

Constructing a Multidimensional Index for Financial Well-Being

Jared Martin U. Desello¹

¹ School of Management, Japan University of Economics, Fukuoka, Japan

Correspondence: Jared Martin U. Desello, School of Management, Japan University of Economics, Fukuoka, Japan. E-mail: jared_desello@yahoo.co.jp

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Abstract

This research presents a new index that measures financial well-being by incorporating three dimensions: financial confidence, financial resilience, and uncertainty. It employs a two-stage principal component analysis to come up with a single indicator for each representative economy, which is then ranked from highest to lowest. Thereafter, the author calculated the cross-country impact of the financial well-being index against poverty, income inequality, and unemployment. The results show that higher financial well-being tends to significantly correlate with better income distribution and lower incidence of poverty. Its relationship with unemployment is not statistically significant. We contend that financial well-being as a measure needs to be considered by policymakers and industry leaders as an indicator to evaluate the effectiveness of financial products and services in enabling financial resilience, confidence, and greater economic freedom towards individuals, going beyond financial inclusion.

Keywords: financial inclusion, financial well-being, principal component analysis

1. Introduction

The COVID-19 pandemic has reignited discussions on the need to strengthen economic resilience among individuals. The World Development Report 2022 highlights the severe economic impact of the pandemic with particular focus on households and smaller businesses brought about by the sudden loss of employment and income. During that time, about 90% of countries around the world saw their respective economies slow down, a figure much higher than the Great Depression or even the two World Wars. On the other hand, COVID-19 appears to have brought about an improvement in financial inclusion. Data from the World Bank's Global Findex Database reveals that formal financial account ownership among adults in developing countries went from 42% in 2011, to about 71% in 2021, mostly due to the greater adoption of mobile money services. This trend points to the increasing role of digital platforms that make owning and using financial products and services much more accessible, especially to underserved markets. But having access to, and being able to use them is only one part of the equation. As we have seen during the COVID-19 pandemic, there is also a need to ensure that individuals are better equipped to face unexpected financial shocks. We should also consider if people are able to confidently use their financial products and services to achieve their financial goals. As financial inclusion rises, we need to make sure that users are benefiting from these solutions. To that end, this research proposes the creation of a multidimensional index that measures financial well-being.

Financial well-being is defined as "a state of being wherein a person can fully meet current and ongoing financial obligations, can feel secure in their financial future, and is able to make choices that allow enjoyment of life" (CFPB, 2015). This definition underscores the notion that financial wellbeing is not just concerned with the availability of financial wealth, but also having a sense of security and confidence about one's current and future economic situation. At the same time, financial well-being also impacts individuals beyond their economic aspect. Several studies have documented the negative effects that poor financial well-being has on a person's physical and mental health. Using data representative of adults in the United States, Ryu and Fan (2023) point out the relationship between financial worries and psychological distress. Bialowski et al. (2021) likewise reports a similar conclusion that having "favorable financial conditions" contributed to mental and physical health, and associated with a reduced risk of depression. As economic uncertainty around the world continues to stifle growth (Ahir, Bloom, & Furceri, 2023), sources of financial stressors are likely to increase and overall financial well-being may be adversely affected, as Borrescio-Higa et al. (2022) concludes on the COVID-19 pandemic.

This paper aims to construct a financial wellbeing index that includes core questions from The Global Findex Database 2021 report, as well as data that measure the level of income and economic uncertainty for each country. We employ Principal Component Analysis (PCA) to derive the weights of the index and rank the countries from highest to lowest. While studies that attempt to construct a general index for overall financial inclusion are numerous (i.e., Sarma, 2008; Camara & Tuesta, 2014; Park & Mercado, 2018; Nguyen, 2021), efforts to do so for financial well-being are largely confined to specific countries (Hayes et al., 2016; Financial Consumer Agency of Canada, 2019; Cardenas et al., 2021). Subsequently, following the approach of Park and Mercado (2018) for financial inclusion, this research will measure the impact of financial well-being on poverty and income inequality, as well as unemployment. Bruggen et al. (2017) suggests that financial well-being contributes positively to societal welfare, which includes economic growth. This research attempts to test this hypothesis and check whether financial well-being impacts these measures. In summary, the contributions of this paper are the construction of a cross-country index of financial well-being, and verifying the relationship between financial well-being and selected development indicators.

