland Development Commission, which manages the program, also credits "We Build Green Cities" with generating reciprocal foreign direct investment interest, including a major Japanese investment in the city's Pearl District" (Global Cities Initiative, 2016). However, in a world where the number of exemplary green cities is growing, a new competitive edge for Portland may be needed soon.

The organizational basis for cities in the age of value ecosystems will consist of physical hubs that connect seamlessly to the cities' digital infrastructure. These hubs will enable them to operate fluidly, as they allow the city government to mold its digital and offline services towards the specific needs of citizens and organizations.

the city as an academy for self-actualization

The Global Cities Initiative recommends that cities forge "stronger relationships with firms, universities, and other actors in key clusters [to develop] a strong and 'sticky' local value ecosystem for the development of new products and solutions. It also means evolving the missions and capacities of existing civic institutions so that new efforts have staying power" (Global Cities Initiative, 2016).

The city operations centers described above can potentially break the vicious cycle of exclusion, a phenomenon that unfortunately tends to be highly

persistent across generations. These centers can help policy makers “to ensure that access to jobs and services is possible for residents from all types of backgrounds and that adequate opportunities for education and skill acquisition are within reach for everyone to foster integration and to avoid segregation” (OECD, 2015). This could be done by letting the city operations centers operate as the starting point for citizen incubators. The online platforms described above can be used to connect citizens with organizations that can help them learn new skills, both online and offline.

The city government can support citizen incubators by institutionalizing certification schemes that prove citizens' abilities and, equally important, by creating a culture of innovation and opportunity. In doing so, cities can prove that they understand the needs of frontrunner businesses, which will need enough people in the city with the right skill sets to be successful. Competitive cities showcase a specific mindset and culture of co-working between men and machines.

gothenborg: smart map

To achieve its greenhouse gas target, the city of Gothenburg (Sweden) set challenging goals for reducing consumption-based emissions. The city recognized that residents needed to be encouraged to make more sustainable choices in their lives, and therefore turned to the sharing economy. The Smart Map, which was created as part of an innovative civil/public partnership, is a tool that maps the sharing economy in Gothenburg, and includes over 100 sharing initiatives.

The Smart Map encourages locals and visitors in Gothenburg to live sustainably, creating a sense of community, facilitating new ways of connecting, and making it easier to share rather than own products. The tool allows residents to hire, borrow, share and swap. In this way, residents are directly participating in the circular economy. The Smart Map highlights current and upcoming activities and networks throughout the city, such as ‘bike kitchens’, where you can learn to fix your own bike, as well as exchange groups, give-away shops, and digital platforms. The tool also encourages people to change their behavior and think of new services. Within six months, a survey showed that 10,000 inhabitants had visited the Smart Map. Many said they were surprised to see how easy living sustainably could be. (Sharing Cities Magazine, New Year's Edition, 2018)

a new reality

The best performing cities have now shifted their modus operandi along the same lines as the economy. These cities are able to operate fluidly by engaging in collaborative co-creation with citizens and organizations. Just like the global value chains of large industries, city governmental organizations have become porous, solving public challenges and meeting public goals in shifting coalitions.

For the majority of cities, this new reality will continue to be puzzling. For decades, they have matched the large industrial institutions by being a large-scale institution. Cities that are unable to keep up will have a hard time engaging with their residents, let alone accommodating the more granular and fluid economic actors. Government hierarchies and a large command-and-control infrastructure simply cannot deal well with smaller economic entities.

Failing governments will start to learn by 2030 that they have been focusing more “on propping up large decaying incumbents [rather] than accelerating economic growth by supporting the new crop of winners” (Moore, 2012). Counterintuitively, city governments will need to become small to become big. Cities have to get equipped to engage in a new breed of Public Private Partnerships, reinvent their service desks and public spaces in order to create city operations centers, and set up citizen incubators in order to get their workforce ready for a future of platformization and automation.

conclusion and recommendations.

drivers of change

	age of silos	age of value chains	age of value ecosystems
technological enablers	steam-powered engine	internet of information	internet of things + artificial intelligence + blockchain
economic shift	industrialization	digitalization	platformization
socio-economic shift	urbanization	globalization	collaboration
competitiveness determined by	size	value	access
most competitive modus operandi	solid	reactive	fluid

The current rise of the platform economy marks the emergence of a new era: the age of value ecosystems. Drawing on the latest predictions about future labor markets and by extrapolating underlying patterns from the past, we have endeavored to paint a picture of what this new era and the cities within it will look like, identifying the characteristics sprouting from those underlying patterns in order to understand what will make cities competitive in this new age.

As we look in the rear-view mirror, we see that cities and work are each other's shapers, and in many ways justify each other's existence. As economies became more advanced, cities grew bigger and more advanced. This in turn boosted economies. History teaches us that there is a sequence here. It all starts with key new technological enablers. These result in economic shifts, which then lead to socio-economic shifts, which in turn change how we govern ourselves. The economy follows technology, and competitive governments follow the economy. Urban planning thus follow the patterns of the age they are in. Those cities that are most competitive are able to evolve faster alongside economical and societal transformations that usher in a new age.

This paper covers three periods: (1) the age of silos, starting at the industrial revolution and ending with the advent of the digital revolution; (2) the age of value chains, starting at the digital revolution and ending in our current time; and (3) the age of value ecosystems, which has just started. Although different regions will enter the age of value ecosystems at different times, our estimate is that most OECD countries will have arrived in the age of ecosystems by the year 2030.

We have seen how technological enablers and resulting economic and socio-economic developments shaped the characteristics of competitive cities. Extrapolating this line into the future, we predict how currently rising technological enablers will result in economic and socio-economic shifts that will shape the characteristics of future competitive cities. What were the enablers of previous and future socio-economic shifts? What are those shifts like? And how does this affect competitiveness in the world of work and between citizens and cities?

what makes cities competitive in the age of value ecosystems?

The key technology that triggered the industrial revolution was the steam engine. It replaced, and complemented, physical human labor power, which greatly increased our economic productivity. Today's rise of Artificial Intelligence will have a similar economic magnitude, as it complements and replaces human intelligence. As a result, both our physical and mental activities are subject to ongoing processes of automation, ultimately making the need for humans to do routine work obsolete. The key technology that triggered globalization was the Internet of Information. It has enabled us to connect with each other instantly and everywhere. Today's rise of the Internet of Things is letting our assets join humans in our digitally connected world, enabling people and assets to interact freely, and facilitating new business models and the more effective usage of resources. A completely new technology called blockchain enables the automation of trust-enabling processes on the marketplace, such as the execution and enforcement of contracts.

The key economic shifts from the past – industrialization and digitalization – form the basis for the key economic shift of the future: platformization. Parts from the digital revolution form the soil, on top of which the platform revolution is building its digital roads and markets, where products and services are being offered and traded. The online platforms form the digital foundation, on top of which new technologies can flourish. Platformization will make it possible to further reduce transaction costs of human collaboration, while also

providing fertile ground that will enable a new wave of automation to flourish. This marks a fundamental change in the underlying structure of the economy – a shift from an economy of value chains to an economy of value ecosystems and blurred lines.

Value ecosystems are dynamically connected networks of people, assets and technology, providing both economic and social value.

The key socio-economic shifts from the past – urbanization and globalization – form the basis for the key socio-economic shift of the future: collaboration. Facilitated by a fast-growing global infrastructure of physical and digital transportation networks, citizens, businesses, governments, and other organizations collaborate in flexible ways at the urban level, the global level, and various levels in between. From simply being a means of economic production in the age of silos, individuals pursuing a career in the age of value chains will now also be able to pursue self-actualization.

Competitiveness in the age of silos was determined by size. Individual citizens did not matter much. Businesses needed scale and cheap labor to be able to produce at the lowest possible cost per unit. Their modus operandi was solid, while hierarchical structures kept production processes in line. City governments followed these needs. They operated their cities much like factories, focusing mainly on providing basic public infrastructure and zoning. They drew sharp lines between residential, industrial, and commercial zones in order to accommodate both work providers and workers. The most competitive cities were able to set up their own hierarchies and organizational structures quickly enough to match the fastest-growing industries and accommodate their fast-growing population. In other words, those cities that were able to grow bigger more quickly were the most competitive.

Competitiveness in the age of value chains was determined by value. Businesses re-focused not on size, but on added value within their value chain. They let different components react to each other and react to changing environments in order to optimize profitability. Similarly, city residents switched from being life-long low-skilled workers to pursuing their own value chain in the form of careers and learning, reacting to changing opportunities. Governments followed these developments by forming their own value chains with other national, international, and city governments, as well as with locally active organizations through Public Private Partnerships. Urban planning shifted from focusing on the basics of working, eating, and sleeping to an urban quality-of-life value chain that included spaces for leisure, social, and cultural activities. The most competitive cities were able to set up their own value chains and organizational structures swiftly enough to match the fast-globalizing economy, and accommodate the more extensive needs of their citizens. In other words, the cities that could provide more value more quickly were the most competitive.

Competitiveness in the age of value ecosystems is determined by access. In a socio-economic context of collaboration, having access to those who can provide or acquire value trumps owning value-producing assets. The creation and consumption of products and services come from constellations of various sizes and often temporary consortiums of people and machines. All value chains become porous, and some dissolve entirely. Both the modus operandi of businesses and individuals become 'fluid' and changeable, constantly adjusting their form to the optimum configuration for adding economic and social value at any given time. Economic value ecosystems focus on skilled labor rather than cheap labor, putting the individual at the center of economic value creation. The most competitive cities embody the age of value ecosystems by becoming value ecosystems themselves as quickly as possible. This enables them to match the rapidly platformizing economy, and become destinations of self-actualization for residents. In other words, cities that manage to become value ecosystems more quickly are the most competitive.

recommendations

The difference between competitive and less competitive cities is straightforward. Competitive cities are able to adjust more swiftly to new economic and socio-economic realities. Our primary recommendation to urban leaders is therefore to develop a strategy to become one of the first cities to operate as a value ecosystem. Such a strategy should incorporate:

- A clear vision and mission plan on how to platformize the city government, allowing some parts of the organizational structures to become porous and other parts to become fluid.

- A plan that enables public officials to easily engage in collaborative co-creation with other stakeholders. This will allow the governmental organization to solve public challenges and meeting public goals in shifting coalitions of diverse stakeholders.
- A vision and execution plan on how the city government will enable optimum access for and among all actors within the city as well as within its metropolitan area, its rural surroundings and the rest of the world, enabling economic and socio-economic ecosystems to add value to the city.
- An urban planning strategy that governs and invests in both the physical and the digital infrastructure.
- A long-term plan to enable anyone who works for the city government in any form to learn the right skills to operate the city as a value ecosystem.

The proper implementation of these recommendations will create the basis of the next set of recommendations.

The main differentiator that sets competitive cities apart from less competitive cities in the age of value ecosystems is their ability to let both people and machines flourish. This requires a culture open to automation and an agile labor supply able to adjust itself, constantly balancing humans and machines. We therefore recommend that city leaders actively orchestrate labor and skills supply in the city. This requires:

- Developing skilled workers locally by optimizing access to opportunities for learning and work experience for all.
- Creating a dashboard that tracks current skills levels and needs and predicts skill shortages, enabling cities to steer learning priorities.
- Shaping a culture that inspires citizens to play with automation.

Polarization is the biggest threat to competitive cities. It is not guaranteed that citizens will have equal access to social and economic opportunities. In the most competitive cities, inclusivity is not a solidarity principle, but an economic requirement. The more that jobless people are encouraged to engage in work, the more they are likely to make the leap to medium- and high-skilled work roles, and the better the local labor supply becomes. This will in turn attract more world-class innovation to the city. We therefore recommend that cities draw up strategies for all residents of all skill levels, and to make the value that is available in the city accessible to all, giving every individual the best possible chance to pursue self-actualization. This requires:

- A plan to reshape the current configuration and functions of the city's physical and digital public infrastructure, turning physical spaces into city hubs that are seamlessly connected with fully digitalized public services, while providing optimal online and offline access to social services.
- Providing a solid economic basis for all citizens, while also providing a perspective of next steps.
- A set of ‘journeys’ for citizens at different life stages and of different skill levels that allows them to choose where they want to go and where to find the assets, skills, organizations, and people they need to get there. These journeys can be accessed both digitally and at the various city hubs.
- Developing a joint strategy of social innovation to steer towards an inclusive local labor market by taking action to constantly improve the position of the most vulnerable on the labor market.

Ultimately, the productivity of cities as value ecosystems and the ability of online platforms to connect needs and haves efficiently will allow cities to provide all their citizens with access to everything they need to live a happy, connected and sustainable life.

part III: yearly report labor and flexible labor relations.

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54 report
69 data tables

report.

The world of work is being reshaped by tremendous forces. Economic shifts are redistributing power, wealth, competition and opportunity around the globe. Disruptive innovations, radical thinking, new business models and resource scarcity are impacting every sector. Technology is changing industries at a rapid pace and the labor market is therefore entering a period of uncertainty. Managing this transition is an important challenge, as is preparing for the future for the workforce of tomorrow.

