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**CENTRE FOR THE
STUDY OF
LIVING
STANDARDS**

**The Current State of Research on the
Two-way Linkages between
Productivity and Well-being**

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The Current State of Research on the Two-way Linkages between Productivity and Well-being

Abstract

Interest in the topic of well-being has burgeoned in recent years as the weaknesses of gross domestic product (GDP) per capita as a proxy for well-being have become more apparent. At the same time, the global economy has experienced a productivity slowdown. Since productivity growth is recognized as being by far the most important long-term source of sustainable gains in living standards, this development has implications for the future of living standards around the world.

These two developments raise a number of issues related to the two-way linkages between productivity and well-being. First, does slower productivity growth constitute a significant threat to the betterment of the well-being of the world's population, and, if so, by how much? Second, given that many indicators of well-being can have positive effects on productivity, should one aspect of any strategy to revive productivity growth be to focus on policies that improve well-being? The objective of this report is to survey the current state of research on the two-way linkages between productivity and well-being.

About the authors

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The Current State of Research on the Two-way Linkages between Productivity and Well-being

Table of contents

Abstract	01
About the authors	01
Executive Summary	05
<hr/>	
▶ Introduction	08
<hr/>	
▶ 1 Measurement issues related to productivity and well-being	09
A. Productivity measurement	09
1) Definitions of productivity	09
2) Productivity metrics	10
3) Problems in productivity measurement	11
4) Misconceptions related to productivity	12
B. Well-being measurement	13
1) Objective measures of well-being	13
2) Measures of subjective well-being	14
<hr/>	
▶ 2 Channels through which productivity growth can affect well-being	16
A. Link between productivity growth and objective well-being	16
1) Impact of productivity growth on real wages	16
2) Impact of higher real wages and higher real incomes on private consumption and government revenues that finance public consumption and public transfers, with implications for objective well-being	19
3) Impact of technical progress and productivity gains on greenhouse gas emissions	21
B. Subjective well-being	22
1) Impact of absolute and relative income on subjective well-being	22
2) Theoretical and methodological limitations to assessing the relationship between absolute and relative income and subjective well-being	24
<hr/>	
▶ 3 Linkages running from well-being to productivity	25
A. Impact of objective well-being on productivity	25
1) Impact of health conditions	25
2) Impact of mental health on productivity	26
3) Impact of risky health behaviours	26
4) Impact of equality and fairness on productivity	27
5) Impact of wages on productivity (job turnover and worker effort in relation to efficiency wages)	28

6) Impact of economic and job security on productivity	28
B. Path from subjective well-being to productivity	28
1) Job satisfaction and productivity	29
2) Link between work-related stress and productivity	29
C. Factors affecting productivity through well-being effects	30
1) Human capital, well-being and productivity	30
2) Social capital (e.g. trust), well-being and productivity	31
3) Impact of public health and environmental conditions both in and outside the workplace on worker well-being and productivity	31
4) Implications of ICT usage on worker well-being and productivity	32
5) Impact of workplace wellness programmes on worker well-being and productivity	32
<hr/>	
▶ Conclusion	34
<hr/>	
References	35

The Current State of Research on the Two-way Linkages between Productivity and Well-being

List of Figures

Figure 1: Growth in labour productivity and real compensation, Canada, 1976–2018 (1976=100)	17
Figure 2: The conceptual framework underlying the analysis of decoupling	18
Figure 3: Components of consumption, Canada, 1981, 2000, 2008, 2014 and 2017 (2007 dollars per capita)	20

The Current State of Research on the Two-way Linkages between Productivity and Well-being

Executive Summary

Interest in the topic of well-being has burgeoned in recent years as the weaknesses of gross domestic product (GDP) per capita as a proxy for well-being have become more apparent. At the same time, the global economy has experienced a productivity slowdown. Since productivity growth is recognized as being by far the most important long-term source of sustainable gains in living standards, this development has implications for the future of living standards around the world.

These two developments raise a number of issues related to the two-way linkages between productivity and well-being. First, does slower productivity growth constitute a significant threat to the betterment of the well-being of the world's population, and, if so, by how much? Second, given that many indicators of well-being can have positive effects on productivity, should one aspect of any strategy to revive productivity growth be to focus on policies that improve well-being?

In order to answer these questions, it is important to understand the linkages between productivity and well-being, both the channels running from productivity to well-being and the paths from well-being to productivity. That is the objective of this background report.

This report contains three main parts. The first part discusses measurement issues related to both productivity and well-being. The second part reviews the literature on the channels running from productivity to well-being. The third part discusses the literature on the linkages running from well-being to productivity. The fourth part presents a conclusion.

Measurement of productivity and well-being

The first part of the report, on measurement issues, covers the definition of productivity, productivity metrics, productivity measurement issues and misconceptions about productivity. Productivity is a vast field, and the discussion is at a high level of generality. The key takeaways are that productivity measurement challenges are formidable, especially with regard to public services and the incorporation of new products into real output measures.

In addition, a number of misconceptions about productivity need to be allayed. Productivity gains come from working smarter, not harder. In the long run, there is no trade-off between productivity and employment at the total economy level. Productivity is not a synonym for output, meaning that productivity losses due to a pandemic, for example, are not the same as output losses and are generally much smaller.

The measurement of well-being is also looked at in the first part of this report. There are two basic approaches to well-being: objective well-being measures, which includes a wide range of economic and social indicators and can be represented either by a dashboard of selected indicators or as a composite index based on a weighting scheme; and subjective well-being measures, often referred to as happiness metrics. Vigorous debate continues about the advantages and disadvantages of the two approaches.

Subjective well-being includes both long-term and short-term measures. The former are retrospective in nature and capture a person's overall satisfaction with life. The latter focus on positive and negative effect in the here and now. The relative importance given to objective and subjective well-being measures varies greatly among researchers. Some discount subjective well-being because of cultural influences and different expectations about what life can bring, while others downplay objective measures of well-being, asserting that all that matters is whether individuals feel happy or not.

Linkages from productivity to well-being

The second part of the report examines the channels through which productivity growth can affect well-being linkages running from well-being to productivity. The most obvious and important channel is created through the real income gains that productivity growth makes possible, both for workers in the form of real wages and for owners of capital through higher profits. Real income growth also boosts tax revenues, which can be used for public infrastructure and services and for transfer payments. The working assumption, which may or may not be correct, is that higher income leads to higher well-being.

Productivity growth, or, more specifically, the technological progress that makes productivity advancements possible, can also indirectly affect well-being through its positive effects on the environment. For example, increased energy efficiency or productivity can reduce CO₂ emissions.

The link from productivity growth to well-being may, however, have been weakening in recent decades, owing to both the slowdown in productivity growth and the decoupling of productivity from median wages.

The impact of productivity growth on subjective well-being is more problematic than the link between productivity and objective well-being, at least in the developed world. Life satisfaction is, on average, low in the developing world, meaning that rapid economic growth, which is driven largely by productivity growth, can increase subjective well-being. In rich countries, however, the impact of higher incomes on well-being is less clear, as illustrated by the Easterlin Paradox, an example of which is the fact that life satisfaction has barely moved in the United States of America for many decades, despite real income gains.

Linkages from well-being to productivity

The third part of the report examines the linkages running from well-being to productivity. The paths from objective well-being to productivity are numerous: better health and nutrition boost worker productivity, and research has shown that a more equitable and inclusive society and economy, as well as greater job security, foster greater productivity. Literature on the efficiency wage shows that workers paid above their market wage become more productive.

Subjective well-being also has effects on productivity. The “happy worker” hypothesis provides evidence that higher levels of job satisfaction promote productivity. On the other hand, if well-being in the workplace or in general is low as a result of high levels of stress, productivity may be negatively affected.

Several factors can affect productivity via their impact on well-being. For example, higher levels of social capital promote trust in society, and trust has been shown to be positively associated with productivity. Equally, public health and environmental conditions have positive effects on well-being and productivity. Wellness programmes can also contribute to both worker well-being and productivity.

Conclusion

Following a review of the evidence presented in this report, the two questions posed at the start of this section can be answered strongly in the affirmative. First, productivity growth – and the higher incomes and government revenues arising from it – do indeed contribute to higher levels of well-being, especially objective measures of well-being and especially in developing countries. This means that slower global productivity growth will dampen the pace of advancement of well-being around the world.

Second, given the strong linkages identified in the report running from well-being to productivity, especially in the area of health, policies and programmes aimed at directly or indirectly increasing the well-being of the population will have positive impact on productivity performance. These productivity gains will, in turn, generate greater income and government revenues that can boost well-being. Productivity growth

and improvements in well-being are closely interconnected and can create positive, mutually reinforcing feedback loops.

The Current State of Research on the Two-way Linkages between Productivity and Well-being

► Introduction¹

Interest in the topic of well-being has burgeoned in recent years as the weaknesses of GDP per capita as a proxy for well-being have become more apparent (Hoekstra 2019). At the same time, the global economy has experienced a productivity slowdown.² Since productivity growth is recognized as being by far the most important long-run source of sustainable gains in living standards, this development has implications for the future of living standards around the world.

These two developments raise a number of issues related to the two-way linkages between productivity and well-being. First, does slower productivity growth constitute a significant threat to the betterment of the well-being of the world's population, and, if so, by how much? Second, given that many indicators of well-being can have positive effects on productivity, should one aspect of any strategy to revive productivity growth be to focus on policies that improve well-being?

In order to answer these questions, it is important to understand the linkages between productivity and well-being, both the channels running from productivity to well-being and the paths running from well-being to productivity. That is the objective of this background report.

From a well-being perspective, multiple indicators can be used to capture the capacity of a country to generate well-being for its citizens and its actual performance in that area. While this report is concerned with only one of those factors, namely productivity, a comprehensive approach to well-being needs to include multiple factors, not just a single factor.

This report contains three main parts. The first part discusses measurement issues related to both productivity and well-being. The second part reviews the literature on the channels running from productivity to well-being. The third part discusses the literature on the linkages passing from well-being to productivity. The fourth part presents a conclusion.

¹ The authors would like to thank Lawrence Jeff Johnson from the International Labour Organization (ILO) for the invitation to prepare this report and the ILO for its financial assistance. We thank the following ILO officials for their written comments: Lawrence Jeff Johnson, Nikolai Rogovsky, Sajid Ghani, Marlene de la Chaux and Marva Corley-Coulibaly. We also wish to thank the participants of the ILO seminar on 8 November 2021 at which this report was presented for comments.

² A second development related to productivity, at least in the developed world, has been the decoupling of productivity and pay. Growth in the real median wage has diverged from labour productivity in many advanced countries. On this issue, see the the Fall 2021 issue (No. 41) of the International Productivity Monitor, with articles on the United States by Mishel and Bivens (2021), on Canada by Sharpe and Ashwell (2021), on the United Kingdom by Teichgraeber and Van Reenen (2021), and on Canada and the United States by Greenspon, Stansbury and Summers (2021). For developments in OECD countries, see Sharpe and Uguccioni (2017) and Schwellnus, Kappeler and Pionnier (2017).