The rest of the paper will proceed from a review of literature on financial well-being; its various definitions and measurements, as well as look into principal component analysis and its strength and weaknesses with regards to building indices. After that, the data and methodology will be discussed, which includes the approach in calculating the values of the index from the principal component analysis. Results will then be reported and discussed, to be followed with the paper's conclusions and recommendations.

2. Literature Review

2.1 Financial Well-Being

Numerous studies have set out to define and measure the concept of financial well-being, but authors contend that there is no consensus on a definitive measure yet (Aubrey et al., 2022; Bruggen et al., 2017; Fan & Henager, 2021; Kempson et al., 2017). Riitsalu et al. (2023) cites several authors on the various terminology used interchangeably with financial well-being such as: financial wellness, financial health, financial satisfaction, financial comfort, and financial resilience. The same authors likewise suggest that the definition of financial well-being might even differ with age and the changing priorities that accompany it. In other studies, financial well-being is defined by negation such as 'financial fragility' or 'financial stress'. We explore the different definitions and approaches to measuring financial well-being.

One study that aimed to assess the overall financial well-being of households referred to this measurement as "financial fragility", described as the ability of U.S. households to come up with \$2,000 in 30 days (Lusardi et al., 2011). This \$2,000 figure may represent the cost of a major car repair, a medical expense, legal expenses, or home repair at that time. Their results reveal that about 25% of Americans would not be able to come up with this amount of money within the set time period. Because of this, the researchers hoped that aside from the focus on long-term asset building, their study could raise the importance of short-term emergency savings as well. Similarly, Prawitz et al. (2006) devised the InCharge Financial Distress/Financial Well-Being Scale that aimed to measure the level of financial distress each respondent had. The scale is made up of subjective questions that asked each individual about their level of financial stress, their level of satisfaction about their financial situation, and how much they worry about ongoing and upcoming financial obligations, among others.

Bruggen et al. (2017), on the other hand, sought to distinguish objective and subjective approaches to defining and measuring financial well-being, pointing out the strengths and weaknesses of each. The authors highlight the limitations of a purely objective approach, and ultimately define financial well-being as "the perception of being able to sustain current and anticipated desired living standards and financial freedom". From their definition, financial well-being takes on more of a personal and subjective approach where only the "individual can assess his/her own well-being". At the same time, financial well-being should cover both a person's present situation, as well as their future, expected situations; echoing earlier research on the topic.

This subjective approach to defining financial well-being was further developed by Sorgente and Lanz (2019) where the authors devised a 25-item multidimensional subjective financial well-being scale aimed towards young adults. Their study originally came about following the aftermath of the 2008 financial crisis specifically towards the financial well-being of the youth population. The survey included statements on general subjective financial well-being, financial future, having money, money management, and peer comparison where respondents have to rate themselves on how much they agree or disagree to each.

The World Bank in their Global Findex 2021 report includes the aforementioned definitions and describes financial well-being as related to a person's ability to face an unexpected event, the amount of stress brought about by common financial issues, and one's confidence in using financial resources (Demirguc-Kunt et al.,

2022). In the survey, financial well-being has two main sub-components: financial resilience and financial worrying. Under this framework, financial resilience is defined as the ability of adults to financially respond to and cope with sudden or unexpected financial obligation (Demirguc-Kunt et al., 2022), similar to the earlier definition of financial fragility. To measure this, the institution asks questions regarding the ability to come up with money equivalent to 5% of the respective country's gross national income (GNI) within the next seven (7) or thirty (30) days. Financial worrying, on the other hand, is the anxiety or stress that comes from "not having sufficient [financial] protection" against economic shocks or future expenses; similar to the definition of financial stress. Four key financial issues are covered by questions pertaining to financial worrying, which aim to measure the level of worry in covering for the following anticipated costs: living expenses for old age, medical costs from a serious illness or accident, monthly bills and expenses, and school or education-related fees. From this definition of financial well-being, we can observe a largely subjective approach in its measurement as demonstrated by self-report questions that gauge an individual's level of resilience or worrying.

The Consumer Financial Protection Bureau (CFPB) similarly proposes a consumer-centric definition of financial well-being as a condition where "a person can fully meet current and ongoing financial obligations, can feel secure in their financial future, and is able to make choices that allow enjoyment of life" (CFPB, 2015). According to the CFPB's measurement, both immediate or short-term financial needs should be covered alongside long-term or unexpected needs in the future. This implies that financial worries are not only limited to one's daily or monthly bills, but also include unforeseen events that require a certain level of financial cushion to get through. An example of such unexpected event that caused widespread economic hardship was the COVID-19 pandemic.