The balance among employment sectors – and the kinds of skills required by those sectors – has been shifting for five decades. Occupations, both traditional and new, require more highly skilled workers now than before. The Information Age is affecting the workforce in several ways. Especially the medium-skilled workers are being replaced by computers that can do the job more effectively and faster. This has created a situation in which workers who perform tasks which are easily automated being forced to find work which involves tasks that are not easily automated and workers are being forced to compete in a global job market.

demographic shifts

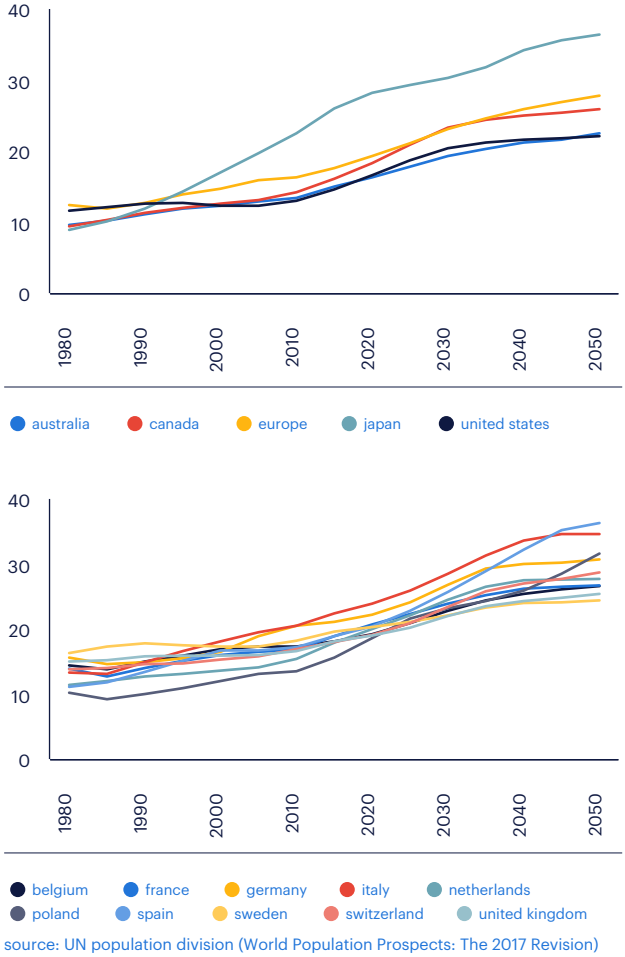
Demographic shifts will significantly lower economic growth. The number of "super-aged" countries – where more than one in five of the population is 65 or older – will reach 27 in 2030. Only Germany, Italy and Japan meet that definition today. Thanks to the aging of today's middle-aged demographic swell and ongoing improvements in life expectancy, the population of seniors is projected to surge to 1.5 billion in 2050.

The result will be a much older world, a future in which roughly one-in-six people is expected to be 65 and older by 2050, double the proportion today. In the coming decades, aging and slower rates of growth are expected to characterize the populations of all major regions in the world. Ranked by median age, Europe is currently the oldest region in the world and should will remain so in 2050. Even relatively young countries such as Brazil and Turkey are aging. Moreover, the pace of aging in some of these countries is more rapid than in developed economies. Some societies in Eastern Asia are forecast to age particularly fast. The population of children, meanwhile, will be at a virtual standstill due to long-term declines in birth rates around the world. The number of children younger than 15 is expected to increase with only 0.2 billion to 2 billion in 2050. Consequently, more countries will find that they have more adults over 65 than they have children younger than 15. Aging of the population will be challenging for public budgets and pension systems.

The falling share of the population at traditionally productive ages means relatively fewer people will pay taxes and social contributions at a time when the rising share of older persons implies that more people will receive pensions and costly health services. In response, many countries have implemented reforms, such as a rise in the retirement age, designed to delay the rate of increase. Nonetheless, public pension expenditures are expected to consume about 15% of GDP in several European countries by 2050. Pension expenditures in the United States are projected to increase to 8.5% in the same period. Larger concerns revolve around public health care expenditures, which

aging populations

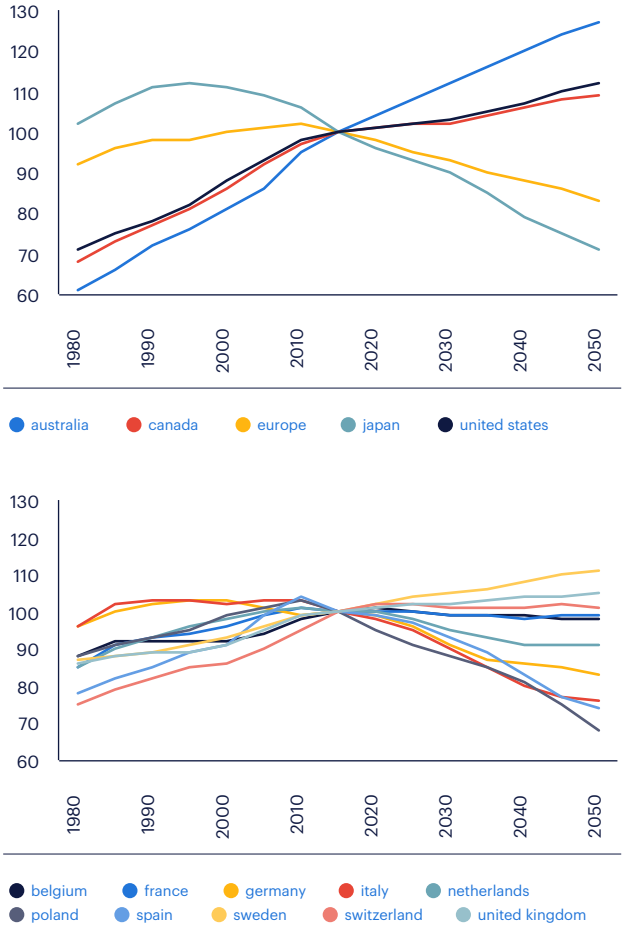
age 65+, in % of total population



source: UN population division (World Population Prospects: The 2017 Revision)

working age population index

age 15 to 64, index 100 = 2015



source: UN population division (World Population Prospects: The 2017 Revision)

are rising faster than pension expenditures in most countries. Health care expenditures are pushed up not just by aging but by cost inflation as well. In the U.S., public health expenditures are projected to more than double to 15% in 2050. Similarly, large increases are expected in Japan and several countries in Europe.

skills are needed more then ever

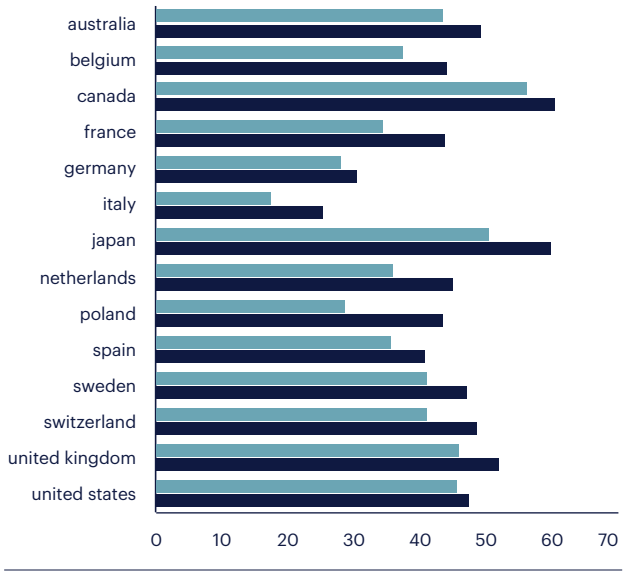
Being skilled has always been an advantage – if not a necessity – for individual workers. Today, having a skilled workforce is just as much a necessity for countries competing in an advanced economy. Promoting education and training is an important facet of developing a skilled workforce.

Skilled people generate knowledge that can be used to create and implement innovations and educated workers have a better start for acquisition of further skills. On the other hand, a concern is that in the future of work, only the highly skilled will have access to rewarding professional careers, and that this trend will increase inequality on the labor market.

Most countries have worked to increase the proportion of students who complete secondary education and move on to post-secondary and higher education. The

share of labor force with tertiairy education

2016, in %



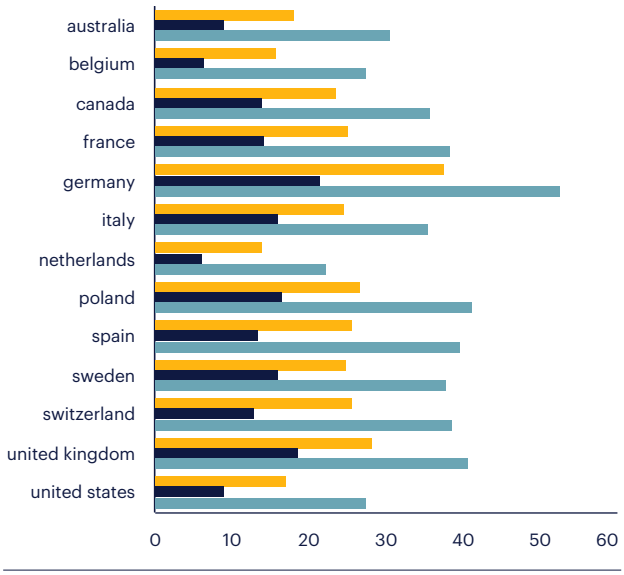
source: OECD.stats (Education and Training)

share of labor force with vocational training

2016, age 25 to 34, in %

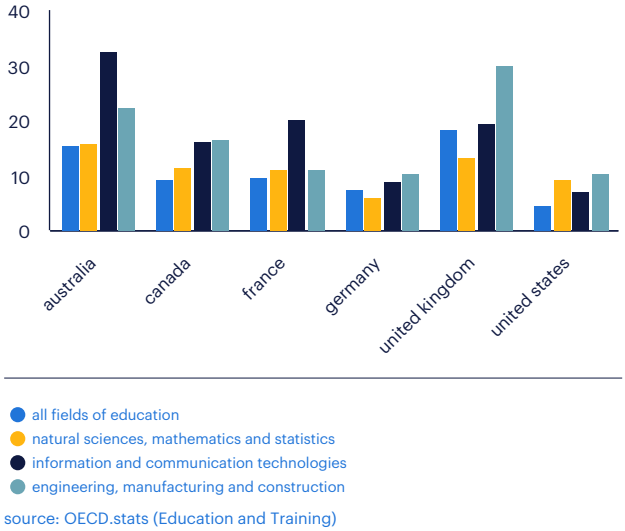
source: OECD.stats (Education and Training)

share of STEM studies in enrolment tertiairy education
2015, in %



source: OECD.stats (Education and Training)

share of foreign students in tertiairy education
2015, in %



source: OECD.stats (Education and Training)

importance of science education is recognized on both sides of the Atlantic but the debate gets particularly heated when it intersects with immigration. Europe is in a similar position to the United States, but has much more rigid immigration policies making that Europe attracts fewer high-skilled workers than not only the United States, but also Canada and Australia. Only 3 percent of scientists in the European Union come from non-EU countries, whereas in the United States 16 percent of scientists come from abroad.

Even at the height of the crisis employers reported having difficulties in finding workers with the appropriate skills. Employers say they cannot fill vacancies because even highly-qualified candidates have the wrong skills. The education systems 'educate graduates of tomorrow in the skills needed in the industry yesterday' as they claim. Many employers are concerned that applicants lack 'soft skills', such as interpersonal, communication and analytical problem-solving abilities. This clearly indicates that jobs in growing sectors such as health, education and other services require a different set of skills than those acquired by unemployed people who worked in declining sectors, such as agriculture and manufacturing. Youth often lack certain social and emotional skills such as those involved in working in teams, which can undermine the use of their cognitive skills.

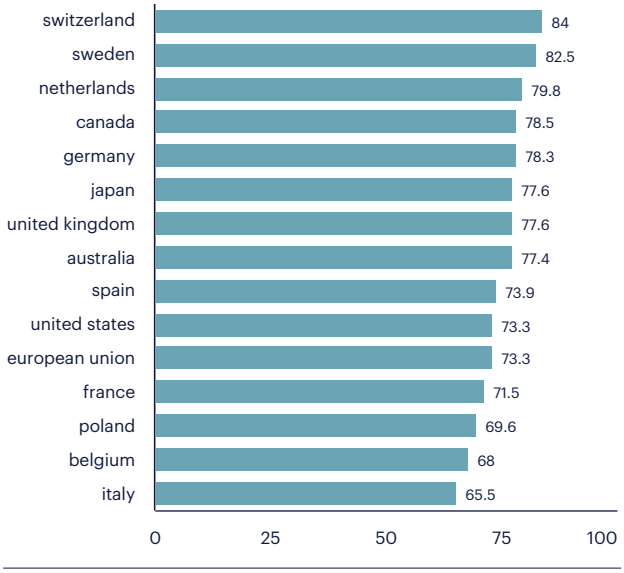
The future of work requires a systemic change in education and training. The types of skills that employers need are changing all the time. Employees need to continually learn and adapt to changing and new industries. Business needs are reshaped continuously by technology, creating ongoing skill gaps both individuals and countries will have to address. Education systems are often badly equipped to develop these dynamic skills in students, most schools and universities are teaching a 20th-century education to young people who will need cutting-edge 21st-century skills. Employers need to collaborate with schools and universities on the development of curricula and a shared practical knowledge of the market. The education system also needs to change to allow a focus on lifelong learning.

labor participation

Globally, there are over 2 billion working-age people who are not participating in the labor market. Some 26 million joined these ranks in 2015. The share of the population over the age of 15 that is active in the labor market varies tremendously. Variation in participation rates are due to both cyclical and structural factors. When jobs are scarce due to recession or slow recovery in the economic cycle, some jobseekers become discouraged and drop out of the labor market. In terms

labor participation

2017, age 15 to 64, in %



source: OECD.stats (Labour force survey)

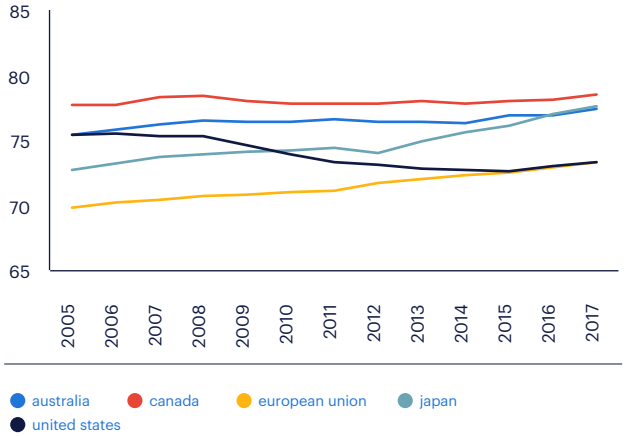
of structural factors, population ageing and increasing years spent in education in many countries result in shrinking or slower growth in the working-age population. These two effects need to be differentiated to provide a clearer understanding of the future path of labor force participation and to design and implement an effective set of policy interventions.