► 1 Measurement issues related to productivity and well-being

To provide some context regarding the linkages between productivity and well-being, we shall first discuss measurement issues related to productivity and well-being. As there is often confusion regarding the meaning of both concepts, it is important to clarify the definitions of the terms and highlight measurement issues associated with them.

This part of the report consists of two major sections, on productivity measurement and on well-being measurement. The first section contains four subsections, on productivity definitions, productivity metrics, productivity measurement issues and misconceptions related to productivity. The second section discusses objective and subjective measures of well-being.

A. Productivity measurement

1) Definitions of productivity

The concept or notion of productivity is intuitively very simple. It is the relationship or ratio between outputs and inputs over a given period of time. The challenge arises in the

measurement of those outputs and inputs. The most basic definition of productivity is labour productivity, defined most simply in terms of homogenous physical output per unit of labour input. An example would be the number of tons of steel that a worker can produce in an hour. If a worker produces 10 tons of steel per hour in year one and then 20 tons per hour in year two, productivity growth is 100 per cent between the two measurement periods.

Only a small proportion of the output that an economy produces can be measured in purely physical terms, so measures of labour productivity based on physical output are relatively rare. Such measures can apply only to narrow industries, such as gold mining, and cannot be used where heterogenous products are produced in one firm or industry. In these cases, an aggregation of the different types of output is needed, and the only way to combine different types of output is by adding up their monetary values.

The term productivity is often used in a manner that does not distinguish between productivity levels and productivity growth rate.³ For example, the phrase “a strong productivity performance” can refer to a situation where the level of productivity is high or one where productivity growth is rapid. Given the ambiguity that can arise in such cases, it is important to always specify which use of the productivity concept is being employed.

The monetary value of an output reflects both the physical quantity of the output produced and the market price at which it is sold. The labour productivity of an industry is the value added produced by that industry per hour worked. The labour productivity of the total economy is the ratio or quotient of the sum of the value added – expressed in monetary units, outputs produced and hours worked – by all industries. For example, the aggregate labour productivity level of the United States in 2019 was approximately US\$80 per hour, expressed in current or 2019 dollars, based on the labour input-weighted average of the different labour productivity levels of the sectors in the economy.

³ For discussion of agreed international measures of labour productivity, see ILO (2016) and OECD (2001).

While labour productivity levels at a point in time are best expressed in current dollars, changes in the nominal productivity levels over time do not represent productivity growth. This is because changes in labour productivity are supposed to reflect changes in the physical quantity of output produced per unit of labour, rather than changes in the price of the output. If the value of an output rises by 10 per cent as a result of inflation, the economy is not 10 per cent more productive. Labour productivity growth rates must therefore be calculated on the basis of real or inflation-adjusted measures of output. These real output measures needed for labour productivity growth calculations at both the aggregate and industry level require nominal or current price estimates of the value of marketed output and of prices for that output at both the aggregate and industry levels.

The labour input used to calculate labour productivity can be either the number of hours worked or the number of workers (also referred to as the number of persons employed). This means that labour productivity can be measured on either a per hour basis or a per worker (or person employed) basis. It is important to recognize that the level of labour productivity is not determined only by the work intensity and the skills of a worker, but also by many other factors, especially the amount of capital that the worker has to work with. Hours worked are a better measure of labour input than the number of persons employed, as hours worked are a more precise or accurate measure of time spent in production, namely labour effort. The number of hours worked per worker can vary over time or across industries, and such variation in labour input is not captured in the number of persons employed.

2) Productivity metrics

In addition to labour productivity discussed above, there are many other metrics and concepts used in productivity analysis, including other partial productivity measures, total productivity measures and social productivity.

Partial productivity measures

A partial productivity measure is a metric that relates output to a single factor of production, the classic example being labour productivity. Many other inputs are used in the production process, however, including capital, energy, raw materials, intermediate goods and purchased services. Partial productivity measures can be calculated for each of the individual inputs, with the input being the denominator of the productivity equation. An example in physical terms is energy productivity, defined as the number of tons of steel produced per barrel of oil. Such a metric is also called the energy intensity of production or energy efficiency. Changes in partial productivity measures over time must be measured in real terms. Just as the nominal values of outputs must be deflated to obtain the real outputs, so the nominal values of inputs must be deflated to obtain real or inflation-adjusted inputs.

Total factor productivity

Total factor productivity (TFP) or multi-factor productivity is a metric that relates more than one input to an output. An example of TFP is the ratio of output to a combined measure of labour and capital inputs. Since it is not possible to combine inputs measured in different units (e.g. hours for labour and dollars for capital), absolute levels of TFP cannot be calculated (although relative measures of TFP can be produced). TFP is measured as the difference between the growth rate of the real output and the growth rate of factor inputs (generally capital and labour, but the European Union capital, labour, energy, materials and service (EU KLEMS) system also includes energy, materials and services). The growth rate of the total input is a weighted average of the growth rates of the different inputs, where the weights are the factor income shares. These factor income shares are assumed to represent the factor's contribution to output. Given the difficulty of measuring capital, TFP measures are considerably more difficult to construct than labour productivity measures owing to greater data requirements. Many developing countries do not have the statistical capacity to produce TFP estimates.

Social productivity

Another concept of productivity sometimes encountered in the productivity literature is social productivity, although this concept is not as well defined as other productivity concepts. In general terms, the concept refers to definitions of productivity that include, in the denominator and numerator of the productivity level, ratio inputs and outputs beyond those used in the narrow economic definition of productivity, where inputs and outputs are defined as only those directly related to production.

One use of this definition is to take the productivity concept beyond economic productivity to include the resources, such as labour, that are not used in production but potentially could be. For example, when the unemployed population is added to the denominator of the labour productivity calculation, the social productivity of society is shown to be less than the more narrowly defined standard labour productivity metric, which excludes unused labour input.

A second specific concept of social productivity, to be discussed later in the current report, refers to the inclusion of externalities arising from production in the output and, hence, in the productivity of a firm or sector.

A third concept specific to social productivity relates to computing time. If the time needed to travel to and from the worksite is included in the denominator of labour productivity calculations, the level of labour productivity falls. From the perspective of the worker, this social productivity metric may be a better representation of the output produced per hour based on the total number of hours that the worker spends both at work and commuting. The shift to remote work during the pandemic reduced commuting time and boosted this measure of social productivity.

3) Problems in productivity measurement

Productivity measures are at the apex of the statistical system, as they require reliable data on real outputs and inputs. Consequently, measurement problems related to nominal output and to output prices, as well as to labour input, nominal capital stock and capital stock prices, affect the accuracy of productivity measures. It is well beyond the scope of this report to provide a comprehensive discussion of productivity measurement issues.⁴ However, four particularly important productivity measurement issues are highlighted in this section.

Externalities

Output, by definition, excludes externalities such as pollution. This means that, from a societal perspective, nominal market output and, therefore, nominal productivity measures may not capture a firm or sector's net social contribution to output and productivity. Both positive and negative externalities generated in the production process are excluded from the standard output measure. For example, the market value of the output of a pulp mill excludes the costs borne by society from the air pollution generated in the production process. From a positive externality perspective, the market value of apiaries excludes the benefits for farmers of the pollination effects on crops. The valuation of these environmental externalities is difficult to calculate and very sensitive to the methodology used (Cárdenas Rodríguez, Haščič and Souchier 2018).

Public sector productivity

The measurement of real output and productivity in the public sector, including public administration, health and education, is problematic. Public sector output is generally not marketed. This means that there is no market-based nominal output measure that can be deflated by price changes to obtain a real output

⁴ For a detailed discussion of productivity measurement issue, see the productivity handbook produced by the Office for National Statistics of the United Kingdom (ONS 2016).

measure. Real output in the public sector is consequently measured by the quantity of inputs, mostly labour inputs. This means that labour productivity growth in the public sector – where output is not measured independently of inputs – is, by definition, zero. Economists have been working on the development of more reliable estimates of output and productivity in the public sector for many years (Atkinson 2005), but progress has been slow.

New and improved products

A major challenge for the measurement of real output and productivity is the introduction of new and improved products into the economy, and specifically the price of these products compared with earlier versions of the same product. Price indices are, in principle, based on the price of a product that does not change in characteristics or quality over time. This is obviously not the case for new and improved products.

Statisticians have developed methods, such as hedonics, to quality-adjust price series involving new and improved products. The accuracy of these series is often questioned, however, particularly for products that never previously existed, such as smart phones. Some economists believe that the consumer utility benefits of new products are not being captured in price series, with the result that real output and, therefore, productivity growth are being underestimated. An historical example of such underestimation is the price of a lumen of light, which Nordhaus (1996) calculates has fallen massively in the past two centuries when adjusted for quality. This development has not been fully incorporated into price statistics, which Nordhaus argues has resulted in the significant underestimation of real long-term output and income growth and, consequently, productivity growth. This is an unsettled area of economic research.

Intangible capital

In addition to tangible capital, such as buildings, machinery and equipment, production requires inputs such as research and development, intellectual property, advertising and construction of databases, which are not currently included, or have not historically been included, as capital inputs in economic statistics. The exclusion of these intangible capital inputs has implications for the accurate measurement of productivity, especially total factor productivity. Fortunately, economists and national statistical offices have recognized this deficiency in economic statistics and are taking steps to improve data in this important area (Haskel and Westlake 2018).

4) Misconceptions related to productivity

The general public, and even economic commentators, have many misconceptions about productivity. Watson (2002: 307) acerbically commented that “[m]ost Canadians think about productivity the way most children think about spinach: they have often been told that it will be good for them in the long run but they suspect it’s not going to be fun.”

A national poll conducted in 1998 revealed that only 21 per cent of Canadians felt that they had a good understanding of what productivity meant. Among those with university degrees, 37 per cent felt that they understood productivity, while only 14 per cent of respondents with a high school education or less felt the same. According to the pollster, a 14 per cent awareness level is the lowest ever recorded for an issue considered a national priority (Marzolini 1999).

A full discussion of the misunderstandings associated with productivity is beyond the scope of the current report, but we will highlight three particularly important misunderstandings: confusion between the concepts of output and productivity; the view that productivity growth means that workers must work harder; and the belief that higher productivity results in job losses.

Misidentification of output increases as productivity gains

As noted, output per hour is a more appropriate measure of labour productivity than output per person employed. An employee who increases the number of hours that he or she works per workday from eight to nine hours may produce more output but is not more productive on an hours-worked basis. Yet, in discussions of productivity, such changes in hours worked and output are identified as productivity gains, without any mention of the fact that this statement is only correct on an output-per-worker definition of productivity.