The World Development Report 2022 published by the World Bank details the economic impact of the COVID-19 pandemic to countries around the world. According to the report, about 50% of households from both emerging and developed economies did not have the capability to "sustain basic consumption for more than three months" in the event of a severe financial shock (World Bank, 2022). This was likely due to the fact that even before the pandemic, many of these households were already saddled with financial debt; and the subsequent layoffs and job reductions led to sharper declines in income and financial capability. Borrescio-Higa, et al. (2022) investigated the economic impact of COVID-19 and the role of financial distress in the well-being of survey respondents in Chile. Their results suggest that unemployment and income loss brought about by the unexpected crisis predict financial distress which, in turn, led to loss of well-being. Tonzer (2017) likewise concludes that well-being is negatively affected by economic uncertainty, in the context of 20 European countries. In addition, Friedline et al. (2020) emphasizes that recent studies on financial well-being tend to focus more the individual's social contexts, such as family, race, or culture, and less on explanations rooted on the economic environment or the economy itself. The authors encouraged researchers to look into the impact of the economic environment on stress and well-being. Thus, there is an opportunity to include uncertainty with the economic environment as one of our perspectives on overall financial well-being.

This section has presented the different ways on how researchers and institutions who study financial well-being define and measure this concept. One of the features that stood out is the importance of having a multidimensional measurement that incorporates objective and subjective components. At the same time, financial well-being is not only concerned with immediate or near-term financial needs, but should also consider longer-term and future concerns, accounting for unexpected events. This paper's definition and the subsequent indicators of the financial well-being index will largely be based on the World Bank's and CFPB's multidimensional definition of financial well-being, at the same time accounting for uncertainty as an objective component in our index.

2.2 Principal Component Analysis as a Method for Index Construction

Jolliffe (2002) points to the works of Pearson (1901) and Hotelling (1933) as the generally accepted origin of the statistical technique known as Principal Component Analysis (PCA). PCA is a technique that aims to reduce a dataset's number of dimensions with several correlated variables, while still retaining much of its existing variation (Jolliffe, 2002). This ability to be able to compress a large amount of variables into fewer "principal components" has led PCA to become a reliable technique in handling multivariate data, and as a tool for constructing indices (Abeyasekera, 2005). Dimensionality reduction is a key feature and advantage of using PCA as it effectively makes a large dataset easier to analyze. The method likewise assigns weights to each component based on their contribution to the total variance resulting in a representative index.

Mazziotta and Pareto (2015), however, caution on solely relying on the first few principal components in building the index as there is a possibility to lose some information. To address this concern, this paper adopts

the method of Camara and Tuesta (2014) where the weights of the indicators will be derived from all principal components to account for 100% of the variation in the model. Another criticism of PCA is its tendency to give more importance or weight to highly correlated indicators, while giving lesser weight to the rest, which may have more theoretical significance (Mishra, 2008). Similar to the previous issue, this can be mitigated by accounting for all the variation in the model, and likewise carefully selecting the indicators to be included in the analysis.

One closely-related application of this methodology is the construction of an index measuring financial inclusion. Several studies have used PCA to construct respective indices that measure financial inclusion. Camara and Tuesta (2014) is often cited in the literature for building a multidimensional index for financial inclusion. Since financial inclusion is a multi-faceted concept that cannot be represented by a single indicator, the researchers aimed to construct a measure that combines information from various supply and demand factors using a statistically-appropriate methodology, in contrast to previous attempts to build the same but focused on supply-side data (i.e., Sarma, 2008). Park and Mercado (2018) improves on the previous two approaches to create their own financial inclusion index and attempted to measure the impact of financial inclusion against poverty, income inequality, entrepreneurship, and female empowerment.

In summary, PCA is an effective approach in index construction due to its feature of reducing a large number of dimensions to a fewer set of principal components while retaining most information. This results in greater ease in the interpretability of results, while being able to utilize a large dataset. However, this interpretability may lead to a loss in important information depending on how many components will end up discarded. In this paper, we will apply a two-stage principal component analysis to obtain the weights of the dimensions encompassing our definition of financial well-being. All derived components will be used to account for 100% of the variability in the model.

3. Data and Methodology

This chapter presents the discussion on the definition and dimensions of financial well-being as applied to the study, the data sources where the various indicators are sourced from, and the statistical analyses used to address the research questions.