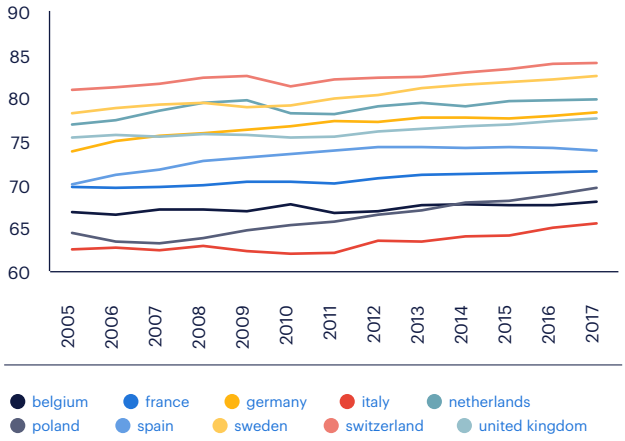
In the case of developed economies, the decline in participation rates in the aftermath of the crisis stemmed from weak labor market prospects, particularly for young people who often chose to extend their education. Indeed, some developed countries that experienced sharp declines in employment also saw a significant drop in participation rates. This is especially so in the United States. As labor markets improve, some of the downward trend is likely to be reversed – this is evident from the stabilization in participation rates in many of the developed economies. Participation rates have also been declining in emerging economies and some developing economies. Some of this decline is due to more young people moving into or staying longer in education rather than entering the world of work, while in some cases fewer women are joining the labor market due to income and wealth effects.

As for women, their participation has been rising in all countries for several decades. Each new generation of women has had a stronger attachment to the labor market than the previous one. There are probably important cultural reasons for this, but the increase has also been enabled by technical progress, allowing housework to be done more easily, while higher educational attainment has also played a role in luring women into the job market. Policies have also affected this trend and appear to play an important role in explaining cross-country differences in female participation. Taxation is one such policy. Married women are widely considered as the second earner in a couple and when their income is taxed jointly with that of their husband, the marginal tax rate can be very high. This is unfortunate since women's participation reacts more to tax changes than that of men. Most countries have moved towards taxing each earner in the couple

labor participation

age 15 to 64, activity rates in %





source: OECD.stats (Labour force survey)

separately, but joint taxation still exists in a number of countries, including France and Germany.

Better participation can also be achieved by subsidising childcare, either directly or through the tax system. Most Nordic countries have gone pretty far in this respect and also have high female labor force participation. Childcare support may be seen more as a subsidy to female full-time work than to part-time work, and indeed, the share of part-time work in Nordic countries has declined. But the money to pay for childcare subsidies obviously has to come from ftaxes, and higher taxes in general reduce people's desire to work, so there are limits to how far this policy can go. Other countries, such as the United States, manage however to achieve high female participation without large-scale subsidisation of childcare. In this case, because of a wide dispersion of wages, many households can afford to meet the costs of childcare by themselves.

In contrast to women, older men have reduced their labor force participation in all countries over the past three decades – in some cases sharply. It may seem ironic that effective retirement ages have fallen at the same time as people are living longer and healthier lives. This fall may reflect a stronger appetite for leisure as real incomes have gone up. But it also owes a lot to policies.

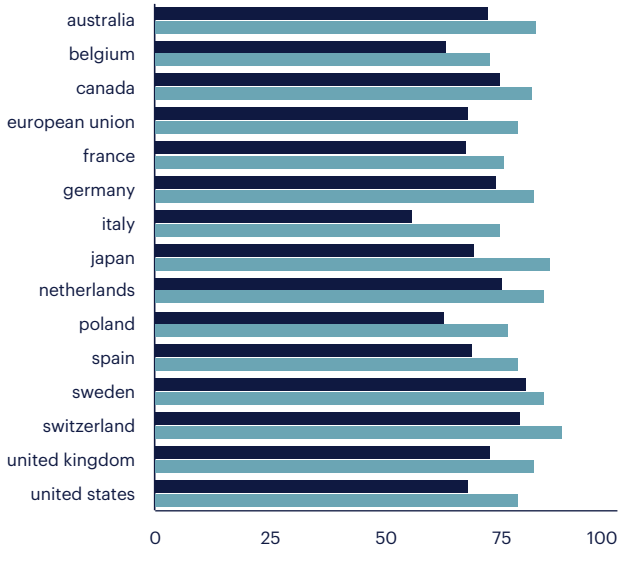
Early retirement, invalidity and unemployment benefit schemes in many countries provide people in their 50s with strong incentives to retire. These often misguided policies led to a sharp drop in participation in the 1970s and 1980s. There has been some moderate roll-back since then, but most of these policies remain in place in many continental European countries, with detrimental consequences for employment.

Old-age pension schemes also stack the cards in favor of people retiring early. If people postpone their retirement by a year, this is rarely reflected in correspondingly higher pensions later on, despite their extra contributions. This is already problematic at ages between 60 and 65, but after 65 the disincentives to work become almost prohibitive in some countries. In our society where people are fitter for a lot longer, we should be free to engage in "active ageing".

There is a strong presumption that those countries which achieved high labor force participation also had the best policy framework. The time has come to implement a new set of policies conducive to stronger growth, higher employment and sounder pension systems. To cope with mounting financial pressures due to the ageing of society, governments have to make hard choices. In particular, to avoid increasing the tax

labor participation by gender

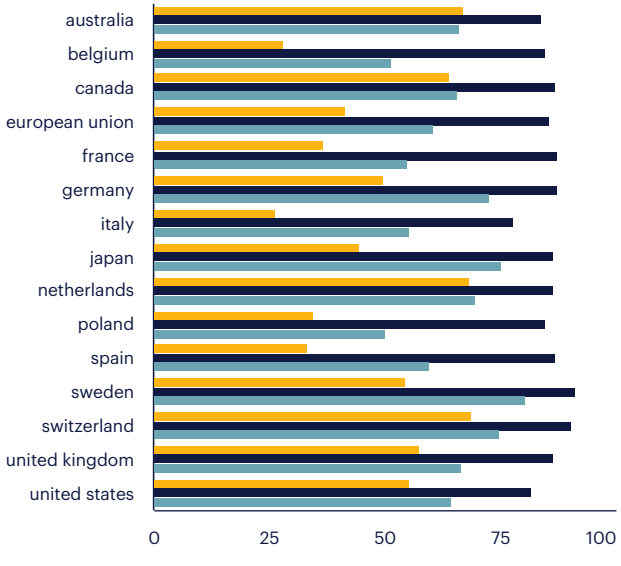
2017, age 15 to 64, activity rates in %



source: OECD.stats (Labour force survey)

labor participation by age

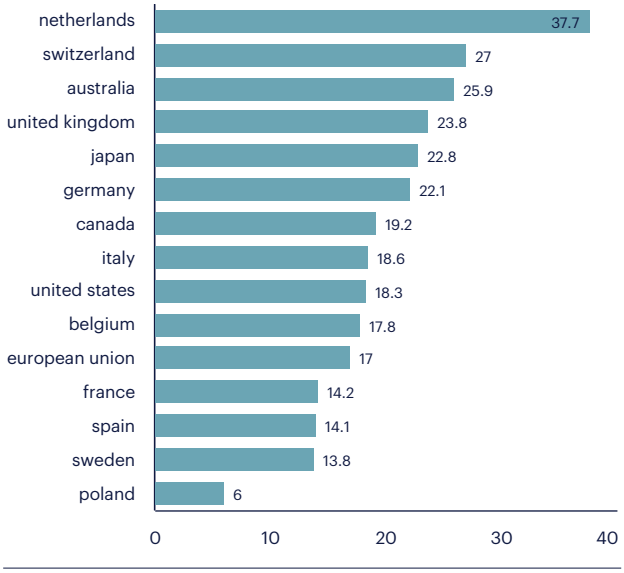
2017, activity rates in %



source: OECD.stats (Labour force survey)

part-time employment

2016, age 15 to 64, in % of total employment



source: OECD.stats (PT employment by common definition (US by national definition))

burden or impoverishing pensioners, they are now looking at ways of inducing more people to enter or stay in work.

These policies will have to be tailored to meet the specific needs of the various groups that make up the active population. One group in the labor market almost fully employed is that of prime-age males (25-54), whose labor-force participation rate generally exceeds 90 percent. By contrast, there is wide variation in the extent to which women, as well as young and older persons, participate in the labor market. Those groups are most likely to be influenced by government policies, for better or worse.

In the short term measures could well be needed to ensure the full employment of more people coming onto the job market. But it is reassuring to note that those countries which have promoted active labor force participation also benefit from high employment. Given time, employers have been able to create the jobs needed to match a more abundant supply of labor.

part-time employment

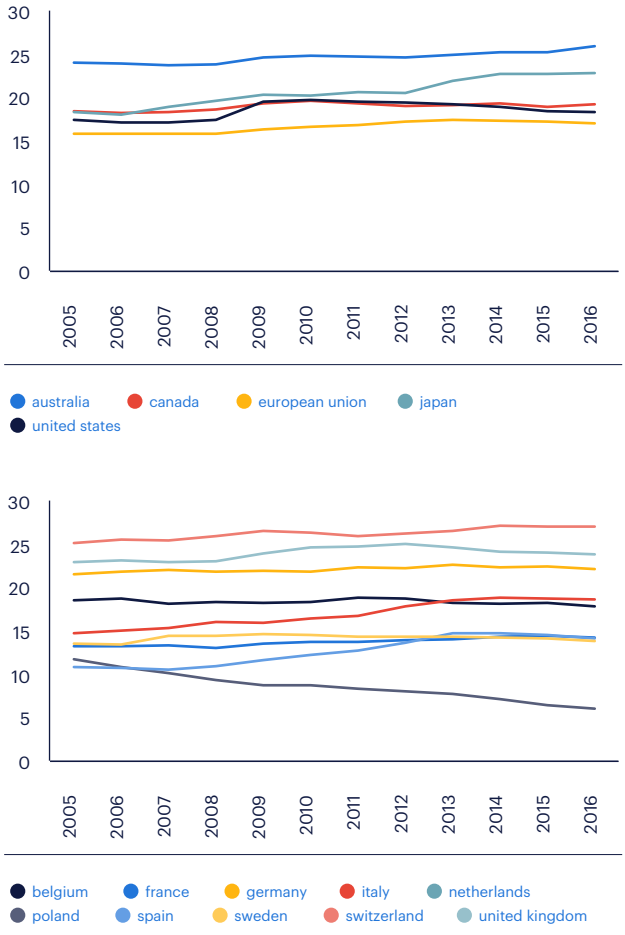
The rise in labor participation in the 90's of last century owes to a large extent to the possibility of part-time jobs, which stimulated many households to participate with both members. In that period some countries faced a transition from the standard 'breadwinner household' to the more modern '1.5 jobs per family' households, gaining popularity among young families with children.

Part-time work is still a female and young phenomenon. Most of the increased female participation during the nineties, was through women entering the labor market in part-time jobs. When looking at the incidence of part-time work we see that the Netherlands take a special position. Nearly 40% of all employed Dutch persons are working in a part-time job of less than 30 hours/week, mostly women.

Young people are most likely to work part-time when they work alongside a study. On average young people

part-time employment

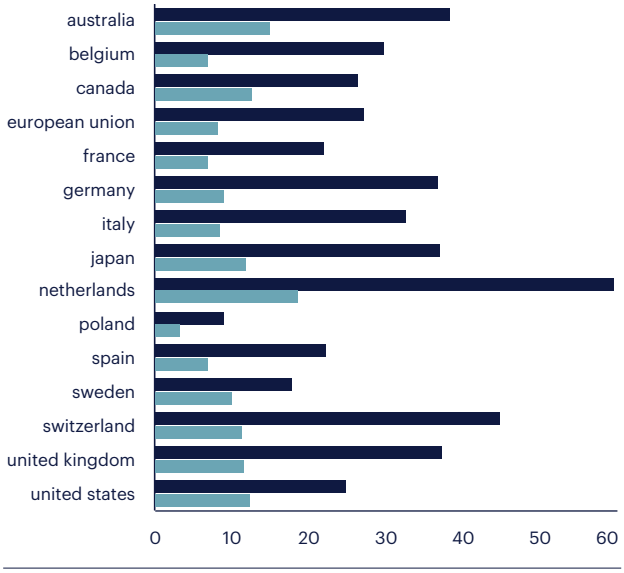
age 15 to 64, in % of total employment



source: OECD.stats (PT employment by common definition (US by national definition))

part-time employment by gender

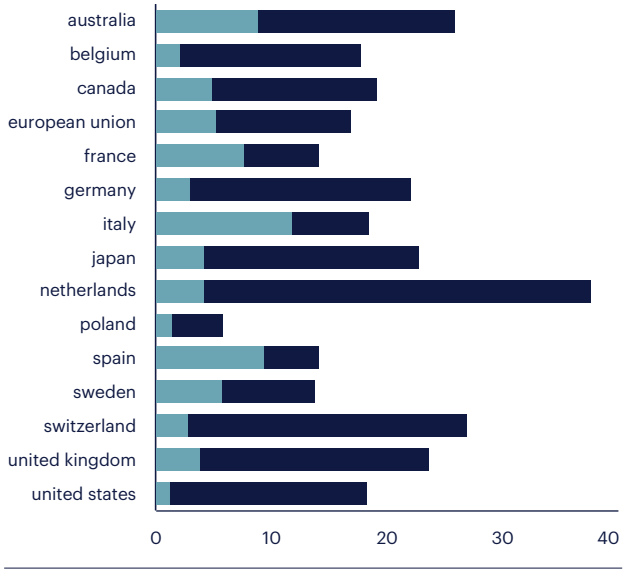
2016, age 15 to 64, in % of total employment



source: OECD.stats (PT employment by common definition (US by national definition))

