

Introduction to the Symposium on Productivity and Well-being, Part II

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The Spring 2022 issue of *International Productivity Monitor* took an important step to begin exploring linkages between productivity and well-being with a four-article symposium. This issue includes a second part to the symposium with three articles that further explore these linkages. All seven articles were presented at an authors' virtual workshop held November 16-17, 2021. The editors are very pleased that this issue of the *International Productivity Monitor* also includes a reflection by John Helliwell who served as a discussant in the authors' workshop on measuring and improving productivity when subjective well-being is the objective. His article provides a valuable perspective on the state of the literature on the productivity-well-being linkages that are discussed in the symposium

as well as direction for future research.

This introduction provides a synthesis of the contributions of the three articles included in this volume. The introduction to the Spring issue — in addition to summarizing the articles in that issue — included a discussion of the background and motivation of the symposium, organizational process, and key issues related to the productivity-well-being linkage.

Context for the Articles in this Volume

As noted in the introduction to the symposium in the spring issue of the IPM (Sharpe, Sichel and van Ark, 2022), the literature on productivity and well-being linkages both is in its infancy and highlights the two-way nature of the rela-

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tionship between productivity and well-being: higher productivity boosting well-being and higher well-being boosting productivity (perhaps through a channel of happier workers being more productive workers). The three articles in this symposium make important contributions to this literature and further highlight the two-way nature of the linkages. The article by Sarracino and O'Connor focuses on the contribution of output per person (and other factors) to well-being, and in particular the efficiency with which countries produce subjective well-being (SWB) given their inputs. The article by Peroni, Pettinger, and Sarracino examines the role played by well-being on economic productivity, while the third article by DiMaria, Peroni, and Sarracino considers linkages going in both directions. All contributors to the three research papers in the symposium are employed at STATEC Research, the research group at the National Institute of Statistics and Economic studies of Luxembourg, known as STATEC. STATEC Research has become an important centre for research on well-being measurement in general and well-being productivity linkages in particular.

A Measure of Well-being Efficiency Based on the World Happiness Report (Sarracino and O'Connor)

The first article in this symposium by **Francesco Sarracino** and **Kelsey O'Connor** both from STATEC Research in Luxembourg extends the literature that estimates and assesses the efficiency with which countries translate inputs into sub-

jective well-being (SWB) as measured on a Cantril Ladder that collects individuals' responses to a question about their well-being. As did Legge and Smith (2022) in the spring symposium, this article valuably emphasizes that there are potential paths to boosting SWB beyond just increasing inputs. That result seems especially important for lower SWB countries with fewer available inputs, though it also applies to high SWB countries that could, in principle, boost SWB by generating it more effectively.

The key data in the article are from the 2021 edition of the World Happiness Report (Helliwell *et al.*, 2021). As noted, the measure of SWB relies on a Cantril Ladder based on questions in a Gallup World Poll. The six inputs into SWB used are real GDP per capita, healthy life expectancy, social support, freedom of choice, absence of corruption, and generosity. Efficiency measures are estimated using Data Envelopment Analysis (DEA) applied to a sample of 126 countries.

DEA is a non-parametric technique that compares a weighted average of the inputs listed above to outputs (in this case, the one output is SWB). The procedure maximizes the ratio of output to a weighted average of inputs by choosing the weights on inputs subject to appropriate constraints. The resulting efficiency measures provide a ranking of countries, indicating how effectively a country transforms inputs into SWB relative to countries at the frontier of efficiency in the sample. While this approach differs from that typically used in conventional productivity analysis, the key idea of estimating how effectively inputs are transformed into outputs is broadly

analogous to estimating total factor productivity (TFP). This article also provides a useful complement to Legge and Smith (2022) who use a more conventional productivity/capital stocks approach to estimating the efficiency with which SWB is generated.

Methodologically, this article goes beyond existing literature by drawing on often-cited and publicly available data from the WHR, covering a wider set of countries, and decomposing the efficiency measure into technical and scale efficiency. Technical efficiency relates to how well a country uses a given set of inputs. Scale efficiency is about whether changing the quantity of inputs is appropriate from a well-being perspective. For example, countries facing increasing returns to scale in the production of SWB are operating below their optimal scale and would benefit from increasing inputs.

Several interesting and provocative results emerge. First, some basic numbers. The top 50 per cent of countries have efficiency scores of at least 90 per cent of frontier efficiency, while the bottom 10 per cent of countries have efficiency scores between 50 and 75 per cent. Looked at another way, of the 126 countries, 19 are at frontier efficiency. The other countries have room to improve either by boosting technical efficiency or by adjusting inputs.