Productivity and work intensity

Labour productivity can indeed be raised, at least in the short run, by an increase in work intensity, such as by speeding up an assembly line. Increased work intensity is not a sustainable path to higher productivity levels, however. There are much more fundamental and important determinants of labour productivity growth, including technological change, increased capital per worker (capital deepening), skills training and organizational changes in the workplace. Employers may implore employees to work harder, but the key to productivity growth is to work smarter using the most advanced technologies and equipment, the best trained workforce and the most effective organizational structures and practices.

Productivity and job losses

Economists have vigorously debated the impact of technical change and productivity advances on employment for over two centuries, going back to David Ricardo's famous chapter on machinery in his book *On the Principles of Political Economy and Taxation*, first published in 1817.⁵ The debate continues with different takes on the impact of artificial intelligence on jobs, which some see as heralding a future without work. There is no doubt that, in sectors that are experiencing rapid productivity advances and relatively inelastic demand, employment can fall significantly. The classic example is agriculture; this sector, at least in Canada over the 1961–2012 period, experienced the fastest rise in labour productivity, the largest fall in its relative output price and the greatest decline in its employment share (de Avillez 2011).

The narrative is different at the aggregate level, however, and rapid productivity growth does not mean falls in employment if demand is not constrained. Even with stable nominal wages, when markets are relatively competitive, productivity gains result in lower prices and higher real wages and incomes and, hence, greater demand, which, in turn, stimulates production and employment. Nonetheless, there can be adjustment problems; workers must move from declining to growing sectors, which can be particularly difficult for older workers and for workers who have to relocate between regions or have to learn new skills. But at the aggregate level, at least, productivity growth in an economy with well functioning markets does not pose a long-term threat to jobs.

B. Well-being measurement

The measurement of well-being can be approached from two perspectives: objective measures of well-being based on data collected by statistical authorities, and subjective well-being estimates based on surveys of individuals' perception of their own well-being. These are both legitimate approaches to the measurement of well-being and can provide different insights on what matters when creating a better society.

1) Objective measures of well-being

Two approaches can be taken when using specific objective indicators to track trends in, and levels of, objective well-being. The first is to identify only what are considered the most important individual measures

⁵ For a recent perspective on the heterogenous nature of technological change and its impact on labour, see Acemoglu (1998).

of objective well-being. The second approach is to go a step further and combine those measures with the key indicators of well-being in order to develop a composite index of well-being.

Specific objective well-being indicators and dashboards

There are myriad indicators of objective well-being. The best known – and the most criticized – proxy for well-being is the average GDP per capita. Distribution concerns can be addressed through the use of median measures, such as median income and wealth. Labour market indicators such as the unemployment rate, average and median earnings and the incidence of low-paid jobs are also important objective economic indicators of well-being. Objective well-being indicators have been developed for many areas, including housing conditions, health status, work–life balance, education and skill level, social connections, civic engagement and governance, environmental quality and personal security (OECD 2011).

The very large number of possible objective indicators of well-being can prove unwieldy. One approach to simplify this situation is to develop a dashboard focusing on a small number of crucial indicators. A metrics dashboard is defined as a tool used to track and display key well-being indicators in order to analyse trends over time and across multiple channels.

Composite indexes of well-being

The issue of how to assess overall trends in well-being using the very large number of possible well-being indicators has been addressed through the development of composite indices of well-being, in which individual indicators are weighted to produce an aggregate index. The best-known composite index is the Human Development Index produced by the United Nations Development Programme. Other composite indexes include the Genuine Progress Indicator, developed by Refining Progress, and the Index of Economic Well-being, developed by the Centre for the Study of Living Standards (Osberg and Sharpe 2002).

Composite indices present both strengths and weaknesses. The well-being research community is strongly divided on the issue. Advocates of composite indices see them as consolidating considerable information into a bottom line, whether a ranking or a time trend, which captures, in a nutshell, the reality of well-being. Composite indices are also very useful for communication purposes. On the other hand, detractors point to the sensitivity of such indices to the choice of indicators, the simplification of complex and countervailing trends into one number and, above all, the sensitivity of the results to the weighting scheme, in which weightings are based not on objective criteria but rather on the views (and biases) of the developers of the index.

2) Measures of subjective well-being

In recent years, interest in subjective well-being, often referred to as happiness studies, has grown rapidly in the well-being research community. Historically, subjective measures of well-being had been seen as inferior to objective measures, as they were considered to be based on perceptions of reality rather than objective data. It has become increasingly apparent, however, that perceptions are a reality for many persons, and that they influence both individuals' behaviour and their assessment of their own well-being. As the Organization for Economic Cooperation and Development (OECD) states, “[s]ubjective well-being reflects the notion that how people experience a set of circumstances is as important as the circumstances themselves, and that people are the best judges of how their own lives are going” (OECD 2011: 265).

There are two measures of subjective well-being. The first is life satisfaction, or the average measure of how persons evaluate their lives as a whole. This is a retrospective, long-term measure. The second measure of subjective well-being, which is short term in nature, is affect, which can be both positive and negative and which measures emotions at a given point in time. Positive affect captures the experiences of feelings of happiness, joy, excitement and love, while negative affect captures experiences of feelings of anger, pain and sadness.

Life satisfaction

Life satisfaction is a cognitive assessment of a person's life, rather than his or her current personal state. One well known measure of life satisfaction is the Cantril ladder, in which respondents are asked to rate their overall satisfaction with life on a scale from 0 (extremely dissatisfied) to 10 (completely satisfied). A limitation of this measure of life satisfaction is that cultural differences in attitudes to life between countries may affect the results when making international comparisons. A second concern regarding life satisfaction measures is that they are related to expectations, which can evolve over time as circumstances change and people adapt. One hundred years ago, individuals had much lower living standards than today. Over time, living standards have improved, as has the expectation that the population would enjoy these higher standards. Through this process of adaptation, referred to as the "hedonic treadmill", higher levels of material well-being do not translate into higher levels of life satisfaction.

Affect balance

Affect focuses on how people are experiencing well-being at a given point in time. It can be captured over time using data that show the path of positive or negative affect or feelings experienced by individuals over the course of a day. Time use data can also identify which activities are associated with each affect state. A simpler measure is the share of the population that reports having experienced more positive than negative emotions throughout the preceding day. This is called the affect balance.

► 2 Channels through which productivity growth can affect well-being

This part of the report examines the channels through which labour productivity growth can have an impact on objective and subjective well-being. Labour productivity growth affects both objective and subjective measures of well-being through the rise in real compensation. While objective measures of well-being are clearly defined by economic and non-economic indicators, subjective well-being is determined by individuals' own perspectives about their life and job satisfaction and by their positive and negative affects. Understanding the determinants of subjective well-being remains important, given that objective well-being cannot entirely explain changes in a society's well-being over time.

A. Link between productivity growth and objective well-being

This section presents the channels of the impact of labour productivity growth on objective well-being. Objective measures capture well-being through quality-of-life indicators based on material resources, such as income, food and housing, and on social attributes, such as education, health, political voice, social networks and connections.

1) Impact of productivity growth on real wages

Growth in labour productivity increases real labour compensation and leads to higher levels of real income, despite the partial decoupling of this relationship seen in recent decades.⁶ Higher labour productivity lowers production costs, allowing savings to be passed on to consumers through lower prices, representing a rise in real income.

In Canada, while similar growth rates in labour productivity and in real compensation were recorded between 1943 and 1975, some decoupling has been seen in the period since. Sharpe and Ashwell (2021) found that earnings barely grew over the 1976–2019 period, with median and average earnings increasing by an average of 0.20 per cent and 0.59 per cent per year respectively, while labour productivity rose by an average of 1.11 per cent per year over the same period.⁷ (See Figure 1.) The gap between median earnings and productivity growth was explained by mean–median inequality (47 per cent of the gap), a decline in the labour share (26 per cent of the gap), a deterioration in terms of trade (25 per cent of the gap) and the measurement of supplementary income (3 per cent of the gap).

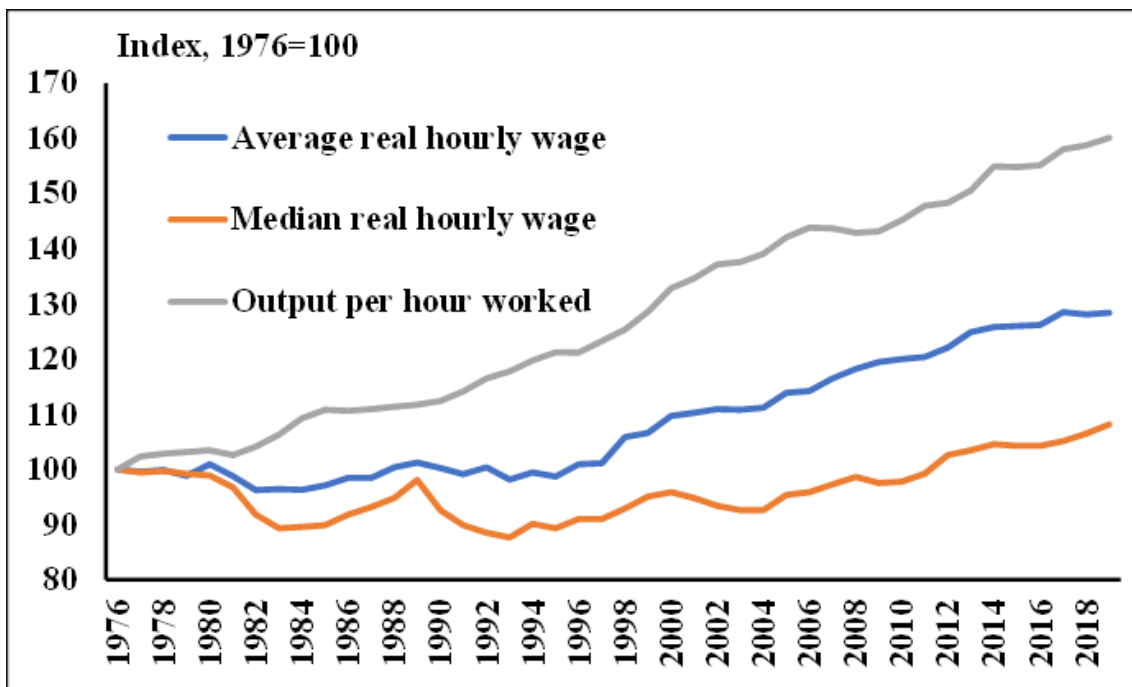
For the OECD countries, Schwellnus, Kappeler and Pionnier (2017) found that, between 1995 and 2013, while productivity rose by 1.57 per cent per year on average, real median compensation rose by 1.17 per cent per year on average, representing an overall average gap of 0.40 percentage points per year.⁸ They found that mean–median inequality and the decline in the labour share accounted for 55 per cent and 45 per cent respectively of the gap between labour productivity and real compensation (which already accounts for self-employment labour income), after adjusting all figures by the GDP deflator.