(in)voluntary part-time employment

2016, age 15 to 64, in % of total employment

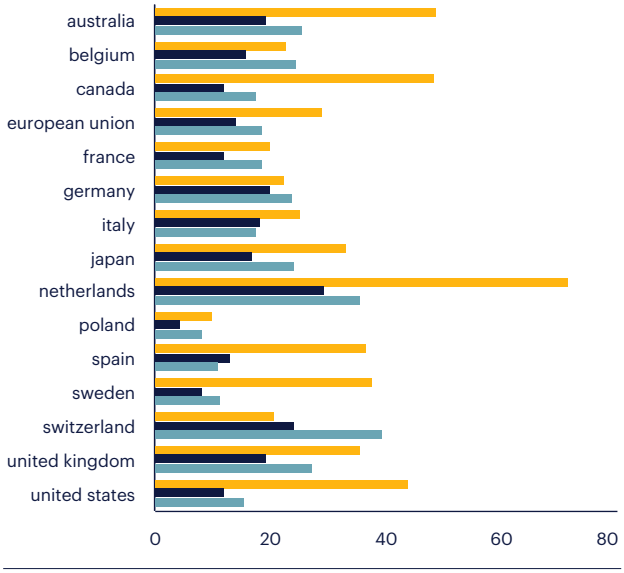


source: OECD.stats (PT employment)

are twice as likely to work part-time. It falls between the ages of 25 to 54 to pick up again when people get older. Most people work part-time by choice. Only in countries with high levels of unemployment like Italy and Spain, where it is harder to find full-time employment, we find more people working part-time involuntary than voluntary. In the European Union 3 out of every 4 part-time workers does so voluntary, in the united states even more then 9 out of 10.

part-time employment by age

2016, in % of total employment



source: OECD.stats (PT employment by common definition (US by national definition))

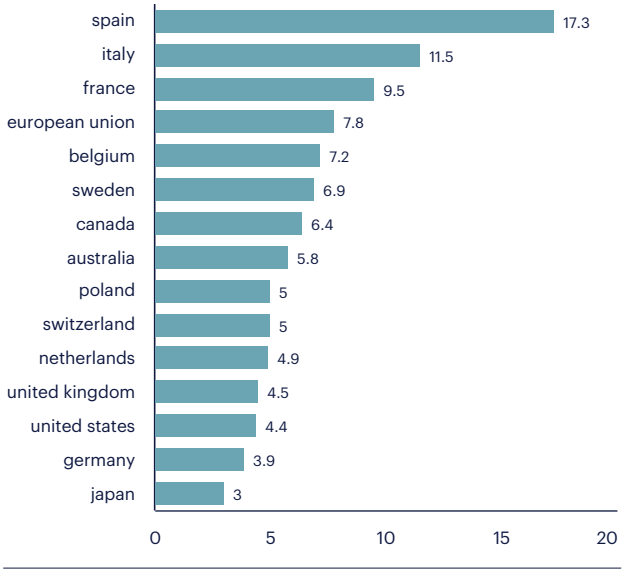
unemployment

After a long period of high unemployment and underemployment labor market conditions are finally improving even in those countries hit hardest by the global financial and economic crisis. In many countries there has been a drop in unemployment numbers since the global financial crisis, but there is some evidence that this is not only due to jobs growth but also because long-term unemployed are giving up on trying to find a job. In Southern Europe labor market conditions are slowly improving and are expected to continue to do so in the short term.

In the United States the unemployment rate has been falling since 2010 from 9.8% to 4.4% in 2017. Also in Japan and Canada unemployment has been falling for over 8 years. In Australia on the other hand unemployment has slowly increased since 2011. The unemployment rate in the European Union has reached 7.8% in 2017, down from 11% in 2013 – the lowest rate

unemployment

2017, age 15 to 64, unemployment rates in %



source: OECD.stats (Labour force survey)

since 2008. Improvements have been most notable in Southern Europe. In Greece, Portugal and Spain, the unemployment rates have fallen from their very high peaks, declining on average by almost 5 percentage points in the past 2 years, although in the case of Greece and Spain they remain above 15%. The EU unemployment rate is projected to continue to fall steadily over the next couple of years. Nonetheless, virtually all the countries in Europe, with the exception of Germany and the United Kingdom, will continue to post unemployment rates higher than the pre-crisis level.

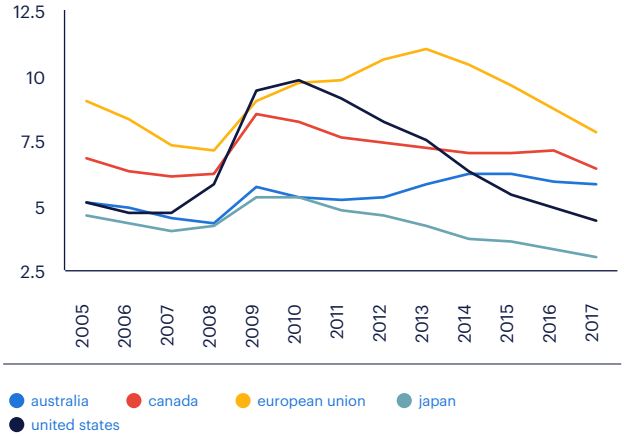
The long-term unemployed continue to comprise a large share of the total number of unemployed. In 2017, around half of all unemployed persons in Europe had been without work for one year or longer. Workers unemployed for long periods risk losing their skills, face reduced employability and are at greater risk of poverty.

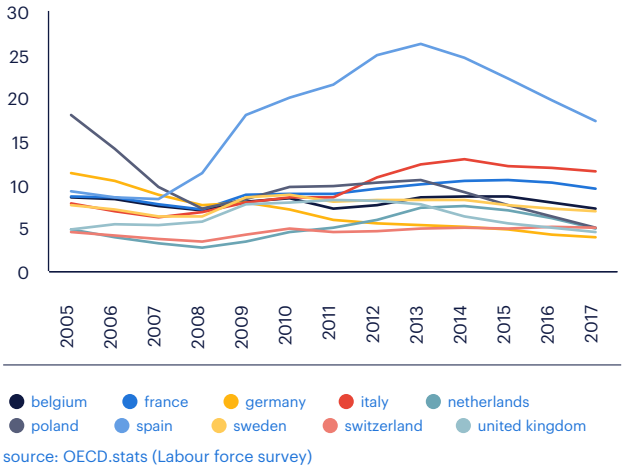
Long-term unemployment has likely peaked but remains a major concern. In countries hardest hit, notably in Southern Europe, this has led to a rise in structural unemployment which will not be automatically reversed by a pick-up in economic growth. Long-term unemployment reveals an important problem of labor market. Because the longer one stays unemployed, the smaller becomes the chance of getting back into employment. This means that high unemployment on itself is not necessarily the problem, but the persistence of unemployment is. As long as mobility is high, people won't stay unemployed for too long.

In the US long-term unemployment has been limited until the latest crisis, but increased sharply since then. While in the EU the average has always been much higher (around 40 percent of all unemployed persons) but decreased in 2009 because so many new people became unemployed. As not all of these newly unemployed could find jobs immediately, the share of long-term unemployment rose again in the last years. These figures point at a serious problem because this kind of unemployment is persistent. Chances that these people will return into employment have become quite low during the unemployment period, and it will take a

unemployment

age 15 to 64, unemployment rates in %

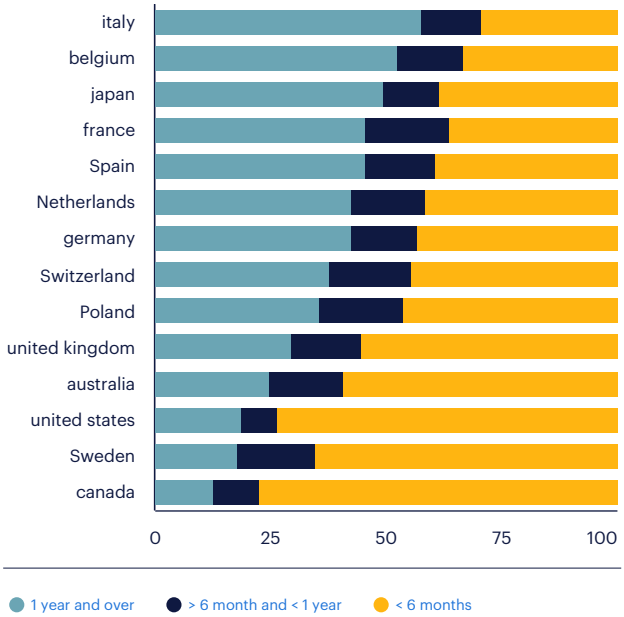




source: OECD.stats (Labour force survey)

unemployment by duration

2016, share of total unemployment in %



source: OECD.stats (Labour force survey)

lot of extra effort to make labor market policy work for this group.

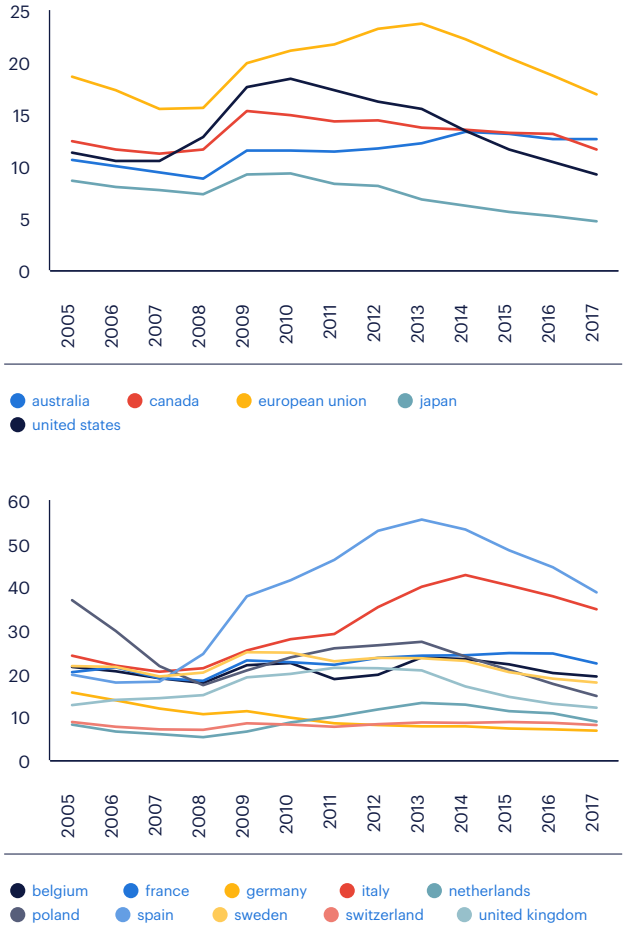
It is not easy to be young in the labor market today. Young people have suffered a disproportionate share of job losses during the global economic crisis. Coping with unemployment is difficult for everyone. But for low-skilled youth, and especially those who have left school without qualifications, failure to find a first job or keep it for long can have negative long-term consequences on career prospects – a phenomenon often referred to as "scarring". The risks posed by a scarred generation have motivated many governments to take vigorous action, notably by scaling up funds for youth labor market programs.

flexible labor relations

In the context of today's fragile recovery and mounting fiscal pressures, there is a strong need to keep momentum, by maintaining adequate resources for cost-effective measures for youth. But governments cannot do everything alone, and well-coordinated supports and incentives must come from all key stakeholders, including employers, trade unions, NGOs, and naturally from youth themselves.

youth unemployment

age 15 to 24, unemployment rates in %

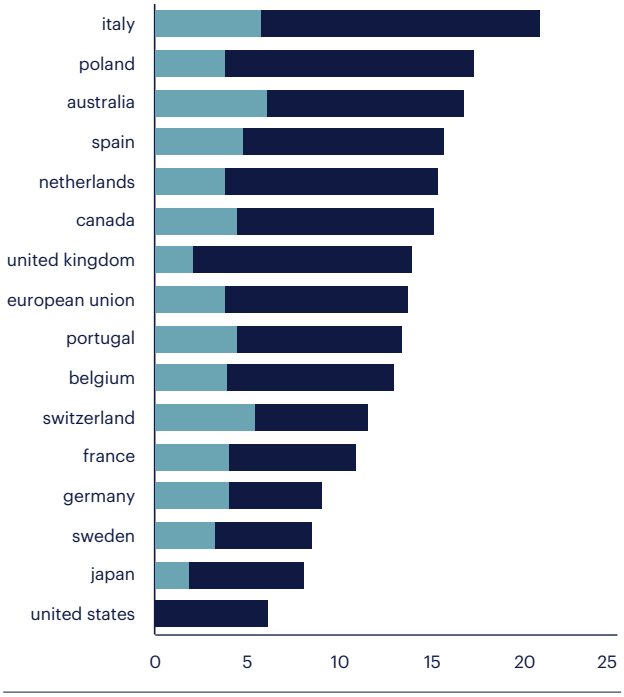


source: OECD.stats (Labour force survey)

Although the traditional open-ended labor contract is still the standard labor relation, many other forms of more flexible labor relations have developed over the last decades. These other forms of labor relations vary in the type of flexibility: flexibility in the duration of the contract (fixed-term contracts), flexibility in the company people work for (e.g. triangular labor relations such as agency work) and flexibility in the labor relation (e.g. self-employed workers). Self-employment includes both owners of businesses, who can be considered employers rather than employees, and own-account workers. All these other types of contracts can be interpreted as flexible labor contracts as opposed to the traditional open-ended labor contract with a direct employer.