Another important result is that countries with high subjective well-being rankings (such as the Nordic countries) are not always the most efficient at translating inputs into well-being (only Finland is fully efficient). Interestingly, Legge and Smith (2022) found a similar result for Nordic countries using a different methodology.

An additional result is that well-being efficiency scores are not correlated with a TFP-like measure of economic efficiency (with the latter calculated using either DEA analysis or conventional TFP estimation). This result highlights that SWB efficiency measures something different than do TFP-like measures of economic efficiency. The authors push further on this result, suggesting that “production per se does not promote well-being.” This interpretation will be controversial in some quarters, given that, by construction, the estimation of SWB efficiency has already accounted for the role of GDP per person as an input. That being said, the article provides external validation of its SWB efficiency measure by demonstrating its correlation with the Happy Planet Index, a measure that is intended to capture sustainable well-being (Happy Planet Index, 2021).

In terms of policy implications, much policy advice related to SWB focuses on the quantity of inputs. This article highlights the importance of evaluating the efficiency with which a given set of inputs are utilized as well. This point is illustrated by a comparison of Costa Rica and Germany: Indeed, Costa Rica and Germany have similar levels of SWB, but Costa Rica has much fewer inputs; that is, greater well-being efficiency for Costa Rica partially offsets a lower level of inputs.

Turning to more specific policy implications, the article shows that SWB efficiency correlates positively with GDP per capita, social support, and healthy life years at birth. Of these factors, healthy life years is the most important, suggesting that investments in health are likely to boost SWB

along multiple dimensions.

Productivity Gains from Worker Well-being in Europe (Peroni, Pettinger, and Sarracino)

While the just-described article by Sarracino and O'Connor focuses on well-being as an output, the second article in the symposium by **Chiara Peroni, Maxime Pettinger, and Francesco Sarracino**, all from STATEC Research, considers the role of well-being as an input to productivity. Specifically, the authors examine the relationship between well-being in the workplace and labour productivity in 30 European countries using survey data on working conditions from 2010 and 2015. Although an extensive literature has explored these linkages, this article is the first to use relatively comprehensive data at the industry level.

The analytic framework is a Cobb-Douglas production function in which total factor productivity (TFP) depends on worker well-being (with constant returns to scale in labour and capital inputs). The production function is transformed to an equation for labour productivity, and the independent variables in the resulting relationship include a measure of worker well-being, capital deepening, and a set of other controls (average age and education of workers in the industry, proportion of large firms in the industry, the industry's labour share, and average wages by industry and country, and year, country, and sector fixed effects). The article considers the relationship in both levels and growth rates. The growth-rate specification includes two additional controls: the initial

level of productivity and the change in industries' employment shares. The only deviation from conventional practice is that, because industry-level capital stock data are not available in their data set, the authors use investment per worker as a proxy for capital deepening.

Data on well-being are from the 2010 and 2015 waves of the European Working Conditions Survey, a representative survey of individuals' working conditions from which the authors construct two measures of worker well-being. The first measure is job satisfaction, constructed from responses to the question about how satisfied workers are with their jobs. This measure is somewhat higher in Western European countries than in Eastern European countries, and, within Eastern Europe, satisfaction is higher in the service sector than in construction or manufacturing.

The second measure, job quality, combines information relating to income and benefits, working time and work-life balance, social dialogue, skills development and training, safety and ethics, and stress at work. On this measure, scores are higher in Western European countries than in Eastern Europe (same pattern as the job satisfaction measure). Within Western European countries, job quality in construction is noticeably below that in manufacturing and services. Within Eastern European countries, job quality is highest in services and lowest in construction.

The remaining data are from Eurostat's Structural Business Statistics, which provides data at the two-digit industry level. The survey covers manufacturing, construction and business services, but does not include agriculture, financial services,

public administration, and some other non-market activities. The authors use annual data from 2010 to 2018. In addition to estimating the levels relationship, the growth-rate specification considers the effect of working conditions in 2010 and 2015 on subsequent labour productivity growth.

Starting with the regressions in levels, the key result is that industries in which worker well-being is higher — measured either by job satisfaction or job quality — have statistically significant higher levels of labour productivity. Specifically, as job satisfaction increases by one unit — it is measured on a scale from one to four — labour productivity increases by 5 per cent. Similarly, in the growth - rate specification, higher levels of job satisfaction and quality are associated with higher levels of productivity growth during the subsequent three years (with magnitudes depending on the specification). To gauge the economic importance of these results, the authors scale their results to show that the effect of job satisfaction or quality on labour productivity is sizable relative to the effect of investment per worker (though again the magnitude of the comparison depends on the specification).

Another bonus result that will interest readers who have not delved deeply into these data is a series of bar charts plotting job satisfaction, job quality, and productivity by country and color coding to highlight differences between Western and Eastern European countries.