⁶ Real labour compensation is measured as hourly wages reduced by either the GDP deflator or by the consumer price index.

⁷ Earnings, rather than wages, is used as the central metric for workers' income, which includes the imputed labour income of self-employed persons.

⁸ These figures are based on a simple average across 24 OECD countries.

► Figure 1: Growth in labour productivity and real compensation, Canada, 1976–2018 (1976=100)



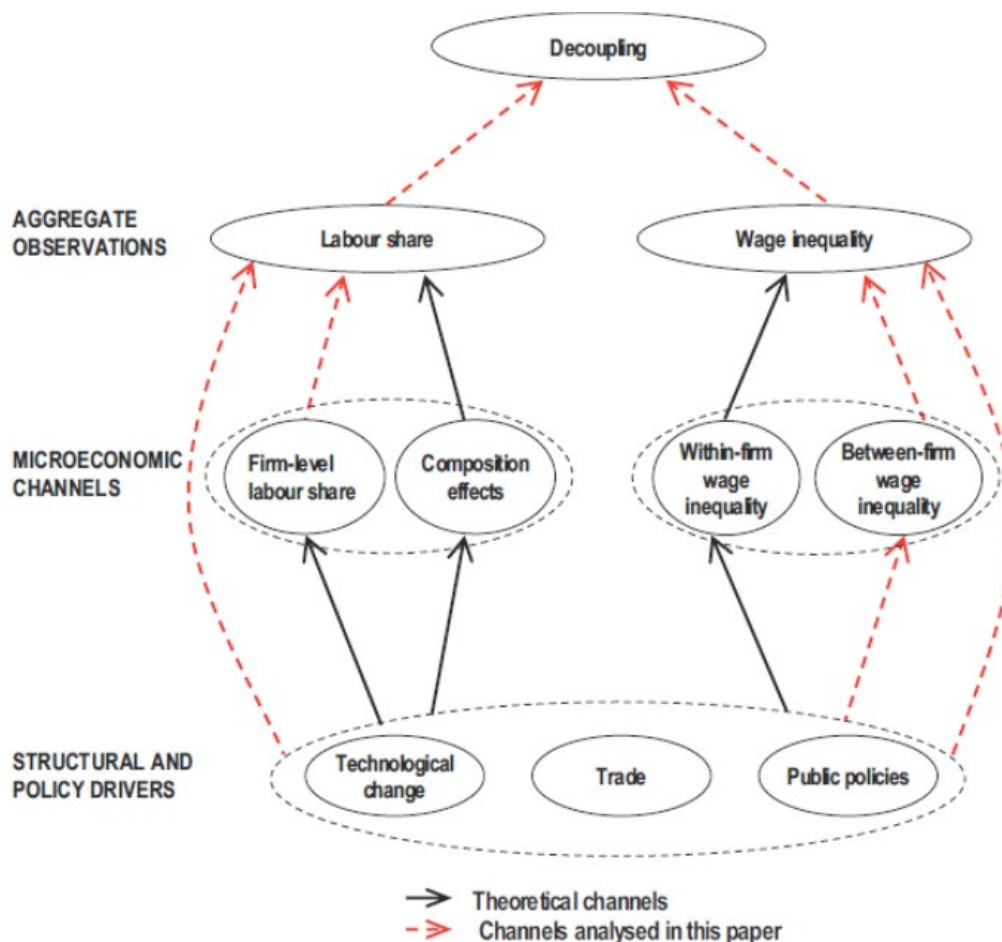
Source: Calculations by the Centre for the Study of Living Standards on the basis of data collected by Statistics Canada.

There are structural and policy drivers behind the two main factors accounting for the decoupling in labour productivity and median wage growth, namely mean–median inequality and the decline in the labour share. Figure 2 presents a conceptual framework underlying the three structural and policy drivers of the microeconomic effects leading to decoupling. The effects of technological change and trade on the fall in the labour share and on wage inequality (which are also depicted in the conceptual framework) can be summarized as follows:

- For OECD countries, the fall in the labour share can be explained either by technology-driven declines in investment prices and by global value chain (GVC) expansion, or by the fall in labour bargaining power. Over the 1995–2013 period, the 9 per cent decline in investment prices relative to value-added prices across the OECD countries was found to reduce the labour share by approximately 1.7 percentage points (OECD 2018). Moreover, the adoption of new technology was found to further displace workers, as it extended the range of existing tasks which could be carried out by machines (Acemoglu and Restrepo 2018). Furthermore, it was found that a 10-percentage-point increase in GVC participation in value-added reduced the labour share by 1 percentage point. As such, the 6-percentage-point increase in GVC participation across the OECD countries over the 1995–2013 period is estimated to have reduced the labour share by 0.6 percentage points. On the basis of these assessments, the effect of GVC expansion on labour share appears to be roughly one-third of the effect of relative investment prices on labour share. The results of this study stand in contrast to those of Guschanski and Onaran (2021), who found that the deterioration in the labour share was attributable to a fall in the labour bargaining power due to pressures to move production to developing countries and to changes in labour market institutions, such as union density, social government expenditure and minimum wages.
- The rise in wage inequality is explained by technological change, which has substituted high-skilled labour for low-skilled labour (i.e. within-firm wage inequality), as well as trade integration with China (i.e. between-firm wage inequality). This first driver is evidenced by the positive correlation between research and development spending as a percent of GDP and wage inequality at the aggregate level (De Serres and Schwellnus 2018), in addition to the positive correlation between digitalization and higher wage dispersion between firms (Berlingieri, Blanchenay and Criscuolo 2017). Furthermore, trade integration

with China is found to have reduced labour demand for low-skilled workers to a much greater extent than for high-skilled workers (Autor, Dorn and Hanson 2015).

► **Figure 2: The conceptual framework underlying the analysis of decoupling**



Source: OECD 2018.

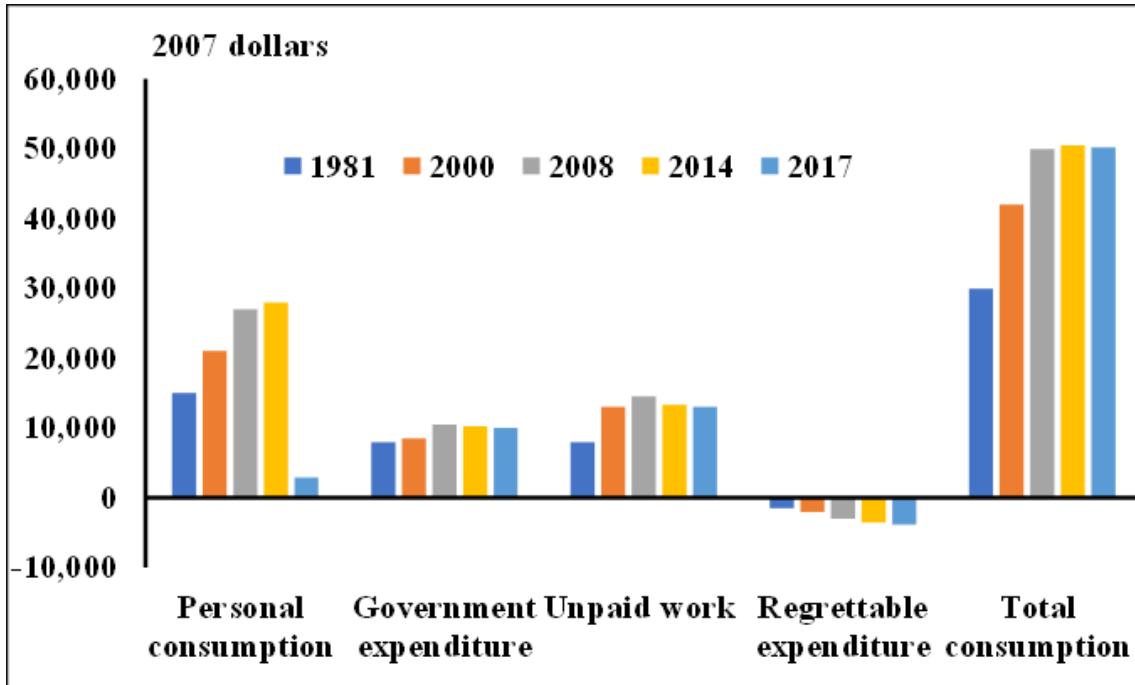
Public policies and institutions can reinforce the linkage between productivity and real hourly wages. First, investment in skills can ensure that technological and trade integration gains are more broadly shared across workers, as capital is less likely to be substituted for high-skilled workers even as prices for new technologies fall. Second, competition-friendly product market reforms can increase the effect of productivity gains on wages by reducing the market rents that accrue to capital, which tend to lead to higher wage inequality by raising productivity and wage dispersion across firms. Third, in countries where the minimum wage is low or employment protection is weak, an increase in the minimum wage can help offset the adverse effect of product market reform on wage inequality. If the minimum wage is binding and employment protection rules are strict, raising the minimum wage may lead to the substitution of capital for labour, however.

2) Impact of higher real wages and higher real incomes on private consumption and government revenues that finance public consumption and public transfers, with implications for objective well-being

Higher real wages support higher real incomes, leading to increased levels of private consumption (including unpaid work) and increased public consumption through the delivery of public services and public transfers. Higher real hourly wages increase real incomes, allowing individuals to increase their consumption of private goods and services. Furthermore, the rise in real incomes allows individuals to dedicate more time to leisure, which has some utility, as well as additional time to unpaid work, which has a non-marketable monetary value associated with it. The rise in income also increases the tax base of the various levels of government, thereby generating more government revenue, which can be used to expand the delivery of public services to the population. Economies with a larger share of spending allocated to high-quality public investments are, in turn, found to experience higher productivity and economic growth in the long-term (Fournier 2016), which creates a positive feedback loop on well-being. In addition to the rise in public services, additional government revenue can be redistributed through public transfers targeted at lower income groups, thereby increasing their income, which can be used for the private consumption of goods and services aimed at improving their well-being.

Empirical evidence gathered in Canada indicates that, while personal consumption per capita has steadily risen in recent decades, growth in government spending and unpaid work per capita has been far more uneven. In Canada, per capita consumption, which includes personal consumption, government spending, regrettable expenditures and unpaid work, adjusted for family size and life expectancy, rose from 30,321 Canadian dollars in 1981 to 50,547 Canadian dollars in 2017 (2007 dollars per capita) or by 1.4 per cent per year, on average, over this period. Personal consumption per capita comprised the largest share of total consumption in 2017, at 58.6 per cent. The largest contribution to growth in per capita consumption was attributed to personal consumption per capita, followed by unpaid work and government expenditure. While personal consumption per capita rose consistently by 1–2 per cent over this period, with the exception of the 2000–2008 period when it spiked to 2.6 per cent, government spending and unpaid work per capita experienced far more uneven growth. (See Figure 3).