Flexible labor relations enable companies to quickly adjust the size and composition of their workforce when

self-employment
2016, age 15 to 64, in % of total employment



source: Eurostat, ILOstat (Labour force survey)

innovations change their product lines and production methods. These flexible labor relations also enable companies to screen workers with respect to their productivity and creativity before adding them to their more permanent workforce. Through this way of matching, long-term labor relations become more efficient to the employer. If flexible labor relations are used to support innovation processes and optimize the quality of the workforce, it enables further economic growth.

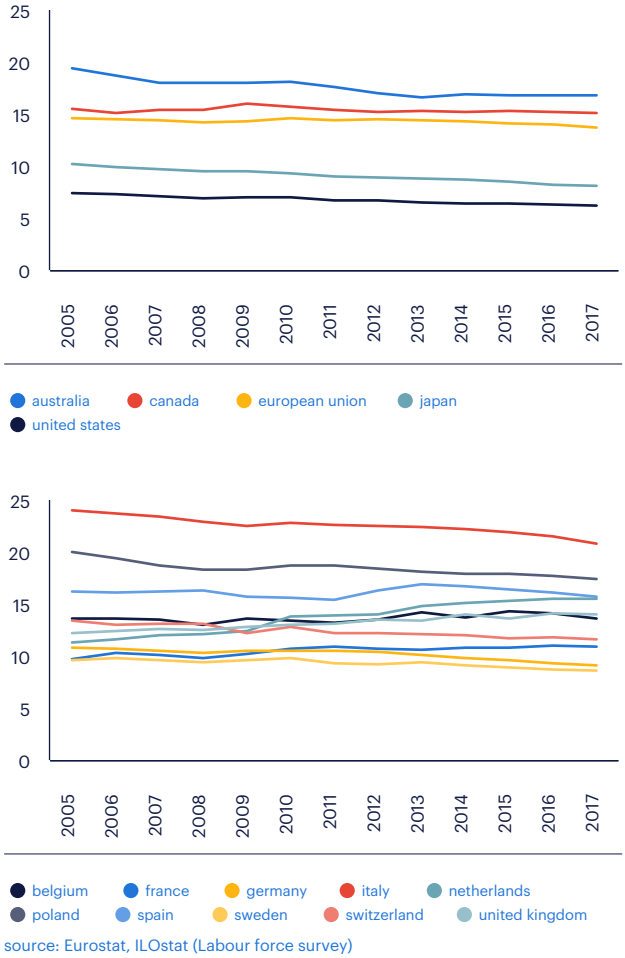
self-employment

Self-employment includes both owners of businesses, who can be considered employers rather than employees, and own-account workers. Many self-employed workers can be found in the agricultural sector and small retail. Therefor, countries with a large share of employment in these sectors have a high rate of self-employment. This is especially so in the developing and emerging regions of the world like Southern and Southeastern Asia and Latin-America where by far the highest rates of self-employment can be found. Self-employment rates here easily exceed 25% and reach up to over 80% in India. Often distinction between self-employment and informal work is difficult to make in these regions.

In the western world however self-employment rates are more moderate. About half of all flexible labor relations consist of self-employment. In the European Union about 14% of all employment is self-employment. The highest shares of self-employment can be found in Southern- and Eastern-European countries where – again – agricultural businesses and small retail still hold a large part of total employment. The United States, Canada and Scandinavian countries have the lowest share of self-employment, all below 10%.

These stable self-employment rates hide a strong variety. Variety between countries, sectors and educational attainment. When we look closer at the

self-employment
age 15 to 64, in % of total employment



source: Eurostat, ILOstat (Labour force survey)

figures for Europe it is clear there has been a decline of self-employment in Southern- and Eastern Europe. On the other hand, self-employment in France, the UK and especially the Netherlands self-employment has been rising in the past decade.

In general self-employment rates drop in countries when employment in agriculture and small retail drop. In the western world self-employment rates have stabilized and remained fairly equal in the last decade. There has been no clear effect on self-employment levels by the recent crisis. In times of economic recession, when jobs are scarce, employees who lose their job may decide to offer their services to companies. These flexible labor services may be attractive to companies as they offer comparable labor productivity in the short run and at lower risks. In the long run however, self-employment may not always provide the right substitution for traditional employees, who have more opportunities to invest in company-specific knowledge and skills (firm-specific human capital) which would eventually lead to a decline in the share of self-employed workers.

The variety in growth of self-employment between the countries partly be explained by a shift of self-employment between the sectors. Since 2008 in the European Union self-employment in agriculture and retail continuous decreased with in total 1.5 million jobs. Furthermore, self-employment dropped with nearly 0.5 million jobs each in manufacturing and construction explaining the drop in most Mediterranean and Eastern European countries. However, recently self-employment is increasing in service sectors. Especially in the professional, science and technical sector (up nearly 0.6 million) and health care (up over 0.3 million) which can explain the increase in several Western European countries.

This sectoral shift of self-employment is reflected in the level of education of self-employed workers. the total amount of self-employed workers remained equal with 30.4 million since 2005 in the European Union but the average level of education changed drastically. In 2005, 9.2 million self-employed only had a basic level of educational attainment opposed to 7.4 million self-employed with an advanced level of education. By 2017 this picture has reversed completely, in a near perfectmirror image 10.7 million self-employed had an advanced level of education and 6.1 million a basic level.

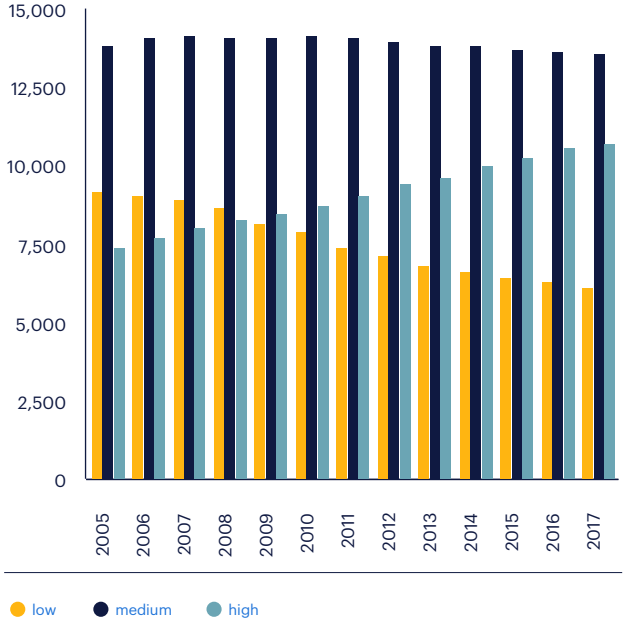
In nearly all countries the probability of being self-employed is higher for men than for women. In North-America this gender gap in self-employment is quite moderate with 44% of self-employed being women in Canada and 40% in the United States, but in Europe less than a third of all employed is a woman. Countries in Southern and Southeastern Asia are the only exception to this rule but very often self-employment in this region involve informal low-quality jobs.

The likelihood of being self-employed does increase with age. In Europe of all young workers, age between 15 to 24, only 4.3 percent are self-employed. The probability triples to nearly 14.1 percent for the core working age-group of 25 to 54 year olds, and of all workers over 55 year olds one in five is self-employed. Elderly workers have better access to capital, can take advantage of their aggregated skills and network and are more likely to want the freedom and independence associated with self-employment.

Self-employed are either pushed or pulled to work for themselves.[6] Push factors are those that push

self-employment by level of education (european union)

age 15 to 64, in thousand of persons

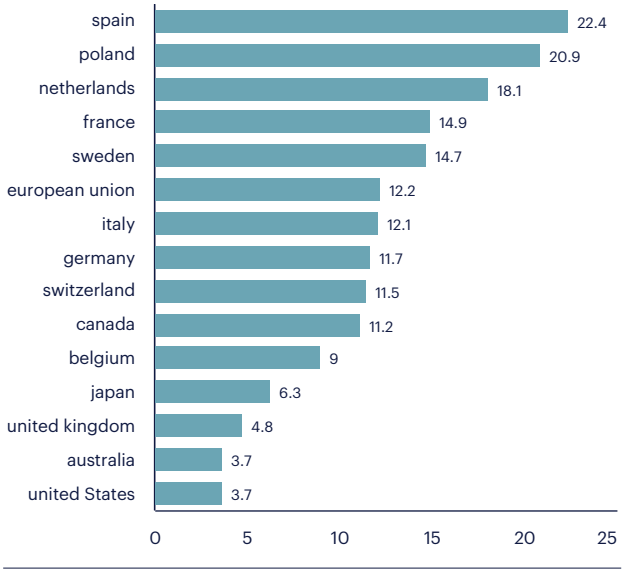


source: Eurostat (Labour force survey)

[6] Flexibility@work 2015

temporary employment

2017*, age 15 to 64, in % of total employment



source: Eurostat, OECD.stats (Labour force survey) - *latest available data canada and japan: 2016, australia: 2015, united states: 2005

individuals into self-employment due to lack of alternatives while pull factors are those that provide incentives for individuals to become self-employed. It is likely that a considerable proportion of those who have recently become self-employed in the recession have done so because of 'push' factors, driven out of wage work because of a lack of jobs. Push self-employment is more likely to occur when unemployment is high.

In good times 'pull' factors tend to become more important; demand is booming and a currently employed person thinks 'I can do that' and sets up his or her own business. The reason for being able to do this is demand is booming and there are opportunities for all. Those who are 'pulled' to self-employment, who make a positive decision to go it alone, frequently after a long planning period, perhaps during which they are able to raise enough capital to go it alone, are generally much closer to our idea of an entrepreneur, the job creator who made a job for him or herself and potentially down the road, will create jobs for others. Pull self-employed frequently are job-makers. Pull self-employment is more likely to take place when unemployment is low.

There is no one way to approach the different faces of self-employment. Tailor-made policies to increase the job quality (social protection and employee benefits) of self-employed are needed yet they should not impede the entrepeneurship and freedom self-employed aspire to maintain innovation and job creation they bring.

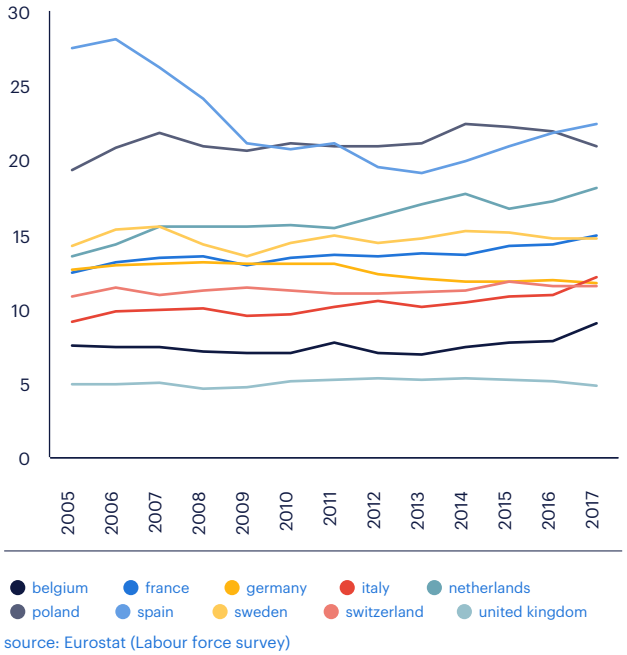
temporary employment

In many countries temporary work has been an important component of employment growth in the last one or two decades. Temporary contracts may facilitate job matching, by providing an initial work experience especially for youths (either during their educational period, for starters or for drop-outs) while also allowing employers to screen suitable candidates. For employers temporary jobs also offer the opportunity to adapt the size of their workforce to the economic conditions.

Currently, about half of all flexible labor consists of fixed-term contracts (the other half being self-employment). Most western countries between 5 and 20 percent of all workers have fixed-term contracts. The United States, Australia and the United Kingdom show traditionally the lowest figures due to the less stringent employment protection. The type of temporary contracts differs between countries in average duration. The average duration of a temporary contract in the EU is 17 months. However, 60% of the contracts agree on a duration of less than 12 months. In Scandinavia and the German-

temporary employment

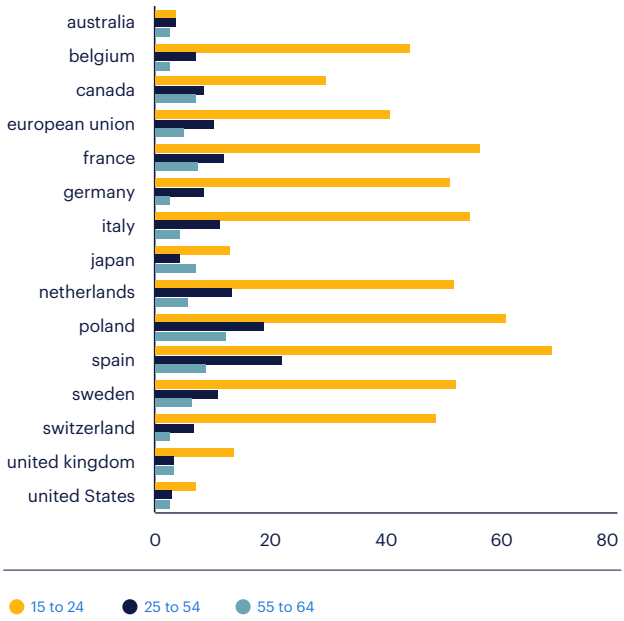
age 15 to 64, in % of total employment



source: Eurostat (Labour force survey)

temporary employment by age

2017, in % of total employment



source: Eurostat, OECD.stats (Labour force survey)

speaking countries temporary workers have longer contracts than in other countries, especially France, Belgium and Spain.

When the recent economic crisis kicked in, the share of fixed-term contracts declined in most European countries. The crisis was assimilated by businesses through not renewing fixed-term contracts. As a result, the share of fixed-term contracts in total employment fell seriously in the financial crisis, particularly in Spain. Since the early nineties close to 30% of all Spanish workers had a temporary contract. The share of temporary contracts dropped as a consequence of the recession, which struck the Spanish labor market more than in most other countries (and temporary workers even more).