In terms of policy implications, this article provides industry-level evidence that workplace well-being, in addition to being intrinsically good, also contributes to labour productivity; that is, happier work-

ers are more productive workers.

From Economic Productivity to Productive Well-being: The Role of Life satisfaction and Adjusted Net Savings (DiMaria, Peroni, Sarracino)

The third and final article in this symposium by **Charles-Henri DiMaria, Chiara Peroni** and **Francesco Sarracino**, all from STATEC Research, assesses the linkages between SWB, conventionally-measured, productivity, and sustainability for a set of European countries from 2005 to 2018. Their setup uses DEA with a ratio of a weighted average of outputs in the numerator and a weighted average of inputs in the denominator. The key innovation of the article is to allow for SWB and sustainability, as well as real GDP, to be outputs, while adding SWB to the usual set of inputs. To the extent that production processes are delivering environmentally sustainable well-being, then SWB and sustainability can plausibly be considered outputs. And, given prior literature cited by the authors providing evidence that SWB is important for productivity (see the just-described article in this symposium as well), SWB also can plausibly be considered an input.

As noted, the article uses DEA, and the estimates of weights in the numerator and denominator indicate which of SWB, sustainability, and real GDP should count as outputs and which of SWB and the usual set of inputs should count as inputs for different countries. The implementation is flexible in that different countries can have a different mix of outputs and inputs and this mix can change over time.

For experts on DEA, the authors use the “output-oriented” approach (rather than the “input-oriented” approach) on the reasonable assumption that, with SWB as an input, countries would not choose to reduce inputs including SWB. The authors also assume constant returns to scale and use a different definition of SWB to make it feasible to include SWB as both an output and an input.

For data, the article relies on real GDP as well as capital and labour measures from the Penn World Tables for 23 European countries. SWB is measured based on the Eurobarometer survey, gauging the fraction of people in each country and in each year that indicate that they are very satisfied with their lives. The article’s measure of adjusted net savings is computed by the World Bank and includes “national savings minus fixed capital consumption plus educational expenditures minus depletion of natural resources and minus damages from CO2 emissions and particulate emissions.”

This analysis indicates that SWB appears either as an input or an output for almost all countries in the sample, confirming the importance of considering SWB. Countries where SWB appears as an input include the Nordic countries and some western countries generally characterized by high levels of well-being (Denmark, Sweden, Finland, Luxembourg, Ireland, Netherlands, United Kingdom, Cyprus, Turkey, and Poland). The countries where SWB appears as an output are Eastern European countries and some western countries (Estonia, Hungary, Czechia, Slovakia, Lithuania, Germany, Spain, and France). Finally, SWB never appears as both an input and an output.

Adjusted net savings appears much less frequently, with Belgium and Slovenia the only countries for which this variable appears as an output most of the time.

The article does some initial investigation into what distinguishes the countries for which SWB is an input or an output. The key finding here is that countries for which SWB frequently appears as an input tend to have a large share of their population that are very satisfied with their lives. In addition, the article calculates conventional Malmquist productivity indexes (a TFP like index) and well-being adjusted Malmquist indexes for each country. Interesting results indicate that growth rates of the conventional and well-being-adjusted indexes are far from perfectly correlated, suggesting that they are conveying different information. This outcome, of course, repeats similar findings in Legge and Smith (2022) and the first article in this symposium by Sarracino and O’Connor.

Results in this article provide a provocative start to thinking about linkages between productivity and well-being and whether and why SWB appears as an input or an output. That being said, this article does not provide specific guidance to policy makers and leaves unanswered questions for future research, including further investigation into why SWB appears as an input or output in different countries.

Take-Aways and Research Directions

The introduction to the symposium in the Spring issue of the *International Productivity Monitor* included 12 take-aways that are relevant to the three articles in this

symposium, and that discussion is not repeated here.

Taking a step back, the holy grail for this literature would be specific policy recommendations that countries could follow to boost well-being. Perhaps not surprisingly, the literature is not yet at that point. (Not surprising given that Development and Growth Economics often struggle with providing crisp policy recommendations for how countries can boost GDP in the long run and given the challenges of identifying the direction of causality in productivity and well-being analysis.) Such recommendations would be especially valuable given that the ultimate purpose of systems of production and distribution is to generate well-being rather than just goods and services.

The articles in the Spring symposium and the ones in this volume highlight once again that SWB matters in important ways, which are not captured by GDP. The articles also highlight some potentially

implementable recommendations such as the importance of investments in health to well-being and the importance of worker well-being to boosting productivity which in turn should provide a boost to well-being. In addition, John Helliwell's closing remarks in this volume provides valuable suggestions for future research directions that could ultimately lead to more specific policy recommendations.

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