► Figure 3: Components of consumption, Canada, 1981, 2000, 2008, 2014 and 2017 (2007 dollars per capita)



Source: Calculations by the Centre for the Study of Living Standards on the basis of data collected by Statistics Canada.

The increase in total private and public consumption of goods and services has significant implications for life expectancy. Higher total consumption results in increased life expectancy, with individuals having access to healthier diets and lifestyles and improved access to medical services, and with increased funding being made available for research that advances medical knowledge. The rise in life expectancy in turn increases the number of years over which individuals benefit from personal, government and unpaid work consumption flows, allowing total consumption and objective well-being to increase over an individual's lifetime. It should be cautioned, however, that the trend towards higher population dependency ratios found in developed countries has placed significant upward pressures on public expenditure while limiting the government's ability to generate revenue, potentially compromising the level and the quality of public services going forward.

Increased public investment and public transfers allow economic gains to be more broadly shared by society, thereby reducing, or limiting the rise in, poverty. Higher public investment, which includes physical infrastructure and social programmes, is found to directly and indirectly increase the disposable income and well-being of households across the entire income distribution. The OECD found that the incomes of low-income and high-income households increased equally by an average of 16 per cent in countries with a level of public investment relative to trend GDP which was below the average ratio of that of countries in the top half, and that those countries converged at this average ratio over a period of ten years (OECD 2016). Meanwhile, societies which benefit from higher productivity growth rates have additional resources for use in reducing poverty.

There are absolute and relative measures of poverty. Absolute measures of poverty, such as the low-income cut-offs in Canada, measure the income thresholds below which a family will likely devote 20 percentage points more of its income on the necessities of food, shelter and clothing than the average family. At international level, the key measure of absolute poverty is the World Bank International Poverty Line of

US\$1.90 per person per day.⁹ The definition of absolute poverty remains subjective and is ultimately arbitrary. A relative measure of poverty, such as the low-income measures in Canada, is defined as a household income that is less than 50 per cent of the median household income. It is typically equivalent to 50 or 60 per cent of the national median income in European countries (measured through Eurostat) and in OECD countries. The preferred measure of poverty when assessing changes in the population's well-being is absolute poverty, rather than relative poverty, given that it targets the population segment without access to necessities. In addition to absolute and relative measures of poverty, the intensity of poverty is also used, as well as the depth of poverty relative to the poverty line.

Increased public investment and public transfers can potentially reduce inequality across the income distribution, in addition to reducing poverty. The distribution of income across a population can be measured using the Gini coefficient, ranging from 0 (perfect equality) to 1 (perfect inequality), or by comparing changes in income across time and across income groups.¹⁰ Labour income inequality, market income inequality and disposable income inequality have all risen since the 1990s across 17 OECD countries (OECD 2016). Over that same period, real disposable income rose by 30 per cent among the top income decile, but only 4 per cent for the bottom income decile. This indicates, to a certain extent, that the redistributive power of tax-and-transfer systems has either been deployed less strongly to counteract market income inequality or that has become less effective at redistributing income.

3) Impact of technical progress and productivity gains on greenhouse gas emissions

Improvements to energy productivity and efficiency can reduce greenhouse gas (GHG) emissions, thereby improving well-being through a reduction in pollution and in the frequency and extent of natural disasters and environmental degradation and an improvement in environmental sustainability. Energy can be considered an input in the production process, similarly to labour and capital, with improvements to energy productivity and efficiency allowing for reduced GHG emissions, thereby reducing the adverse impact of pollution and climate change on well-being.¹¹ According to a report published by ClimateWorks Australia (ClimateWorks Australia, 2015), Australia could increase its energy productivity from 24 cents of GDP per megajoule of primary energy use in 2010 to 48 cents of GDP per megajoule by 2030, representing a 97 per cent improvement. Under this scenario, the GDP of Australia would rise by 58 per cent by 2030, while its energy consumption would decline by 15 per cent. This could be achieved through a number of initiatives, including the automation of some industrial processes, improvements in energy data systems and electrification in the transport and industry sectors. This would lead to significant reductions in GHG emissions, given that energy use accounts for more than 65 per cent of GHG emissions in Australia.

Improvements in the efficiency of production processes for agricultural crops and livestock can lower GHG emissions and enhance well-being by reducing the adverse impact of climate change on ecosystems. While agriculture represents 3.2 per cent of the world's GDP in value-added terms, it is estimated to generate between one quarter and one third of the world's GHG emissions from on-farm activities and land use change to cropland (World Bank 2013). Havlik et al. (2013) created projections of GHG emissions under a baseline which assumes no TFP growth in crop and livestock production, as well as an alternative scenario which includes TFP growth. They found that global GHG emissions (excluding CO₂ emissions) would rise by 47 per cent between 2004 and 2034 under the baseline scenario, compared with only 16 per cent over the same period under the alternative scenario with TFP growth.

⁹ The World Bank objective of eradicating poverty by 2030 and the United Nations Sustainable Development Goal 1.1 are both set with respect to this benchmark. The World Bank has also established a lower middle-income International Poverty Line of US\$3.20 per person per day and an upper middle-income International Poverty Line of US\$5.50 per person per day in addition to this benchmark.

¹⁰ Values greater than 1 are theoretically possible due to negative income or wealth.

¹¹ Improved energy productivity and efficiency can also improve well-being through cost savings for consumers, which can increase real incomes.

B. Subjective well-being

This section presents the linkage between productivity growth and subjective well-being through the rise in real incomes. Subjective well-being refers to an individual's own sense of how well his or her life is going. Subjective well-being has been defined as being influenced by frequent positive affect, infrequent negative affect, and cognitive evaluations such as life satisfaction (Diener et al. 1985). It is therefore defined by a combination of an individual's moods and emotions, in addition to a self-evaluation with regard to general and specific areas of one's life. Subjective measures of well-being have been developed in recent decades in recognition of the fact that well-being is not entirely determined by the economic and non-economic factors used to measure objective well-being.

1) Impact of absolute and relative income on subjective well-being

Studies indicate that individuals in higher income groups report higher levels of subjective well-being, on average, than individuals in lower income groups, according to cross-sectional data. The relationship between income and happiness is found to be non-linear, however, with marginal utility diminishing as absolute income increases. Easterlin (2001) found a simple correlation of 0.2 between income and happiness in the United States. This low coefficient reflects the fact that other economic and non-economic factors, such as unemployment, health and personality, also exert a significant influence on happiness. Blanchflower and Oswald (1999) found that higher income is associated with higher happiness, according to cross-sectional data gathered in the United States and the United Kingdom. Di Tella, MacCulloch and Oswald (2001) found that, according to an analysis of cross-sectional data for Europe collected through the Eurobarometer Survey Series (1975–1991), 88 per cent of individuals in the upper income quartile report being “fairly satisfied” or “very satisfied”, compared with 66 per cent of individuals in the lowest income quartile. Data from the General Social Survey conducted in the United States over the 1994–1996 period indicate that doubling the income of individuals in the bottom five deciles increases reported happiness by 0.05 score points, on average, but only increases the happiness of individuals in the top five deciles by 0.03 score points (Frey and Stutzer 2002). Sacks, Stevenson and Wolfers (2010) found that richer individuals are more satisfied with their lives and that this condition holds across more than 140 countries and datasets. They also found that a 20 per cent increase in income resulted in an identical change in happiness regardless of the initial income, suggesting that the diminishing impact of an additional dollar of income does not hold. They also found no evidence of a satiation point.

The direction of the causation from higher income to higher subjective well-being has been proven through the effect of money windfalls on happiness. The direction of the causation between income and happiness has also been tested by assessing the effect of money windfalls through lottery winnings on well-being, with an unexpected transfer of £50,000 found to raise subjective well-being by between 0.1 and 0.3 standard deviations (Gardner and Oswald 2001). Other studies with similar findings include those conducted by Smith and Razzell (1975) and by Brickman, Coates and Janoff-Bulman (1978). A similar analysis could be conducted on countries that are introducing or piloting a universal basic income transfer to assess the impact on recipients' well-being.

Some studies also suggest that relative income or income rank affects happiness. Easterlin (1974, 1995, 2001) uses the concept of aspirations as a frame of reference and postulates that a proportional increase in income across all income groups does not affect happiness because relative income has remained unchanged. This has been tested and proven in studies on the importance of relative judgements for happiness (Smith, Diener and Wedell 1989; Tversky and Griffin 1991). The “relative income hypothesis” formulated and tested by Duesenberry (1949) posits an asymmetric structure of externalities, with wealthier individuals imposing a negative external effect on poorer individuals, but not vice versa. Other research on individual welfare functions or the Leyden approach (such as that conducted by van Praag and Arie Kapteyn (1973)) have found that the level of self-reported income considered to be “sufficient” is higher than the level of income that is self-reported by poor people. Preference shift has also been found to destroy 60–80 percent of the welfare effect of an increase in income, so that somewhat less than a third remains.

Alesina, Di Tella and MacCulloch (2001) found that inequality has a large negative, and statistically significant, effect on happiness in Europe, which may be explained by the fact that Europeans have an aversion to inequality. In contrast, income distribution was found to have no effect on happiness in the United States, which they attributed to the perception that upward social mobility remains much more significant in the United States than in Europe and that a low ranking in the range of income distribution may not affect future income. Sacks, Stevenson and Wolfers (2010) found that subjective well-being, however it is measured, rises with income. Deaton (2008) comes to a similar conclusion, finding that individuals in richer countries have both higher levels of subjective well-being and better health. Stevenson and Wolfers (2008) also reached a similar finding, albeit using slightly different methods.

Taken together, these new, stylized facts suggest that subjective well-being, however it is measured, rises with income. Other recent papers have noted this as well. Deaton (2008) found that individuals in richer countries have both higher levels of subjective well-being and better health. Stevenson and Wolfers (2008), performing an analysis parallel to the one in the current report albeit using slightly different methods, have reported similar findings to those described here and have discussed in detail why previous researchers have failed to identify the strong link between subjective well-being and income.