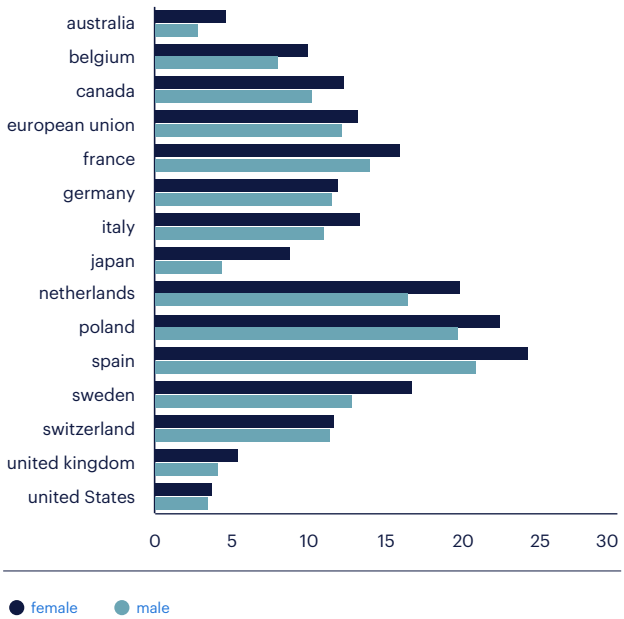
In Poland temporary work increased in a seven-year period in the beginning of the century from less than 6 percent to over 20 percent and remained on the same level ever since reaching 20.9% in 2017. Strong growth of the temporary employment rate in the Netherlands, from 12% at the beginning of the century to 18.1% in 2017 was driven by institutional factors, which made it easier for employers to offer fixed-term contracts. France and Italy have seen a more moderate, yet continuous growth of the temporary employment rate. In Germany there was a directly increase of the temporary employment rate after the Hartz reforms in 2004, peaking at 13.1 percent in 2008, but it has fallen since to 11.7% close to the level before the Hartz reforms.

Incidence of temporary work differs by age but not by gender. In most countries women are only slightly overrepresented. However, as expected, temporary work is more common among youth. Part of this effect is caused by the fact that many young people are still in education, and therefore not available for a fulltime job. The relations in temporary employment rates between the age-groups has been very constant over the years which indicates most youth who are in temporary employment do step into open-ended employment by the time they reach their thirties or before.

Temporary work is not only characterized by relatively young workers, it is also characterized by overrepresentation of low-skilled workers. The most dramatic example of this being Germany where the likelihood of being in temporary work is three times higher for low-skilled workers. Two possible explanations can be thought of. Firstly, if people are still in education, their skill level is not measured correctly by 'highest successfully completed education' because they have not completed their educational track yet.

temporary employment by gender

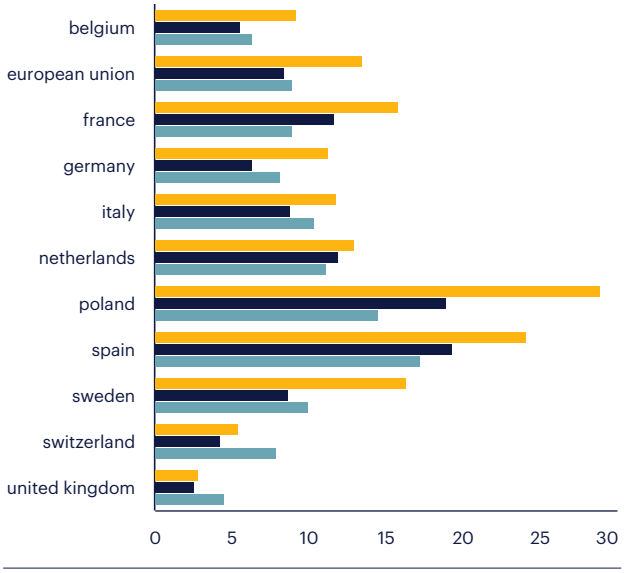
2017, age 15 to 64, in % of total employment



source: Eurostat, OECD.stats (Labour force survey)

temporary employment by level of education

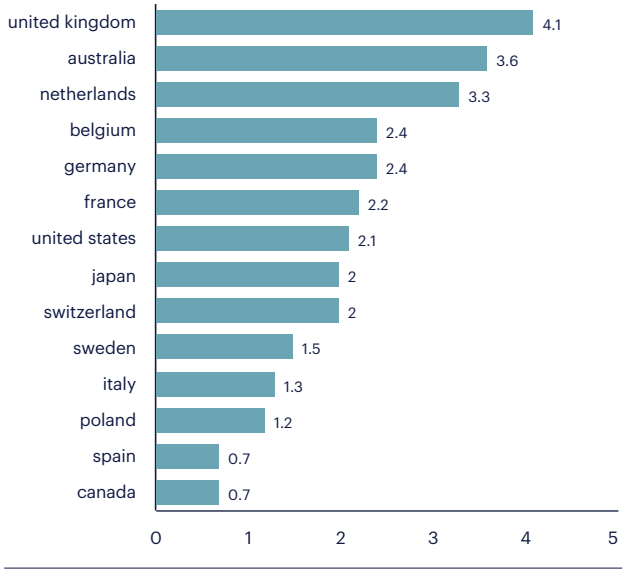
2017, age 25 to 64, in % of total employment



source: Eurostat (Labour force survey)

share of agency work

2016*, age 15 to 64, in % of total employment



source: World Employment Confederation - *latest available data australia, canada and sweden: 2015

Secondly, early school leavers ('drop-outs') do not get a permanent job easily because they lack certain minimum qualifications. Starting with temporary jobs is often their only option. However, in Spain and Italy temporary work is not distinguished as 'typically low-skilled': high-skilled temporary work is also very common in these countries.

Temporary workers can be found in different economic sectors like manufacturing, retail, health-care, education, construction and business services. There is no clear pattern but it varies by country. Manufacturing is the most important sector for temporary workers in the Germany, France, Italy and Portugal. Construction is more dominant in Spain, Portugal and Greece. Furthermore, in the Netherlands, Germany, France, Sweden and the UK the health sector plays an important role in the labor market for temporary workers. At least 15% of the temporary workforce in these countries works in the health sector. In the UK many temporary workers are also found in the education sector (although the overall share of temporary workers in total employment is considerably low in the UK).

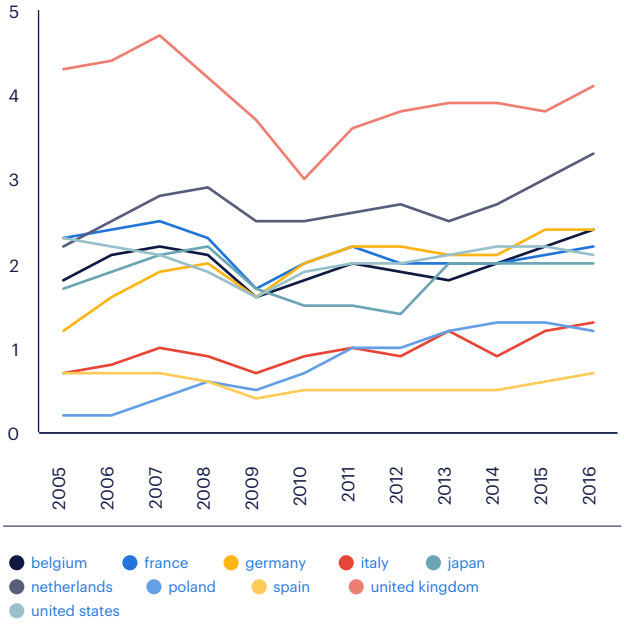
The reasons for working in a temporary job differ substantially between countries. Roughly speaking: in the German-speaking countries, Scandinavia and the Netherlands temporary work is a voluntary choice for the majority of temporary workers. In contrast, in Belgium and the Mediterranean countries the majority of temporary workers opt for temporary work only as a second choice. A correlation does exist between employment participation and whether temporary work is voluntary: countries with higher participation have less people working involuntary in a fixed term contract. In other words, higher participation levels come hand in hand with more voluntary temporary workers. Apparently some part of the higher participation countries might be connected to their labor markets providing 'good quality' temporary jobs.

agency work

With agency work, the employer does not hire an employee directly on a fixed-term contract, but through a private employment agency. Typically, the employee is hired directly by the employment agency, mostly on a fixed-term basis but occasionally on an open-ended contract. During the contract period, the employee can be assigned to different user companies. After the contract expires, a renewed contract with the employment agency is one of the possibilities, but also a contract with one of the user companies.

agency work

age 15 to 64, in % of total employment



source: World Employment Confederation

Agency work give employers the opportunity to adapt the size of their workforce to economic conditions and at the same time facilitate job matching by providing initial work experience. This is particularly true for younger people, either during their educational period or when starting on the labor market, but also for the unemployed to find their way back to the labor market.

Agency work accounts for a relatively small but important part of total employment. It has a long tradition in the United States, with a long-term share in total employment of around two percent. In Europe, agency work has the highest employment share in the United Kingdom with over four percent, followed traditionally by the Benelux countries and France, where agency work has been well-established for four to five decades now.

In Germany agency work has become much more popular over the last decade after the changed regulation on labor in the Hartz reforms when the employment share went up to over two percent. In Japan, agency work has become more popular since 2000, with the current share also at two percent. After the financial crisis agency work penetration rates went down in many countries but have recovered since to pre-crisis rates.

agency work as a stepping stone

Although there are significant differences between the countries, each show that agency work is a stepping stone out of unemployment into work. Clearly, people use the experience and skills they obtain while working as an agency worker to make a next move on the labor market.

People who start working as an agency worker can do so either from employment or unemployment, but also from education or inactivity. Through agency work, they do not only have a good point of entry to the labor market, but they are also able to stay in employment after their agency work assignment ended.

In many countries agency workers receive formal training, either directly through the agency, or through bipartite funds set up by the agencies and the trade unions. This makes sure that agency workers get opportunities to keep developing themselves in order to take another step on the labor market.

Being close to the labor market, employment and recruitment agencies are excellently suited to advice workers on the type of training to follow in order to enhance their employability. In its Economic Report 2018 the World Employment Confederation has gathered ample research into the stepping stone function of agency work.

data tables.

unemployment

age 15 to 64, unemployment rates in %

	year								gender		age		
	2010	2011	2012	2013	2014	2015	2016	2017	female	male	15 to 24	25 to 54	55 to 64
argentina	7.4	7.1	7.3	6.6	7.0	6.9	8.4	8.7	10.9	7.3	24.7	6.3	..
australia	5.3	5.2	5.3	5.8	6.2	6.2	5.9	5.8	5.8	5.7	12.6	4.4	4.1
austria	4.9	4.6	4.9	5.4	5.7	5.8	6.1	5.6	5.1	6.0	9.8	5.1	4.3
belgium	8.4	7.2	7.6	8.5	8.6	8.6	7.9	7.2	7.1	7.2	19.3	6.3	5.9
brazil	8.4	6.7	7.2	7.0	6.7	8.4	11.6	12.9	15.1	11.2	30.5	9.0	..
canada	8.2	7.6	7.4	7.2	7.0	7.0	7.1	6.4	5.9	6.9	11.6	5.4	5.8
chile	8.4	7.4	6.7	6.2	6.6	6.5	6.8	7.0	7.5	6.6	16.9	6.3	4.0
china	4.2	4.3	4.5	4.5	4.6	4.6	4.7	4.7	4.2	5.0	10.8	4.0	..
czech Republic	7.4	6.8	7.1	7.0	6.2	5.1	4.0	2.9	3.7	2.4	8.0	2.7	2.4
denmark	7.6	7.7	7.7	7.2	6.8	6.3	6.4	5.9	6.1	5.8	11.1	5.2	3.7
estonia	17.1	12.6	10.3	8.9	7.6	6.3	7.0	5.9	5.5	6.4	12.2	5.3	5.7
european union	9.7	9.8	10.6	11.0	10.4	9.6	8.7	7.8	8.0	7.6	16.9	7.1	5.9
finland	8.5	7.9	7.8	8.3	8.8	9.6	9.0	8.8	8.5	9.1	19.8	7.1	7.8
france	8.9	8.9	9.5	10.0	10.4	10.5	10.2	9.5	9.4	9.5	22.3	8.5	6.5
germany	7.1	5.9	5.5	5.3	5.1	4.8	4.2	3.9	3.4	4.3	6.8	3.5	3.4
greece	12.9	18.1	24.7	27.7	26.7	25.1	23.7	21.7	26.3	18.0	43.6	20.7	18.2
hungary	11.3	11.1	11.1	10.3	7.8	6.9	5.2	4.2	4.6	3.8	10.7	3.7	3.6
iceland	7.8	7.1	6.1	5.5	5.1	4.2	3.1	2.9	2.8	3.0	7.7	1.9	..
india	3.5	3.5	3.6	3.5	3.4	3.5	3.5	3.5	4.2	3.3	10.5	2.3	..
indonesia	5.6	5.2	4.5	4.3	4.1	4.5	4.1	4.3	3.9	4.5	15.6	2.0	..
ireland	14.8	15.7	15.8	14.0	12.1	10.2	8.6	6.9	6.4	7.3	14.4	5.9	5.8
israel	6.8	5.7	7.0	6.3	6.0	5.3	4.9	4.3	4.4	4.2	7.3	3.8	3.5
italy	8.5	8.5	10.8	12.3	12.9	12.1	11.9	11.5	12.6	10.6	34.8	10.9	5.8
japan	5.3	4.8	4.6	4.2	3.7	3.6	3.3	3.0	2.8	3.1	4.7	2.8	2.6
korea	3.8	3.5	3.3	3.2	3.6	3.7	3.8	3.8	3.6	3.9	10.3	3.5	2.5
latvia	19.8	16.5	15.4	12.1	11.1	10.1	9.9	8.9	7.9	9.9	17.0	8.3	8.3
luxembourg	4.4	5.0	5.2	5.9	5.9	6.7	6.3	5.5	5.5	5.6	15.4	4.9	3.2
mexico	5.5	5.4	5.1	5.1	5.0	4.5	4.0	3.6	3.7	3.5	6.9	3.0	1.9
netherlands	4.5	5.0	5.9	7.3	7.5	7.0	6.1	4.9	5.3	4.5	8.9	3.7	5.5
new Zealand	6.3	6.3	6.7	6.0	5.6	5.6	5.4	4.9	5.4	4.5	12.7	3.5	2.8
norway	3.6	3.3	3.2	3.5	3.6	4.5	4.8	4.3	3.8	4.7	10.4	3.7	1.8
poland	9.7	9.8	10.2	10.5	9.1	7.6	6.3	5.0	5.0	5.0	14.8	4.2	3.7
portugal	11.4	13.4	16.3	17.0	14.5	13.0	11.5	9.2	9.6	8.8	23.9	7.9	8.6
russian fed	7.4	6.5	5.4	5.5	5.2	5.6	5.5	5.2	4.9	5.4	16.3	4.4	..
saudi arabia	5.6	5.8	5.5	5.6	5.7	5.6	5.9	5.7	18.0	3.4	34.7	3.8	..
slovak republic	14.4	13.7	14.0	14.3	13.2	11.5	9.7	8.2	8.5	8.0	18.9	7.6	6.0
slovenia	7.4	8.4	9.0	10.3	9.9	9.1	8.1	6.7	7.6	5.9	11.3	6.3	6.4
south africa	24.7	24.7	24.7	24.6	24.9	25.2	26.6	27.7	30.5	25.5	57.4	23.6	..
spain	20.0	21.5	24.9	26.2	24.6	22.2	19.7	17.3	19.1	15.8	38.7	15.9	15.4
sweden	8.8	8.0	8.2	8.2	8.2	7.6	7.2	6.9	6.5	7.2	17.9	5.4	5.1
switzerland	4.9	4.5	4.6	4.9	5.0	4.9	5.1	5.0	5.2	4.8	8.1	4.6	3.8
turkey	10.9	9.0	8.4	8.9	10.1	10.5	11.1	11.1	14.2	9.6	20.6	9.5	6.5
united kingdom	7.9	8.2	8.1	7.7	6.3	5.5	5.0	4.5	4.3	4.6	12.1	3.2	3.6
united states	9.8	9.1	8.2	7.5	6.3	5.4	4.9	4.4	4.3	4.5	9.2	3.8	3.1