The study borrows the definition of the World Bank and CFPB to define financial well-being. Both institutions emphasize the importance of resilience especially during times of unexpected financial events, and at the same time having some degree of confidence or control over one's regular financial obligations, both in the present and future. However, the COVID-19 pandemic has allowed discussions on how uncertainty undermines overall well-being to resurface, as these unexpected events limit an individual's ability to make choices that enhance their quality of life. As such, this paper identifies three dimensions that will allow us to construct an index for financial well-being: financial resilience, financial confidence, and uncertainty.

Financial resilience refers to the capacity of individuals to manage their finances effectively when confronted with unexpected income loss or necessary expenses (Demirguc-Kunt et al., 2022). The Global Findex Report identifies several main indicators to describe resilience, which includes access to extra funds, savings behavior, and various ways of utilizing financial products and services such as digital payments, banks, or insurance coverage. This paper uses the following data to define financial resilience: (1) Coming up with emergency funds in 7 days: possible and not difficult (Global Findex Database), (2) Coming up with emergency funds in 30 days: possible and not difficult (Global Findex Database), (3) Saved any money (Global Findex Database), and (4) GDP per capita (IMF Database). The indicators from the Global Findex Database are aggregated responses of 128,000 adults across 114 economies.

Another related concept that the Global Findex Report attributes to overall financial well-being is 'financial worrying'. While resilience is the ability to obtain financial resources during unexpected situations, financial worrying refers to anxiety or worry that individuals experience about their financial situation. The report targets four common issues that can lead to financial anxiety: (1) Living expenses for old age, (2) Medical costs arising from an illness or accident, (3) Monthly bills and expenses, and (4) School or education fees. In this paper, to align with the positive polarity of the indicators on financial resilience, we obtain responses that indicate "Not worried at all". We will refer to this dimension of financial well-being as "financial confidence" instead.

Uncertainty is a vague idea that represents the "doubts" in the minds of individuals about potential future events. In the context of personal finance, uncertainty may fuel the possibility of not being able to fulfill one's financial obligations, depending on the nature and extent of an unforeseen economic event. While the term "uncertainty" was not explicitly mentioned as a direct cause in the Global Findex Report, the continuing impact of the COVID-19 pandemic has been a significant source of worry for respondents. Global events that led to financial

turbulence (e.g., global recessions, COVID-19 pandemic, Russia-Ukraine war) have increased uncertainty about the future and with that, the need to manage one’s finances (Sorgente et al., 2023). Measuring uncertainty, however, remains a challenge and literature has largely relied on proxy measurements such as stock returns, productivity, or the appearance of “uncertainty-related” words in publications (Jurado et al., 2014). In this study, we rely on the World Uncertainty Index (WUI) by Ahir et al. (2022) to account for uncertainty in our index. The WUI is derived by counting the appears of the word “uncertain” or its equivalent in the Economist Intelligence Unit country reports. A higher count is interpreted as higher uncertainty applicable to a specific country. This paper utilizes the 3-quarter weighted moving average calculation of the WUI (i.e., $2021Q4 = [(2021Q4*0.6) + (2021Q3*0.3) + (2021Q2*0.1)]/3$).

To obtain the weights needed to calculate the Financial Well-being Index, we gather the necessary data across our three identified dimensions: financial resilience, financial confidence, and uncertainty, and utilize a two-stage principal component analysis similar to the approach of taken by Camara and Tuesta (2014). The first stage estimates sub-indices for each of the dimensions using their respective underlying indicators, after which the second stage allows us to derive the weights of the overall dimensions themselves. Once we have obtained these weights, we calculate the overall index using the weighted average of the dimensions we obtained using PCA. Figure 1 summarizes the relationship between financial well-being and its dimensions.