Researchers have also considered the impact of higher income on subjective well-being over time. Their findings remain divided. Easterlin (1995) found that higher income over time does not increase the happiness level of all persons, according to an analysis of time series data for the United States. He explains this result by changes in material norms on which judgements of well-being are based, which rise by the same proportion as the actual income of society. Di Tella, MacCulloch and Oswald (2001) found that reported levels of happiness have fallen in the United States and that life satisfaction in the United Kingdom has remained flat, according to time series data collected between the early 1970s and the late 1990s. In the United States, some groups, such as American men and Black individuals, were found to have become happier over time, which could be potentially linked to an increase in real income. Similarly, in the United Kingdom, once the data were controlled for a sufficient number of personal characteristics (such as whether the individual was unemployed or divorced), there had been a positive trend in happiness over time, which could be attributed to an increase in real income. It should be noted, however, that if the theory regarding the effect of relative income on subjective well-being holds, then higher productivity growth – which would lead to an equal increase in real compensation across the entire income distribution range – would not have an impact on subjective well-being.

There is extensive literature on the determinants of life satisfaction or happiness at a point in time. While productivity and income play a role to a degree, they appear to be much less important than other factors, especially health. Using regression analysis, Clark et al. (2018) identified seven factors influencing the life satisfaction of adults at ages 34 and 42 in the United Kingdom. The most important factor was emotional health, followed closely by whether the person was in a romantic partnership. All other factors were seen as less than half as important: the third factor was not being unemployed, closely followed by income, physical health and the absence of a criminal record, with the least important factor being qualifications. Notably, the only factor that had a direct link to productivity was income.

An econometric analysis of factors affecting the life satisfaction or happiness of Canadians revealed similar results (Sharpe et al. 2010). Mental health was the most important factor affecting happiness, followed by physical health. A sense of belonging and feelings of stress – two factors not included in the study in the United Kingdom – were the third and fourth most important determinants of happiness. Marital status and unemployment were also found to be important. Income, or at least relative income, did explain some variation in happiness across the population, although less than the other variables.

These studies suggest that, to the degree that productivity growth boosts median income, life satisfaction can potentially be improved. Productivity can have an indirect impact on the other determinants of life satisfaction by making additional resources available to the Government through higher GDP arising from productivity growth. This is conditional on the Government being able to use the additional resources to improve the emotional and physical health of the population, reduce unemployment, decrease criminality and boost

qualifications. It is unlikely that additional resources will have much effect on increasing the share of the population that is in a romantic partnership, building a sense of community or reducing feelings of stress.

In recognition of the fact that GDP does not adequately capture a population's well-being, Bhutan developed the Gross National Happiness Index, which measures human well-being on the basis of traditional measures of well-being, such as living standards, health and education, as well as less traditional measures such as time use, psychological well-being, culture, community vitality and environmental diversity. In 2010, 10.4 per cent of the population of Bhutan reported being unhappy, having achieved a sufficient score in less than 50 per cent of the domains measured; 48.7 per cent reported being narrowly happy, having a sufficient score in 50–65 per cent of the domains; 32.6 per cent were extensively happy, with a sufficient score in 66–76 per cent of the domains; and 8.3 per cent reported being deeply happy, with a sufficient score in 77 per cent or more of the domains. The evolution of the index over time is used to guide policy-making and develop project screening tools in Bhutan. The consequences for the index are taken into account before project implementation begins, with the ultimate objective of maximizing the index over time.

2) Theoretical and methodological limitations to assessing the relationship between absolute and relative income and subjective well-being

There are a number of theoretical and methodological limitations to assessing the relationship between income and subjective well-being. First, the relationship between income and subjective well-being varies across countries and regions and may be affected by factors such as culture, language and social institutions (Seligman 2004; Ye, Ng and Lian 2015). Second, the relationship between income and positive emotional well-being may be different from that between income and negative emotional well-being (OECD 2013; Kahneman and Deaton 2010; Tversky and Kahneman 1992). Third, aggregating and disaggregating data may exclude all within-group information and make the relationship between aggregated variables much stronger (Raudenbush and Bryk 2002).

▶ 3 Linkages running from well-being to productivity

This part of the report considers the linkages running from objective and subjective well-being to labour productivity growth. The first section presents the link between objective well-being and productivity, with objective well-being defined by economic and health indicators. The second section considers the link between subjective well-being and, specifically, job satisfaction and work-related stress, and productivity. Finally, the last section considers the indirect effect of factors such as human and social capital and ICT usage on labour productivity through their impact on well-being.

A. Impact of objective well-being on productivity

In this section, we consider the effect of objective measures of well-being on productivity. The objective measures of well-being considered are health conditions, equality and fairness, wages, and economic and job security. With regard to health, for example, studies by Rivera and Currais (1999a, 1999b) and Knowles and Owen (1995, 1997) suggest that, over the past 25–30 years, between 21 and 47.5 per cent of GDP growth per worker among the working-age population in developed countries can be attributed to improvements in the health of the population (defined as health-care expenditure and life expectancy) at the country level.

1) Impact of health conditions

Impact of worker health conditions on productivity¹²

Absenteeism¹³ among workers with poor health conditions results in significant losses in economy-level output and in productivity measured on per-person-employed basis.¹⁴ Kessler et al. (2001) found that 6.7 workdays were lost on average over a 30-day period among respondents between the ages of 25 and 54 with any form of work impairment, according to data collected through a survey on midlife development in the United States conducted by the MacArthur Foundation.¹⁵ The findings implied that, at national level, some 2.5 billion work-impairment days were being lost in the United States every year within that age group. The same study found that cancer was associated with the highest reported prevalence of any impairment, at 62 per cent, and with the highest conditional number of impairment days within the preceding 30 days, at 16.4 days. Ulcers, major depression and panic disorders were associated with a high likelihood of impairment, and heart disease and high blood pressure were associated with a large conditional number of impairment days. In the United Kingdom, data collected by the Office for National Statistics indicate that 4.1 workdays per worker, on average, are lost owing to sickness absence, which is estimated to cost the economy around £15 billion each year (Black and Frost 2011).

¹² The adverse effect of health conditions on productivity is also found to become more prominent as the workforce ages (Black and Frost 2011; Clements-Croome 2006; PricewaterhouseCoopers 2008).

¹³ Absenteeism refers to the habitual non-presence of an employee at his or her job. Habitual non-presence extends beyond what is deemed to be an acceptable number of days away from the office for legitimate causes such as scheduled vacations, occasional illness and family emergencies.

¹⁴ Absenteeism results in reduced output per worker. Absenteeism does not lead to lower productivity measured on an output per hour basis, as time spent outside of the workplace is not considered in that calculation.

¹⁵ Respondents were asked how many of the preceding 30 days they had been totally unable to work or perform normal activities because of health problems (work-loss days) or had been forced to cut back on such activities because of health problems (work-cut-back days).

In addition to the output losses attributed to absenteeism, a high incidence of presenteeism¹⁶ is found among workers with poor health conditions, which adversely affects both labour productivity and output. In the United Kingdom, while the incidence of absenteeism may be falling, the incidence of presenteeism is on the rise owing to employees' fear of being let go by their employers because of their health conditions (Collinson 2018). As highlighted by Kessler et al. (2001), the intangibility of presenteeism suggests that cut-back days might actually pose greater downside risks for employers than work-loss days, and the difficulty of measuring and monetizing presenteeism poses a challenge for future research that must be addressed. Some studies nonetheless link certain health conditions to poorer productivity as a result of both presenteeism and absenteeism, such as musculoskeletal disorder and hypertension (Hafner et al. 2015), asthma (Chen et al. 2008), arthritis (Burton et al. 2006), chronic obstructive pulmonary disease (Britton 2003), type 1 and type 2 diabetes (Hex et al. 2012) and cardiovascular diseases (Gordois et al. 2016).

2) Impact of mental health on productivity

Workers suffering from poor mental health were found to represent significant costs to business in the form of output lost through presenteeism and absenteeism. Workers affected by depression lost approximately one quarter of a workday per month in comparison with workers with no psychiatric issues (Kessler et al. 2001), in addition to 20 per cent of their self-reported productivity owing to factors such as fatigue, low self-confidence, memory lapses and poor concentration (Greenberg et al. 1993). Workers suffering from poor mental health had limited ability to manage their time, concentrate on work, communicate effectively with colleagues and achieve the required output. A study conducted in the United States found that employees with mental health conditions such as depression, sadness and mental illness cost businesses an average of US\$4,741 per affected employee per year in absenteeism¹⁷ and an average of US\$28 per affected employee per day in presenteeism¹⁸ in terms of lost output between 1997 and 1999, representing the third highest cost to businesses after heart disease and hypertension (Goetzel et al. 2004).¹⁹ The high incidence of presenteeism found among workers suffering from poor mental health conditions is explained by a general fear of disclosure to their employer about their condition, with 43 per cent of employees found to be reluctant to disclose mental health issues at work (NHS Information Centre 2011), given that 22 per cent of individuals who disclose a mental health problem to their employers are sacked or forced out of their jobs (Mind, 2014).

The most significant degree of work impairment, and, consequently, lost productivity and output, as a result of presenteeism and absenteeism is related to conditions such as obsessive-compulsive disorder (OCD) and post-traumatic stress disorder (PTSD). Some 41.7 per cent of individuals with moderate OCD report a degree of impairment in fulfilling their role at work within the preceding 12 months. That percentage rises to 79.9 per cent for individuals with severe OCD, of whom 56.7 per cent report experiencing severe workplace impairment. Injured patients who develop PTSD are three times more likely not to have returned to work 12 months after their injury than patients who do not develop PTSD. The highest number of days of absence from work is found among individuals with PTSD, at 15.2 days per person per year (Alonso et al. 2011).

3) Impact of risky health behaviours

Risky health behaviour, which can ultimately result in disease or injury, can affect productivity. Burton et al. (2005) identified a number of health risk factors that were significantly correlated with presenteeism, namely life dissatisfaction, job dissatisfaction and stress, and found that each additional risk factor was

¹⁶ Presenteeism refers to the lost productivity that occurs when employees are not fully functioning in the workplace owing to, for example, an illness or an injury. Another factor resulting in presenteeism is slacking.

¹⁷ This represented the highest cost among the ten most prevalent conditions studied.

¹⁸ This represented the third highest cost among the ten most prevalent conditions studied, after migraines/headaches and respiratory disorders.

¹⁹ Figure based on estimates of the prevalence and on productivity impairment of the condition, as well as the assumption of an hourly wage rate of US\$23.15. Data obtained from the IBM MarketScan Health and Productivity Management Database.

associated with a 2.4 per cent excess drop in productivity. Smoking and smoking breaks have also been found to lead to productivity losses (Alavinia, Molenaar and Burdorf 2009; Baker et al. 2017; Berman et al. 2014). The amount of sleep also affects productivity, with 7–8 hours of sleep seen as optimal and anything above or below this amount leading to lower productivity. Similarly, the amount of physical exercise affects productivity, with less than 150 minutes of exercise per week associated with greater productivity losses, and less than 30 minutes of exercise four times per week associated with reduced productivity. Employees with poor diets were found to report greater presenteeism (Boles, Pelletier and Lynch 2004; Hafner et al. 2015) and to experience greater difficulty in getting along with their co-workers. Lastly, Gates et al. (2008) found that workers with a body mass index exceeding 35 had productivity losses 4.2 per cent higher than workers who were a healthy weight.