source: OECD.stats (Labour force survey)

labor participation

age 15 to 64, activity rates in %

	year								gender		age		
	2010	2011	2012	2013	2014	2015	2016	2017	female	male	15 to 24	25 to 54	55 to 64
argentina	59.7	60.8	60.7	60.4	59.8	60.0	59.9	59.8	47.3	73.2	37.7	65.8	..
australia	76.4	76.6	76.4	76.4	76.3	76.9	76.9	77.4	72.3	82.6	66.9	83.9	66.3
austria	74.4	74.6	75.1	75.5	75.4	75.5	76.2	76.4	71.8	81.0	56.1	88.7	53.6
belgium	67.7	66.7	66.9	67.6	67.7	67.6	67.6	68.0	63.2	72.8	28.1	84.9	51.3
brazil	65.8	64.6	64.4	64.2	64.0	64.1	63.8	63.7	53.2	74.7	54.9	66.0	..
canada	77.8	77.8	77.8	78.0	77.8	78.0	78.1	78.5	75.0	81.9	63.9	87.0	66.0
chile	64.8	66.2	66.3	66.4	66.6	66.8	66.8	67.4	57.1	77.6	34.0	79.9	68.0
china	71.0	70.7	70.5	70.3	70.0	69.7	69.4	68.9	61.5	76.1	46.6	72.7	..
czech Republic	70.2	70.5	71.6	72.9	73.5	74.1	75.0	75.9	68.7	82.9	31.7	89.1	63.7
denmark	79.4	79.3	78.7	78.1	78.1	78.5	80.0	78.9	76.1	81.5	63.3	86.2	71.6
estonia	73.9	74.8	74.8	75.1	75.3	76.7	77.5	78.8	75.1	82.7	46.1	88.6	72.2
european union	71.0	71.1	71.7	72.0	72.3	72.5	72.9	73.3	67.8	78.9	41.7	85.7	60.6
finland	74.5	75.0	75.2	75.2	75.4	75.8	75.9	76.8	74.9	78.5	53.2	86.8	67.9
france	70.3	70.1	70.7	71.1	71.2	71.3	71.4	71.5	67.6	75.6	36.9	87.4	54.9
germany	76.7	77.3	77.2	77.7	77.7	77.6	77.9	78.3	74.0	82.4	49.9	87.3	72.6
greece	67.8	67.3	67.5	67.5	67.4	67.8	68.2	68.3	60.3	76.4	25.1	85.0	46.7
hungary	61.9	62.4	63.7	64.7	67.0	68.7	70.1	71.2	64.3	78.3	32.5	86.8	53.6
iceland	84.8	84.5	84.9	85.8	87.4	88.4	89.4	88.7	85.9	91.3	82.3	91.5	85.4
india	55.3	54.6	54.0	54.0	54.0	53.9	53.9	53.8	27.2	78.8	32.8	60.9	..
indonesia	67.9	67.8	67.6	67.3	67.1	65.8	66.4	66.3	50.7	81.8	47.5	72.0	..
ireland	71.6	71.2	71.1	71.8	71.8	72.1	72.7	72.7	66.6	78.8	46.7	82.8	62.2
israel	64.5	64.6	71.5	71.6	72.2	72.2	72.1	72.1	68.7	75.6	48.3	82.8	69.1
italy	62.0	62.1	63.5	63.4	64.0	64.1	65.0	65.5	56.0	75.0	26.2	77.9	55.4
japan	74.2	74.4	74.0	74.9	75.6	76.1	77.0	77.6	69.4	85.6	44.6	86.7	75.4
korea	65.9	66.2	66.5	66.8	68.0	68.4	68.7	69.2	59.0	79.3	30.3	79.1	69.1
latvia	73.0	72.8	74.4	74.0	74.6	75.8	76.3	77.0	74.3	79.8	39.8	88.6	67.9
luxembourg	68.2	68.0	69.4	69.9	70.8	70.9	70.0	70.2	66.2	74.0	30.5	88.0	41.1
mexico	63.1	63.4	64.2	64.1	63.6	63.6	63.6	63.4	46.7	81.8	43.8	73.5	56.0
netherlands	78.2	78.1	79.0	79.4	79.0	79.6	79.7	79.8	75.2	84.2	68.4	86.7	69.5
new Zealand	77.1	77.3	77.1	77.5	78.6	78.7	79.8	80.9	76.2	85.7	63.4	87.2	80.5
norway	78.1	77.8	78.3	78.2	78.0	78.2	78.1	77.3	75.2	79.3	53.8	85.6	73.2
poland	65.3	65.7	66.5	67.0	67.9	68.1	68.8	69.6	62.6	76.6	34.8	84.9	50.1
portugal	73.7	73.6	73.4	73.1	73.3	73.4	73.7	74.7	71.7	77.9	34.0	89.6	61.5
russian fed	63.0	63.4	63.4	63.5	63.5	63.7	63.8	63.5	56.6	71.8	36.0	67.2	..
saudi arabia	52.4	52.3	52.6	53.2	53.4	54.6	54.7	54.7	22.3	79.5	18.4	65.7	..
slovak republic	68.7	68.7	69.4	69.9	70.3	70.9	71.9	72.1	65.9	78.2	33.2	86.6	56.4
slovenia	71.5	70.3	70.4	70.5	70.9	71.8	71.7	74.2	71.2	77.1	39.2	91.8	45.7
south africa	51.0	52.2	53.6	54.4	54.9	55.6	55.8	56.1	47.9	62	26.2	64.7	
spain	73.5	73.9	74.3	74.3	74.2	74.3	74.2	73.9	68.8	78.9	33.4	87.0	59.6
sweden	79.1	79.9	80.3	81.1	81.5	81.8	82.1	82.5	80.7	84.3	54.7	91.3	80.5
switzerland	81.3	82.1	82.3	82.4	82.9	83.3	83.9	84.0	79.4	88.5	68.7	90.4	75.1
turkey	51.9	53.2	53.4	54.4	55.1	56.0	57.0	58.0	37.5	78.2	43.2	67.5	36.8
united kingdom	75.4	75.5	76.1	76.4	76.7	76.9	77.3	77.6	72.9	82.4	57.6	86.6	66.5
united states	73.9	73.3	73.1	72.8	72.7	72.6	73.0	73.3	67.9	79.0	55.5	81.7	64.5

source: OECD.stats (Labour force survey)

part-time employment

age 15 to 64, in % of total employment

	year							gender		age		
	2010	2011	2012	2013	2014	2015	2016	female	male	15 to 24	25 to 54	55 to 64
australia	24.8	24.7	24.6	24.9	25.2	25.2	25.9	38.4	15.1	49.0	19.3	25.5
austria	19.2	19.0	19.4	19.9	20.9	21.0	20.9	34.7	8.6	20.7	19.7	22.7
belgium	18.3	18.8	18.7	18.2	18.1	18.2	17.8	30.0	6.9	23.0	15.8	24.7
brazil	..	16.0	16.2	16.4	17.1	17.9	..	..	..	..	..	..
canada	19.6	19.3	19.0	19.1	19.3	18.9	19.2	26.4	12.6	48.5	12.1	17.8
chile	17.4	17.2	16.7	16.5	17.0	16.8	17.4	25.0	12.2	27.3	14.0	18.0
czech Republic	4.3	3.9	4.3	4.9	4.8	4.7	4.9	8.0	2.6	10.3	3.2	5.7
denmark	19.2	19.2	19.4	19.2	19.7	20.0	21.7	26.7	17.3	66.4	11.6	14.5
estonia	8.8	8.9	8.2	8.0	7.6	8.6	8.7	11.9	5.6	17.4	5.8	9.2
european union	16.6	16.8	17.2	17.4	17.3	17.2	17.0	27.2	8.3	29.1	14.3	18.8
finland	12.5	12.7	13.0	13.0	13.3	13.4	14.0	17.7	10.6	37.1	8.5	14.7
france	13.7	13.7	13.9	14.0	14.3	14.4	14.2	22.0	7.0	20.1	12.2	18.7
germany	21.8	22.3	22.2	22.6	22.3	22.4	22.1	36.9	9.1	22.4	20.0	24.0
greece	8.9	9.1	9.8	10.3	11.2	11.1	11.0	16.1	7.2	23.0	10.7	9.1
hungary	4.0	5.2	5.2	4.9	4.5	4.4	4.0	5.5	2.6	7.1	2.7	6.4
iceland	18.4	17.0	17.3	17.4	16.7	17.2	17.7	24.6	11.6	44.4	10.9	17.2
ireland	24.9	25.7	25.0	24.2	23.4	23.3	22.8	34.8	11.9	40.4	19.5	27.6
israel	15.2	14.9	16.1	15.9	16.0	15.9	15.5	22.8	9.1	20.9	12.2	16.3
italy	16.4	16.7	17.8	18.5	18.8	18.7	18.6	32.6	8.5	25.3	18.2	17.7
japan	20.2	20.6	20.5	21.9	22.7	22.7	22.8	37.1	11.9	33.1	16.8	24.2
korea	10.7	13.5	10.2	11.1	10.5	10.6	10.9	16.5	6.8	24.4	6.7	11.7
latvia	8.2	8.0	8.3	7.6	6.6	6.8	7.3	9.7	4.8	12.0	5.8	7.9
luxembourg	15.8	16.0	15.5	15.3	15.5	14.9	13.6	24.1	4.9	25.5	12.1	18.8
mexico	18.2	18.4	18.9	18.4	18.2	18.1	17.7	26.9	12.0	21.6	14.9	21.8
netherlands	37.1	37.0	37.6	38.5	38.3	38.5	37.7	59.8	18.7	71.6	29.3	35.8
new Zealand	21.8	22.1	22.3	21.6	21.5	21.3	21.2	32.1	11.6	38.1	15.6	19.4
norway	20.1	20.0	19.8	19.5	18.8	19.4	19.2	27.2	12.0	51.2	12.2	18.6
poland	8.7	8.3	8.0	7.7	7.1	6.4	6.0	9.0	3.4	10.2	4.5	8.2
portugal	9.6	11.7	12.5	12.0	11.0	10.5	9.1	11.5	6.8	18.2	6.1	12.2
russian fed	4.3	4.1	4.1	4.3	4.0	4.2	4.3	5.6	3.1	6.9	3.1	7.6
slovak republic	3.7	4.0	3.8	4.3	4.9	5.7	5.8	7.6	4.2	10.5	4.9	6.8
slovenia	9.4	8.6	7.9	8.6	9.6	9.2	8.0	11.1	5.2	30.9	5.5	9.5
south africa	7.7	7.4	7.7	8.3	8.0	8.8	9.0	13.3	5.6	8.5	8.5	11.8
spain	12.2	12.7	13.6	14.7	14.7	14.5	14.1	22.3	7.1	36.7	13.3	11.0
sweden	14.5	14.3	14.3	14.3	14.2	14.1	13.8	17.8	10.1	37.6	8.4	11.4
switzerland	26.3	25.9	26.2	26.5	27.1	27.0	27.0	44.9	11.4	20.9	24.4	39.5
turkey	11.5	11.7	11.8	12.3	10.6	9.9	9.5	17.8	5.8	14.1	7.2	16.3
united kingdom	24.6	24.7	25.0	24.6	24.1	24.0	23.8	37.5	11.6	35.5	19.4	27.3
united states	19.7	19.5	19.4	19.2	18.9	18.4	18.3	24.9	12.4	43.9	12.1	15.7

source: OECD.stats (PT employment by common definition (united states by national definition))

data tables.