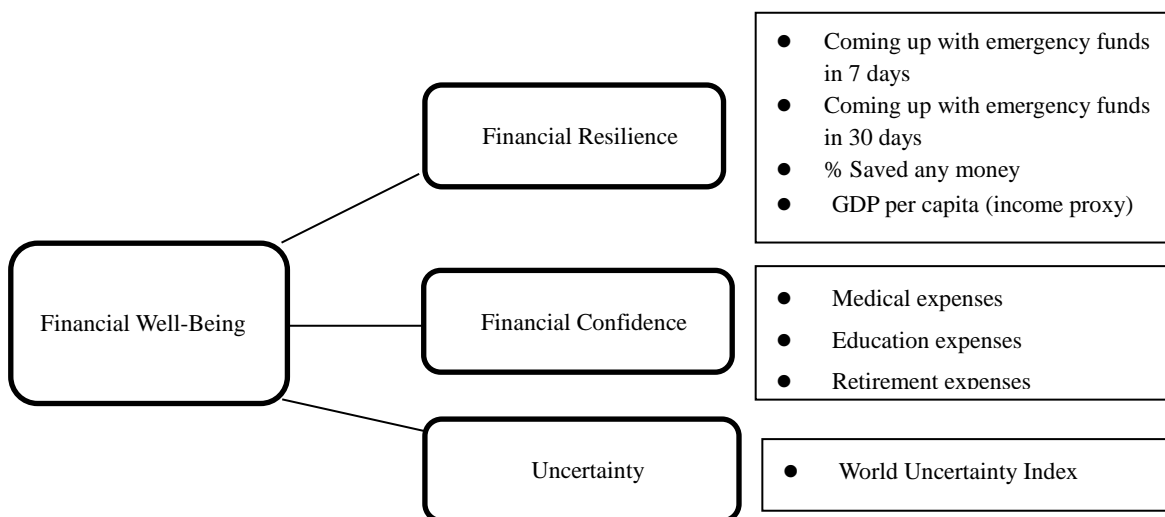


Figure 1. Financial Well-Being Index

Source: Author’s elaboration.

Let us assume that financial well-being can be expressed as follows:

$$FW_i = \omega_1 D_i^r + \omega_2 D_i^c + \omega_3 D_i^u + e_i \tag{1}$$

where i refers to the country, D_i^r to the dimension of financial resilience, D_i^c to financial confidence, and D_i^u to uncertainty. As Camara and Tuesta (2014) explains, as long as the model specification is sound and there is an adequate number of explanatory variables, then we can expect the variance coming from the error term e_i to be minimal, with most of the variation coming from the causal variables.

The first stage PCA estimates the two endogenous variables: D_i^r and D_i^c , and the parameters in the following equations:

$$D_i^r = \beta_1 emergency7_i + \beta_2 emergency30_i + \beta_3 savings_i + \beta_4 percap_i + u_i \tag{2}$$

$$D_i^c = \gamma_1 medical_i + \gamma_2 education_i + \gamma_3 retirement_i + \gamma_4 bills_i + u_i \tag{3}$$

As the dimension on uncertainty (D_i^u) is defined solely by the values from the WUI, there is no need to perform the same estimation. We represent λ_j ($j = 1, \dots, p$) as the j -th eigenvalue, where the subscript j indicates the number of principal components, which is the same as the number of indicators, p . The vector $q_j(p \times 1)$ is the eigenvector of the correlation matrix. We assume that $\lambda_1 > \lambda_2 > \dots > \lambda_p$ and refer to P_k ($k = 1, \dots, p$) as the k -th principal component. We can then derive each dimension estimator according to the weighted averages calculated by:

$$D_d = \frac{\sum_{j,k=1}^p \lambda_j P_k}{\sum_{j=1}^p \lambda_j} \quad (4)$$

In Equation 4, $P_k = X\lambda_j$ denotes the variation found in the k-th principal component and X refers to the indicators matrix. As the weights of each subsequent principal component tend to decrease, more weight or “importance” is ascribed to the initial principal components. Following the approach of Camara and Tuesta (2014), and subsequently of Park and Mercado (2018), this study likewise accounts for 100% of the total variation for each dimension index, for the purpose of not losing information that could contribute to the overall index.

Once all the dimension indices have been calculated, we perform a second principal component analysis to obtain the weights for each dimension, summing up to overall financial well-being.

$$FW_i = \frac{\sum_{j=1}^p \lambda_j P_{ki}}{\sum_{j=1}^p \lambda_j} \quad (5)$$

In Equation 5, FW_i refers to the overall financial well-being index for country i . $P_k = X\lambda_j$ denotes the variation found in the k-th principal component and X refers to the dimensions matrix. Again, we account for 100% of the total variation in the financial well-being index. Equation 5 can likewise be represented by Equation 1, where ω are the weights derived from the principal component analysis.

Prior to performing the principal component analysis, we run a Kaiser-Meyer-Olkin (KMO) test and Bartlett’s test of sphericity to determine the suitability of the dataset for factor analysis. Both tests help to ascertain if the dataset has adequate correlations among its variables, which is a pre-condition for running the PCA.