Impact of caregiving for non-workers on worker health conditions

Family caregivers are found to be less productive at work compared with workers who do not have to care for family members outside of work. Individuals who provide daily care for a spouse with severe impairments are more likely to struggle to find time to exercise, rest and take prescription medications compared with non-caregivers (Burton et al. 1997). Caregiving is associated with an overall drop in workplace productivity of just over 20 per cent through greater absenteeism and presenteeism (Giovannetti et al. 2009). Mazanec et al. (2011) found that caregivers reported a productivity loss of 15 per cent while working owing to their caregiving responsibilities, and 28 per cent reported missing work in the preceding week (a mean of 17 hours) over a 15-month period.

4) Impact of equality and fairness on productivity

A fairer society tends to expand educational opportunities for all, which can result in greater labour productivity. Fairer societies enhance public investments in education and ensure that tax-and-transfer mechanisms enable children from low-income households to access the educational system, leading to a more educated workforce that is able to meet labour market requirements and generate greater labour productivity. Numerous studies have found that access to early childhood education for all provides a high return on investment, given that it enhances equality of opportunity and skills acquisition throughout life (Wößmann 2008; Cuhna, Heckman and Schennach 2010; Heckman 2011; Cingano 2014; OECD 2015). Better and more education, up to secondary school education, is associated with higher productivity and, through a positive feedback loop, to greater income equality (OECD 2016). The benefits of public investments in education are found to be the greatest when combined with family benefits targeting lower-income households, which allow parents to remain actively involved in the labour force and generate economic outputs.

Higher levels of pay inequality have been found to reduce satisfaction levels among those at the bottom of the pay scale without increasing happiness levels among those at the top, which challenges the pay-for-performance theory (Card et al. 2012). In the United States, baseball teams with the greatest level of pay inequality perform worse than those with less inequality (Bloom 1999). Similar effects have also been identified in the National Football League (Mondello and Maxcy 2009). Inequality undermines performance by creating resentment and weakening cooperation and teamwork.

Cowherd and Levine (1992) found that the greater the pay inequality between executives and hourly workers, the lower the quality of work produced, reflecting the negative effects of inequality on teamwork.

Payne (2017) provides many interesting anecdotes about the negative effects of inequality on well-being. He noted that the odds of air rage incidents are almost four times higher in the coach section of an airplane with a first-class cabin than in airplanes without a first-class cabin. Payne points out that Rawls uses the view of ignorance to argue that, once self-interest is removed, anyone can see that equality is preferable to inequality.

5) Impact of wages on productivity (job turnover and worker effort in relation to efficiency wages)

Wages which are set above market clearing rates are believed to lead to higher productivity gains at both the enterprise level and at the economy-wide level. Akerlof (1982) introduced the efficiency wage theory,²⁰ which postulates that workers are motivated to work harder when their wage is set above the market clearing rate. There are two competing views of the effect of wage premiums on employees. The first view is that employees compare the marginal costs of losing their job to the marginal benefits of working hard, with high wages being a carrot which employers can use, along with a stick consisting of the threat of dismissal (Bowles 1985; Shapiro and Stiglitz 1984). The second view is that high wages constitute gifts which appeal to norms of loyalty and mutual obligation in workers (Akerlof 1982). Higher wages can, in turn, reduce employee turnover, which reduces the cost of training replacement workers. Over time, firms which offer wages above market clearing wages can attract more productive workers, allowing these firms to become more productive and gradually replace less productive firms, providing economy-wide productivity gains. The efficiency wage theory has been tested and proven under a limited set of employment and firm conditions. Rebitzer (1995) found empirical evidence for the negative trade-off between wages and employer supervision for contract maintenance workers in the petrochemical industry, with the cost of supervision linked to lower wages, while Dube, Lester and Reich (2016) found reduced employee turnover in restaurants in California that offered a wage above the market clearing wage.

6) Impact of economic and job security on productivity

The impact of economic and job security on productivity is mixed. Some studies have found that lower economic and job security reduces well-being and, ultimately, productivity and, in turn, that greater economic and job security improves well-being and productivity. A lack of job security has been linked to poorer states of well-being which ultimately affect productivity (Van den Heuvel et al. 2010; Kinnunen et al. 2000; Probst et al. 2007). Kinnunen et al. (2000), for example, found that high perceived job insecurity was a predictor of poor relationships with both colleagues and superiors a year after the initial survey, which was conducted across three organizations in Finland.

Other studies, meanwhile, suggest that job security is linked to reduced productivity. Ichino and Riphahn (2005) found that the number of days of absence per week increases significantly once employment protection is granted to white-collar workers. The authors postulate that, in addition to shirking as a cause, workers gradually learn how to work as little as possible and that, because a worker's ability is not initially observable and is largely gauged by output, workers dedicate a higher level of effort in the earlier months, which declines the longer the worker holds the post. Engellandt and Riphahn (2005) found that workers under temporary contracts dedicate more effort to their work than permanent employees and that the probability of a temporary worker working unpaid overtime is 60 per cent greater than for permanent workers.

B. Path from subjective well-being to productivity

This section presents a summary of the literature review of the effect of subjective measures of well-being on productivity, namely job satisfaction and work-related stress.

²⁰ The term "efficiency wages" was introduced by Alfred Marshall to establish that wages were set per efficiency unit of labour and that, for employers, there is no difference between more efficient workers and less efficient workers, as wages are established based on the efficiency of the worker.

1) Job satisfaction and productivity

Studies in the field of psychology and organizational behaviour link happiness to traits associated with enhanced job performance, providing support for the happy/productive worker thesis. Happier workers²¹ are found to be more pragmatic, less absent, more cooperative and friendlier (Bateman and Organ 1983; Judge et al. 2001), to change jobs less often and to be more willing to help others (Spector 1997), and to be more engaged at work, to earn more money and have better relationships with colleagues and customers (George and Brief 1992; Pavot and Diener 1993; Spector 1997; Wright and Cropanzano 2000). Furthermore, positive shocks to happiness have been found to result in significant productivity gains from increased effort, rather than from higher precision in executing standardized tasks (Oswald, Proto and Sgroi 2014). The impact is, however, conditional on the social and the economic context. Other studies have found that, in addition to enhanced analytical thinking, positive emotions are also linked to greater creativity and may enhance productivity in occupations where this type of thinking is required.

A statistically significant positive relationship has been found between workers' happiness and productivity and financial indicators of business performance. Bryson, Forth and Stokes (2017) found a significant positive correlation between job satisfaction and productivity using a nationally representative employer-employees matched dataset in the United Kingdom. Hafner et al. (2015) found that, among workers who were satisfied with their job, productivity impairment as a result of presenteeism and/or absenteeism dropped by 6.92 percentage points. Arnold et al. (2016) found a significant negative relationship between job satisfaction and presenteeism costs but failed to find an association between job satisfaction and absenteeism. At the organizational level, Bakotić (2016) found significant positive correlations between employee job satisfaction and several financial indicators, such as revenue per employee, return on equity and business excellence index rankings, across 40 medium- to large-sized Croatian companies ($r < .44$). Koys (2001) also found a positive correlation between employee satisfaction across a restaurant chain in year 1 and store profit and customer satisfaction in year 2 ($.35 < r < .61$).

Some studies have refined the happy/productive worker thesis by considering the relationship between trait and state levels of happiness²² on productivity. Zelenski, Murphy and Jenkins (2008) calculated average levels of happiness (between-subjects or at the trait level of analysis) as well as individual variations in happiness over time (within-subject or at the state level of analysis) and examined the relationship with self-reported productivity among managers employed in the public and private sectors. The happiness indicators examined included job satisfaction, quality of work, life, life satisfaction, positive affect and negative affect. The results of their study indicate that between-subjects positive affect and quality of work life were moderately correlated with productivity ($r = .35$ and $.32$, respectively), whereas job satisfaction and life satisfaction were less strongly correlated with productivity ($r = .22$ and $.24$, respectively). They also find that within-subject positive affect and quality of work life were moderately correlated with productivity ($r = .36$ and $.35$, respectively), but that job satisfaction was less strongly correlated with productivity ($r = .19$), and that daily changes in life satisfaction and negative affect were not significantly associated with productivity. The results of this study indicate that, while positive affect has a robust relationship with production, negative affect appears to have no significant relationship.

2) Link between work-related stress and productivity

Empirical evidence suggests that work-related stress is associated with productivity losses, either directly or indirectly, through its effect on health conditions and health-related behaviours. Motowidlo et al. (1986)

²¹ In Bateman and Organ (1983), for example, the happiness of workers is determined by citizenship behaviours established by the worker's direct superior with regard to items such as compliance, altruism, dependability, house-cleaning, complaints, waste, cooperation, criticism of and arguing with others, and punctuality, as well as the worker's job satisfaction, as measured through the Job Descriptive Index developed by Smith, Kendall and Hulin (1969), which measures items pertaining to work, pay, promotions, co-workers and supervision.

²² This refers to the study of human personality and the emotional state of individuals, denoted by positive and negative affects, in psychology.

surveyed nurses to determine their subjective stress levels and asked supervisors and co-workers to measure each nurse's job performance; they found negative correlations between subjective stress and job performance variables such as composure, quality of patient care and interpersonal effectiveness. The cost of high subjective stress levels among employees is found to result mostly from presenteeism rather than absenteeism, with employees with high stress levels losing 4.72 hours of work per week, on average, as a result of presenteeism and two-thirds of an hour per week, on average, as a result of absenteeism (Burton et al. 1999). Mind (2013) cautions, however, that the size of the relationship between work-related stress and absenteeism may be underestimated, with findings showing that 90 per cent of individuals who reported a day off work because of stress provided an alternative reason for their absence. Chronic work-related stress ultimately leads to physical health risks and physical health-related behaviours, which are negatively correlated with productivity. Belkic et al. (2004) have linked high work-related stress with health conditions such as high blood pressure, musculoskeletal disease, heavy alcohol use, low physical activity, smoking and being overweight. Chandola et al. (2008) also found that poorer health behaviours due to high stress levels led to health conditions; for example, lower consumption of fruits and vegetables was found to account for 16 per cent of the effect of work-related stress on coronary heart disease.

Some studies, however, suggest that while too little or too much work-related stress may be associated with poor job performance, moderate levels of stress optimize job performance. The Yerkes-Dodson Law suggests an inverted-U function in which job performance correlates to the level of work-related stress. This theory suggests that, while low stress levels are associated with boredom and low arousal leads to low job performance, moderate amounts of stress optimize job performance, and more than moderate stress leads to diminishing performance. There is a significant lack of empirical evidence to support this theory, however, with Muse, Harris and Feild (2003) noting that the majority of studies into the relationship between stress and performance have chosen to study populations that are likely to be in high-stress work environments and have used measures that do not tap into the low-stress side of the inverted-U.