self-employment

age 15 to 64, in % of total employment

	year								type		gender	
	2010	2011	2012	2013	2014	2015	2016	2017	employers	own-account	female	male
argentina	22.8	22.4	22.5	23.1	23.1				3.5	19.6	18.6	26.3
australia	18.1	17.6	17.0	16.6	16.9	16.8	16.8	16.8	6.2	10.6	12.2	20.7
austria	11.3	10.9	10.8	11.0	10.9	11.0	10.8	10.6	4.6	6.0	7.9	12.9
belgium	13.0	12.8	13.0	13.7	13.2	13.8	13.5	13.1	4.0	9.0	9.3	16.3
brazil	..	..	26.9	27.2	27.3	28.6	29.5	29.8	4.7	25.1	22.6	35.3
canada	15.7	15.4	15.2	15.3	15.2	15.3	15.2	15.1	4.5	10.6	11.7	18.2
chile	24.2	24.0	22.9	23.2	23.8	23.7	24.5	25.5	4.5	21.0	23.6	26.8
china	9.2	10.4	11.3	12.1	13.7	..	..	..	..	..	..	..
czech republic	16.8	17.2	17.5	16.5	17.0	16.3	16.2	16.1	3.0	13.1	11.6	19.8
denmark	8.4	8.4	8.3	8.2	8.0	7.8	7.7	7.3	3.0	4.3	4.6	9.8
estonia	8.2	8.3	8.5	8.8	8.8	9.3	9.5	9.9	4.6	5.3	6.3	13.3
european union	14.6	14.4	14.5	14.4	14.3	14.1	14.0	13.7	3.9	9.8	9.7	17.2
finland	12.2	12.2	12.3	12.2	12.6	12.7	12.4	11.6	3.8	7.9	8.1	15.0
france	10.7	10.9	10.7	10.6	10.8	10.8	11.0	10.9	4.1	6.8	7.7	13.8
germany	10.5	10.5	10.4	10.1	9.8	9.6	9.3	9.1	4.1	5.0	6.6	11.2
greece	29.2	30.0	31.1	31.7	30.7	29.9	29.5	29.4	7.1	22.3	22.4	34.4
hungary	11.8	11.4	11.0	10.6	10.3	10.2	10.0	9.7	4.5	5.2	7.5	11.5
iceland	11.9	11.8	11.6	11.9	11.8	11.6	11.2	10.8	3.7	7.1	7.2	13.9
india	67.5	..	65.7	..	..	..	..	..	1.5	64.2	51.7	69.6
indonesia	42.4	40.4	38.2	37.6	37.9	36.7	37.3	37.7	3.4	34.3	33.1	40.8
ireland	15.1	14.9	14.5	14.7	14.5	14.1	13.8	13.3	4.2	9.1	6.7	19.0
israel	11.9	11.9	11.7	11.5	11.6	11.9	12.7	..	..	..	9.1	15.9
italy	22.8	22.6	22.5	22.4	22.2	21.9	21.5	20.8	5.8	15.1	14.9	25.2
japan	9.3	9.0	8.9	8.8	8.7	8.5	8.2	8.1	2.0	6.1	4.7	10.7
korea	23.5	23.1	23.2	22.5	22.1	21.5	21.2	..	..	..	14.1	26.5
latvia	9.9	10.1	10.2	10.5	10.6	11.6	11.8	11.8	4.6	7.2	9.8	13.9
luxembourg	7.2	7.7	8.0	7.9	7.8	8.6	9.0	8.9	3.5	5.4	5.9	10.1
mexico	26.9	27.5	26.9	27.2	26.7	26.7	26.7	26.8	4.6	22.2	24.6	28.1
netherlands	13.8	13.9	14.0	14.8	15.1	15.3	15.5	15.5	3.9	11.5	12.2	18.4
norway	7.2	6.5	6.3	6.3	6.6	6.3	6.2	5.9	1.7	4.1	3.9	7.7
poland	18.7	18.7	18.4	18.1	17.9	17.9	17.7	17.4	3.9	13.4	12.0	21.8
portugal	17.7	16.8	17.0	17.1	15.5	14.5	13.9	13.4	4.5	8.9	10.1	16.6
saudi arabia	..	..	..	5.3	5.0	4.8	..	..	1.9	2.9	1.3	5.3
slovakia	15.8	15.8	15.3	15.4	15.2	14.9	15.2	15.0	3.1	11.9	10.2	19.0
slovenia	11.6	11.9	11.6	11.6	12.1	12.1	11.5	11.4	3.8	7.6	8.1	14.3
south africa	15.0	15.0	14.7	14.2	13.6	14.1	14.6	14.7	5.4	9.3	12.1	16.7
spain	15.6	15.4	16.3	16.9	16.7	16.4	16.1	15.7	4.9	10.8	11.4	19.3
sweden	9.8	9.3	9.2	9.4	9.1	8.9	8.7	8.6	3.4	5.1	5.1	11.8
switzerland	12.8	12.2	12.2	12.1	12.0	11.7	11.8	11.6	5.5	6.1	9.5	13.4
turkey	24.2	23.3	22.7	22.1	20.6	20.0	20.0	20.3	4.5	15.8	10.5	24.8
united kingdom	13.0	13.1	13.5	13.4	14.0	13.6	14.1	14.0	2.2	11.8	10.0	17.7
united states	7.0	6.7	6.7	6.5	6.4	6.4	6.3	6.2	..	..	5.2	7.1

source: Eurostat, ILOstat (Labour force survey)

temporary employment

age 15 to 64, in % of total employment

	year								gender		age		
	2010	2011	2012	2013	2014	2015	2016	2017	female	male	15 to 24	25 to 54	55 to 64
australia	4.8	5.0	5.0	4.7	4.9	3.7	..	..	4.7	2.8	3.9	3.9	2.8
austria	8.2	8.4	8.2	8.1	8.1	8.0	7.9	8.1	8.4	8.0	33.7	5.2	2.4
belgium	7.0	7.7	7.0	6.9	7.4	7.7	7.8	9.0	10.0	8.0	44.4	7.3	2.8
canada	11.2	11.6	11.5	11.4	11.3	11.3	11.2	..	12.3	10.2	29.8	8.5	7.2
chile	21.0	20.8	21.4	20.9	20.4	20.5	20.0	..	18.4	21.1	39.2	20.2	12.6
czech Republic	6.7	6.5	6.8	7.5	8.0	8.3	8.1	8.0	10.2	6.2	28.7	7.0	5.7
denmark	7.7	8.1	7.9	8.1	7.9	8.0	12.4	11.9	13.2	10.7	37.2	8.3	4.2
estonia	3.4	4.1	3.2	3.2	2.8	3.1	3.4	2.8	2.7	2.9	10.3	2.2	1.6
european union	11.7	11.8	11.5	11.5	11.7	12.0	12.1	12.2	13.2	12.2	40.9	10.3	5.3
finland	13.4	13.6	13.5	13.4	13.4	13.1	13.6	13.9	17.1	10.9	41.6	11.6	6.6
france	13.4	13.6	13.5	13.7	13.6	14.2	14.3	14.9	16.0	14.0	56.6	12.0	7.6
germany	13.0	13.0	12.3	12.0	11.8	11.8	11.9	11.7	12.0	11.5	51.3	8.7	2.9
greece	8.3	7.6	6.5	6.5	7.5	7.9	7.5	7.6	9.6	6.3	23.0	7.5	4.0
hungary	8.5	8.0	8.5	9.7	9.6	10.1	8.7	7.9	8.7	7.3	17.1	7.2	7.5
iceland	10.9	10.8	11.4	12.5	11.8	11.4	10.5	9.4	10.9	8.2	24.2	7.3	3.9
ireland	8.6	9.1	9.1	9.0	8.5	8.0	7.6	7.8	8.6	7.0	29.4	5.1	5.1
italy	9.6	10.1	10.5	10.1	10.4	10.8	10.9	12.1	13.4	11.1	54.6	11.4	4.6
japan	11.9	11.9	11.9	7.3	6.7	6.6	6.3	..	8.8	4.4	13.1	4.5	7.1
korea	16.5	17.2	16.6	16.3	15.9	16.6	16.4	..	18.8	14.6	25.1	12.8	20.2
latvia	6.3	5.9	4.2	3.8	2.9	3.3	3.2	2.6	2.1	3.2	6.3	2.4	2.2
luxembourg	6.5	6.5	6.9	6.4	7.3	9.1	7.9	8.1	8.5	7.7	36.1	6.4	4.0
netherlands	15.6	15.4	16.2	17.0	17.7	16.7	17.2	18.1	19.9	16.5	52.1	13.4	5.9
norway	7.8	7.4	7.9	7.8	7.3	7.5	8.2	8.0	9.3	6.8	26.2	6.3	1.7
poland	21.1	20.9	20.9	21.1	22.4	22.2	21.9	20.9	22.5	19.7	60.9	19.0	12.5
portugal	18.6	18.2	16.9	17.6	18.0	18.7	19.1	19.0	19.4	18.5	63.2	17.8	7.9
russian fed	8.4	7.7	7.9	7.9	8.3	8.3	7.8	..	5.9	9.6	16.3	7.3	6.2
slovak republic	4.7	5.5	5.7	5.8	7.4	8.9	8.4	8.0	8.8	7.3	21.0	6.9	7.7
slovenia	14.5	15.2	14.4	13.7	13.7	15.1	14.6	15.2	16.8	13.8	63.5	12.2	6.9
spain	20.7	21.1	19.5	19.1	19.9	20.9	21.8	22.4	24.3	20.9	69.0	22.2	9.1
sweden	14.4	14.9	14.4	14.7	15.2	15.1	14.7	14.7	16.8	12.8	52.3	11.1	6.7
switzerland	11.2	11.0	11.0	11.1	11.2	11.8	11.5	11.5	11.7	11.4	48.7	6.8	2.9
turkey	7.1	7.7	7.7	7.8	8.7	9.0	9.1	9.1	7.7	9.7	19.5	7.4	6.4
united kingdom	5.1	5.2	5.3	5.2	5.3	5.2	5.1	4.8	5.5	4.2	13.7	3.6	3.4

source: Eurostat, OECD.stats (Labour force survey)

agency work

age 15 to 64, in % of total employment

year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
australia	..	..	..	..	2.8	2.7	2.8	2.9	2.9	3.7	3.6	..
austria	1.2	1.5	1.7	1.7	1.4	1.6	1.8	1.9	1.8	1.6	1.8	..
belgium	1.8	2.1	2.2	2.1	1.6	1.8	2.0	1.9	1.8	2.0	2.2	2.4
canada	..	..	..	..		0.6	0.6	..	..	..	0.7	..
chile	..	..	..	..	0.4	0.5	0.3	..	..	..	0.5	..
czech Republic	..	..	..	0.7	0.7	0.7	0.7	0.9	0.9	0.9	0.9	..
denmark	0.6	0.7	0.7	0.8	0.5	0.5	0.5	0.5	0.6	0.7	0.8	0.7
estonia	..	..	..	..	..	0.5	0.6	0.6	0.6	0.7	0.6	0.5
europe	1.7	1.8	1.9	1.7	1.4	1.5	1.8	1.6	1.7	1.8	1.9	..
finland	0.7	0.7	1.1	1.3	0.8	0.9	1.3	1.2	1.1	1.2	1.5	..
france	2.3	2.4	2.5	2.3	1.7	2.0	2.2	2.0	2.0	2.0	2.1	2.2
germany	1.2	1.6	1.9	2.0	1.6	2.0	2.2	2.2	2.1	2.1	2.4	2.4
greece	..	..	0.2	..	0.1	0.1	0.1	0.2	0.2	0.2	0.1	0.1
hungary	1.4	1.4	1.4	1.4	0.6	1.8	..	..	2.3	..	2.6	
ireland	1.3	1.5	1.7	1.7	0.9	1.9	2.5	1.4	..	1.4	..	..
italy	0.7	0.8	1.0	0.9	0.7	0.9	1.0	0.9	1.2	0.9	1.2	1.3
japan	1.7	1.9	2.1	2.2	1.7	1.5	1.5	1.4	2.0	2.0	2.0	2.0
latvia	..	..	..	..	..	0.3	0.4	..	..	..	..	0.2
luxembourg	2.1	2.6	2.5	2.0	1.8	1.9	..	2.4	2.5	2.6	2.8	3.0
mexico	..	..	..	..	0.1	0.1	0.3	0.3	0.3	0.3	0.9	..
netherlands	2.2	2.5	2.8	2.9	2.5	2.5	2.6	2.7	2.5	2.7	3.0	3.3
new Zealand	..	..	..	..	..	..	..	..	..	..	3.3	..
norway	0.7	1.0	1.0	1.0	0.8	0.9	0.9	1.0	0.9	1.1	1.1	1.1
poland	0.2	0.2	0.4	0.6	0.5	0.7	1.0	1.0	1.2	1.3	1.3	1.2
portugal	0.9	0.9	0.9	1.6	1.6	1.8	1.7	..	..	..	1.8	
slovak republic	..	..	..	0.6	0.6	0.8	..	..	..	..	..	..
slovenia	..	..	..	0.2	0.2	0.5	..	..	..	..	..	..
spain	0.7	0.7	0.7	0.6	0.4	0.5	0.5	0.5	0.5	0.5	0.6	0.7
sweden	0.7	0.8	1.3	1.3	1.0	1.3	1.4	1.3	1.5	1.4	1.5	..
switzerland	1.2	1.5	1.7	1.6	1.3	1.5	1.7	1.7	1.7	1.7	1.8	2.0
turkey	..	..	..	..	..	..	..	0.1	..	..	..	..
united kingdom	4.3	4.4	4.7	4.2	3.7	3.0	3.6	3.8	3.9	3.9	3.8	4.1
united states	2.3	2.2	2.1	1.9	1.6	1.9	2.0	2.0	2.1	2.2	2.2	2.1

source: World Employment Confederation

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