After obtaining the values for the index, we address the question on what the impact of financial well-being is on development measures such as inequality, poverty, and unemployment. We estimate the following regression equations:

$$Inequality_i = \alpha + \phi_1 FW_i + \phi_2 Percap_i + \phi_3 Educ_i + e_i \quad (6)$$

$$Poverty_i = \alpha + \phi_1 FW_i + \phi_2 Percap_i + \phi_3 Educ_i + e_i \quad (7)$$

$$Unemployment_i = \alpha + \phi_1 FW_i + \phi_2 Percap_i + \phi_3 Educ_i + e_i \quad (8)$$

For every development indicator, we used two different kinds of measurement to see whether any difference in impact exists or not. For instance, inequality is measured by the Gini index and the income share held by the highest 20%. Poverty is measured by multidimensional poverty headcount ratio by the World Bank and the percentage of the population at societal poverty line. Unemployment is measured by either the International Labor Organization estimate and the national estimate. All models include the calculated financial well-being index, GDP per capita growth, and the percentage of the population that has completed at least secondary education; following the models of Park and Mercado (2018). Data for the development indicators per country were obtained from the World Bank’s World Development Indicators database. For this second analysis, data was not available for all 114 countries.

4. Results and Discussions

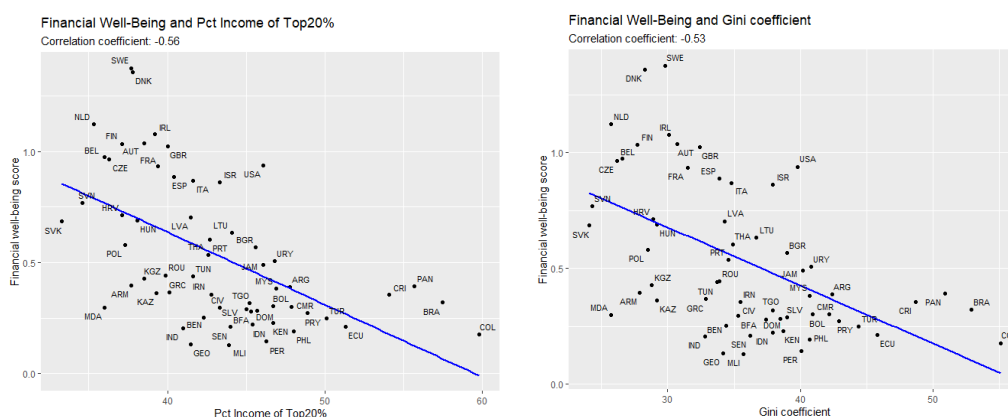
Table 1 shows the top 30 countries ranked from highest to lowest according to financial confidence, financial resilience, uncertainty, and overall financial well-being. From the list, it can easily be observed that most countries with high financial confidence and resilience, and overall financial well-being, are high income countries. The World Bank’s Global Findex report shows that 79% of adults in developed economies demonstrate more economic resilience compared to 55% in developing countries. The sources of “financial worries” tend to differ by income level as well, with high-income countries worrying more about retirement, while other countries worry more about medical or education expenses. These imply that perhaps in some countries, access to affordable medical insurance or education may still be out of reach. At the same time, more adults in upper-middle and high-income countries tend to not be worried at all, in contrast to a smaller proportion in lower-middle and low-income economies. Generally, an environment of economic stability, which reduces financial stress and promotes less fluctuations in employment and income, along with the necessary social infrastructures in healthcare and education, tends to promote better financial confidence, resilience, less uncertainty, and overall well-being.

Table 1. Top 30 countries according to financial confidence, financial resilience, uncertainty, and financial well-being