Chronic, continuous exposure to work-related stress can lead to burnout, which is defined by physical, mental and emotional exhaustion, cynicism and impaired personal efficacy. Bakker et al. (2003) found a positive relationship between employee burnout and the duration of their absence from work. Dewa et al. (2014) identified a negative relationship between burnout and productivity (measured by work ability and number of days of sick leave), as well as intent to continue practising and intent to change jobs.

C. Factors affecting productivity through well-being effects

This section presents the impact of factors such as human capital, social capital, public health and environmental conditions at work and outside of work, ICT usage and workplace wellness programmes, which can increase objective and subjective well-being and, in turn, productivity.

1) Human capital, well-being and productivity

Human capital, whether acquired through the educational system or on the job, is found to improve well-being and can thereby indirectly affect productivity. Kemna (1987) identified a positive relationship between educational attainment levels and well-being, while other studies point to the idea that a general (secondary) education leads to the highest levels of health and life satisfaction of all (Hartog and Oosterbeek 1998; Stutzer 2004). With regard to the impact on productivity of human capital acquired at work, Ryan and Deci (2000) argue that individuals are at their best when trying to learn new skills, master new challenges and apply their talents where they can be of benefit. They also argue that all individuals share three basic innate and universal psychological needs which must be satisfied to enhance well-being, namely autonomy, competence and relatedness.

The coronavirus disease (COVID-19) pandemic, which led to many school closures, is believed to have adversely affected the acquisition of skills by students, which will later affect their productivity and earnings.

An OECD (2020) study suggests that students who experienced school closures will earn 3 per cent less over their lifetimes unless measures are put in place to help them catch up. Such a loss of earnings would, in turn, lead to a drop in long-term economic growth of 1.5 per cent in countries that were deeply affected by school closures.

2) Social capital (e.g. trust), well-being and productivity

Companies in which employees are more engaged experience less absenteeism, lower turnover and fewer thefts (GALLUP 2017), as well as greater customer satisfaction. First, social capital allows for the effective sharing and diffusion of skills and information among workers (Coleman 1990; Healy and Côté 2001). Second, significant positive associations are found to exist between trust in organizational leadership and numerous outcomes linked to higher levels of productivity, such as conscientiousness, job performance, organizational commitment and intention to stay (Dirks and Ferrin 2002). This is found to be particularly important as employees start to work away from the office more, which often makes it difficult to monitor their effort and performance (Bijlsma and Koopman 2003). A 2011 workplace employment relations survey found that the average level of trust in managers was positively related to workplace labour productivity (Brown et al. 2015).

Organizational structures and practices can also help maximize worker performance. Organizational citizenship behaviours are defined as “individual behaviour that is discretionary, not explicitly recognized by the formal reward system and that in the aggregate promotes the effective functioning of the organization” (Organ 1988). It is an area of study that requires more research to understand how organizational structures and practices can maximize worker performance above and beyond their job responsibilities. Using data from surveys of employees and their supervisors across eight companies in 1992, Cappelli and Rogovsky (1998) found that involvement in work organization increased organizational citizenship behaviours both indirectly, by changing the job characteristics of individual tasks, and directly, independent of such changes, but that involvement in decisions governing employment practices had only small indirect effects on organizational citizenship behaviours and no direct effect.

3) Impact of public health and environmental conditions both in and outside the workplace on worker well-being and productivity

Environmental conditions, which can be affected by public health measures, can have an impact on well-being and productivity. Brereton et al. (2008) found that spatial environmental and climate variables are significantly linked to individual life satisfaction, while Wargocki et al. (1999) found that the performance of female students asked to complete tasks from the Walter Reed performance assessment battery was negatively affected by polluted air. Federspiel et al. (2004) found that ventilation has a significant impact on the performance of call centre workers, and Kosonen and Tan (2004) found that the effect of air quality on productivity losses varies by occupation, with losses being the greatest in occupations requiring analytical thinking, compared with typing tasks. Gohara and Iwashita (2003) found that air temperature affects work performance, with temperatures between 22°C and 24°C found to generate the highest performance on proofreading tasks. Lamb and Kwok (2016) found that dark environments are associated with a greater negative impact on work performance than those considered to be too bright. Viola et al. (2008) found that exposing workers to blue-enriched white light for four weeks resulted in higher rates of alertness, concentration and performance compared with workers exposed to white light. Lamb and Kwok (2016) found that the effect of environmental stressors, such as poor lighting or noise annoyance, on performance was often indirect; such stressors were linked to poorer mood, headaches and feeling “off”, which can, in turn, affect performance by reducing motivation and increasing tiredness and distractibility.

The impact on job performance of work environments located in green buildings remains unclear. Some studies have found the use of green buildings to support productivity, with the number of sick days reported to have dropped by 39 per cent among workers at an Australian law firm following its move to a

green building (Miller et al. 2009). Similarly, Singh et al. (2010) found significant reductions in self-reported absenteeism due to asthma, respiratory allergies, depression and stress-related conditions after workers were moved from conventional office buildings to buildings that had achieved Leadership in Energy and Environmental Design (LEED) certification in the United States. The impact on productivity is not consistent across studies, however, with Thatcher and Milnermilner (2014) failing to find any significant difference in organizational outcomes associated with a move from traditional buildings to three green buildings in South Africa. They do, however, find changes in physical well-being and perceived environmental comfort.

4) Implications of ICT usage on worker well-being and productivity

There are a number of channels through which ICT usage affects worker well-being and productivity. First, ICT usage can affect employee well-being by fostering higher levels of autonomy, as information needed to complete a task can easily be found online. Fujimoto et al. (2016) found that usage of mobile technologies by Japanese workers is linked to greater levels of job autonomy, which, in turn, is linked to higher levels of work engagement. Second, ICT usage allows greater flexibility, enabling employees to work at any time and in any location, thereby improving workplace well-being and, potentially, productivity. Third, ICT usage allows for better and easier communication between workers, thereby reducing stress levels in tasks requiring co-ordination between team members, in addition to freeing up more time for productive activities and reducing ambiguity (Lee, Shin and Baek 2017).

The COVID-19 pandemic is believed to have increased labour productivity. Three-quarters of firms across European Union countries were reported to have become more efficient and innovative, with nine out of ten firms having accelerated the adoption of digital technology and automation in order to become more agile in a changing environment (Bruegel, 2021). This has the potential to increase labour productivity, with one survey finding that productivity growth could rise by 1 additional percentage point over the coming years as a result of the changes brought about by the pandemic (McKinsey & Company, 2021). Furthermore, teleworking has also potentially increased labour productivity by introducing more flexibility in working conditions, reducing commuting time and improving connectivity. It should be cautioned, however, that teleworking is not suitable for all types of jobs and requires careful considerations as to how to coordinate tasks, manage teams and provide equal career opportunities for all in a hybrid model. As such, the net impact on labour productivity remains unclear.

5) Impact of workplace wellness programmes on worker well-being and productivity

Workplace wellness programmes were first designed to improve well-being without having to alter workplace factors. The interventions featured in workplace wellness programmes can serve as a test of whether improvements to employee well-being lead to productivity gains. Wellness intervention programmes can be categorized as primary, secondary and/or tertiary prevention-focused (Goetzel et al. 2008). Primary programmes are directed at employees who are generally healthy, while secondary programmes target employees who have been identified as demonstrating certain health risk-factors and tertiary programmes are designed to improve disease control in employees who already have a chronic health condition, such as diabetes or heart disease. While primary and secondary programmes usually focus on managing certain lifestyle factors, such as nutrition and physical activity, tertiary programmes are more closely aligned with the goals of early employee assistance programmes.²³ In addition to supporting productivity gains, workplace wellness programmes are also believed to improve the organizational climate, which can help improve employees' morale, desire to work and relations with other employees (O'Donnell 2000).

²³ An employee assistance programme is a confidential, short-term counselling service for employees with personal difficulties that affect their work performance. Employment assistance programmes grew out of the industrial alcoholism programmes of the 1940s.

By enhancing productivity, workplace wellness programmes are often able to deliver financial benefits to firms that outweigh the cost of the scheme. The workplace wellness programme offered by Johnson & Johnson, which included on-site fitness centres, online weight management tools and coaching programmes for tobacco cessation and blood pressure management, delivered a positive return on investment estimated at US\$1.88–US\$3.92 for every dollar spent (Henke et al. 2011).

A number of factors continue to influence the success of workplace wellness programmes. Black (2008) found that the most successful programmes have visible support and participation of senior management and have interventions that are well aligned with the overall business aims. Following a literature review and a series of interviews with employers in London to examine best practice in supporting the health needs of City workers, it was found that the most effective programmes were those based on the specific needs of the staff, rather than those which adopted a “one size fits all” approach, and that employees should be involved in the design, delivery and evaluation of the programme (Cavill Associates Ltd 2014). It was also determined that the targeted behavioural change affected the success of the programme; programmes aimed at increasing physical activity received stronger support than interventions aimed at altering diets. Weiner, Lewis and Linnan (2009) have developed the “theory of implementation” for workplace wellness programmes, which is based on the idea that effective programmes should be accessible and easy to use and should provide incentives for engagement.

► Conclusion

This report began by posing two questions. First, does slower productivity growth constitute a significant threat to the betterment of the well-being of the world's population, and, if so, by how much? Second, given that many indicators of well-being can have a positive effect on productivity, should one aspect of any strategy to revive productivity growth focus on policies that improve well-being?

The evidence reviewed in this report answers both these questions strongly in the affirmative. First, productivity growth – and the higher incomes and government revenues arising from it – does indeed contribute to higher levels of well-being, especially objective measures of well-being, and especially in the developing world. Consequently, slower global productivity growth will dampen the pace of improvements in well-being worldwide.

Second, given the strong impact of well-being on productivity, especially with regard to health, policies and programmes aimed at increasing the well-being of the population, either directly or indirectly, will have a positive impact on productivity performance. These productivity gains will, in turn, generate greater income and government revenues that can boost well-being. Productivity growth and improvements in well-being are closely interconnected and can create mutually reinforcing positive feedback loops.

There is great opportunity for the ILO to play a global role in broadening the debate on productivity/well-being linkages. In a related concept note drawn up as part of this project, a research strategy has been elaborated that the ILO may wish to consider, given its interest in deepening its understanding of the linkages between productivity and well-being. The scoping exercise identifies five themes that the ILO may wish to adopt in its research agenda on productivity/well-being linkages. The five themes are:

- The concept and measurement of productivity
- Determinants of productivity growth
- The equitable sharing of productivity gains
- The importance of decent work for productivity growth
- Limitations of productivity/income growth for well-being improvement.

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