Rank	Financial Confidence	Financial Resilience	Uncertainty	Financial Well-Being
1	Denmark	Norway	Chile	Sweden
2	Sweden	Sweden	Nepal	Denmark
3	Norway	Denmark	Guinea	Norway
4	Netherlands	Iceland	Peru	Netherlands
5	New Zealand	Switzerland	Switzerland	New Zealand
6	Iceland	Ireland	United Kingdom	Ireland
7	Ireland	Austria	Norway	Australia
8	United Arab Emirates	Finland	Colombia	Austria
9	United Kingdom	Australia	Greece	Finland
10	Australia	United Kingdom	Romania	United Kingdom
11	Estonia	New Zealand	North Macedonia	Canada
12	Canada	Czech Republic	Ireland	Switzerland
13	Finland	Hong Kong SAR, China	Malaysia	Belgium
14	Switzerland	Netherlands	El Salvador	Czech Republic
15	Belgium	Germany	Bosnia and Herzegovina	United States
16	Austria	Canada	Kyrgyz Republic	France
17	France	United States	South Africa	Germany
18	Italy	Belgium	Nicaragua	Spain
19	Czech Republic	Singapore	Hong Kong SAR, China	Taiwan, China
20	United States	Taiwan, China	Kenya	Italy
21	Israel	Estonia	Moldova	Israel
22	Spain	France	Slovak Republic	Hong Kong SAR, China
23	Saudi Arabia	Japan	Cambodia	United Arab Emirates
24	Croatia	Spain	Nigeria	Slovenia
25	Taiwan, China	Korea, Rep.	Philippines	China
26	Uzbekistan	Malta	Georgia	Saudi Arabia
27	Malta	Slovak Republic	Turkey	Croatia
28	Slovenia	Italy	Panama	Latvia
29	Germany	Israel	Uzbekistan	Korea, Rep.
30	China	China	Costa Rica	Japan

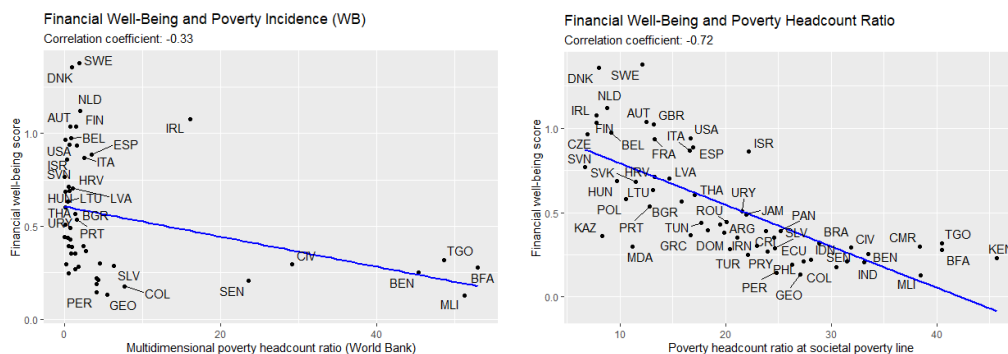
Source: Author’s calculations.

Next, we test the relationship between financial well-being and measurements of inequality, poverty, and unemployment. We hypothesize that countries with high financial well-being tend to have lower inequality, poverty, and unemployment. Data for the development indicators were only available to a limited number of economies, so the models only accounted for countries that had them. Figures 2-4 show the scatterplots with the correlation coefficients between financial well-being and each respective development indicator.



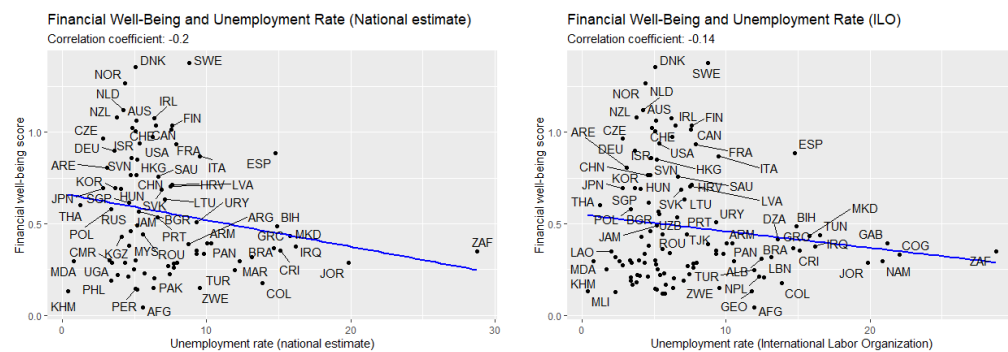
Figures 2a and 2b. Correlation between financial well-being and measures of inequality

Source: Author’s calculation.



Figures 3a and 3b. Correlation between financial well-being and measures of poverty

Source: Author's calculation.



Figures 4a and 4b. Correlation between financial well-being and measures of unemployment

Source: Author's calculation.

The calculated correlation coefficients confirm the hypothesized negative relationship with financial well-being. With respect to inequality, Figures 2a and 2b show a strong negative correlation (i.e., $r = -0.56$ and $r = -0.53$, respectively) with financial well-being, implying that countries with better financial resilience, confidence, and lower uncertainty tend to have lower levels of inequality among residents. This result is similarly reflected when tested against measures of poverty, as seen in Figures 3a and 3b. In particular, Figure 3b shows a very strong negative correlation (i.e., $r = -0.72$) between financial well-being and poverty headcount as defined by each respective country's poverty line. However, the same results were not found when tested against unemployment. Figures 4a and 4b show a relatively weak negative correlation (i.e., $r = -0.2$ and $r = -0.14$, respectively) between financial well-being and indicators of unemployment.

Table 2. Estimates on inequality, poverty, and unemployment

	Inequality		Poverty		Unemployment	
	Gini	Top20%	WB	Societal	ILO	National
Financial Well-Being	-9.328** [0.004]	-7.965** [-3.397]	-0.128 [-0.070]	-12.523*** [-3.702]	-2.966 [-1.364]	-2.905 [-1.358]
Per Capita GDP Growth	-0.311 [-1.238]	-0.245 [-1.266]	0.207 [1.331]	-0.554 [-1.986]	0.012 [0.099]	-0.101 [-0.822]
Education	-0.030 [-0.403]	-0.018 [-0.319]	0.037 [0.804]	-0.148 [-1.794]	0.034 [0.760]	0.030 [0.676]
(Intercept)	42.724*** [13.881]	48.789*** [20.594]	-0.768 [-0.375]	33.417*** [9.779]	7.848*** [5.042]	8.638*** [5.695]
Adj. R-squared	0.288	0.328	-0.026	0.503	-0.020	-0.002
N	32	32	29	32	55	56

Note. Dependent variables are various measures of income inequality, poverty, and unemployment for 2021. The independent variables are values of financial well-being, GDP per capita growth, percentage of secondary education completion for 2021. T-stats are reported in brackets.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 2 shows the results of the OLS models we constructed on the relationship of financial well-being on inequality, poverty, and unemployment. For each model, the dependent variables are the indicators of development (i.e., inequality, poverty, unemployment) were regressed against financial well-being scores, per capita GDP growth, and percentage of secondary education completion as a proxy for level of education in each country.

Based on the regression estimates, higher financial well-being scores strongly correlate with lower income inequality measured through the Gini coefficient and the share of income held by the wealthiest quintile in an economy. This relationship is highly significant, implying that financial well-being meaningfully impacts income inequality. Specifically, a one-point increase in a country's respective financial well-being score, leads to an 8-9 points reduction in their Gini coefficient and the share of income held by the top 20%, respectively. The lower the Gini coefficient, the lower that economy's measure of income inequality. When individuals attain a state of financial resilience and confidence, it implies that they were able to make use of available financial products and services to satisfy their present and future (i.e., unforeseen) financial needs. This higher level of financial participation in the economy through savings, wealth accumulation, or investments, may likely lead to lesser inequality or greater income distribution.

Looking at poverty headcount, financial well-being likewise demonstrates a highly significant association with poverty according to relative societal measures. A one-point increase in a country's financial well-being score leads to a 12% reduction in societal poverty. The model's coefficient of determination (i.e., R-squared) was also the highest at 0.50, implying the model's relatively high predictive value. The relationship with the World Bank's absolute poverty measure was not found to be statistically significant. Similar to the other models, the relationship with per capita GDP growth and educational achievement was not significant.

Lastly, the model for unemployment does not show a statistically significant relationship with any of the independent variables, including financial well-being scores. Furthermore, the negative value of the R-squared suggests that the independent variables of the current model are insufficient to explain both measurements of unemployment rates.

5. Conclusion and Recommendations

This study had two main objectives: first, to construct a multidimensional index for financial well-being that accounted for measures in financial resilience, confidence, and uncertainty; and second, to test whether this index correlates with development measures such as income inequality, poverty, and unemployment. The core components of our constructed financial well-being index relies on responses from the World Bank's The Global Findex Database report, as well as the World Uncertainty Index that measures the level of uncertainty in economies around the world. A two-stage principal component analysis was used to calculate the financial well-being index, and ordinary least squares were constructed to measure the relationship with development measures.

Based on the results of the two-stage principal component analysis, financial confidence, financial resilience, and uncertainty roughly have similar contributions or weights to the overall score. The financial well-being index showed that countries scored at the top of the list are largely high and upper middle income economies. This is well within expectations as most of these countries have well-functioning financial industries and relatively stable economies, which may have contributed to higher financial resilience and confidence to people living there.

Our second objective looked into the relationship between the constructed financial well-being index against selected development measurements on income inequality, poverty, and unemployment. Results have shown that our financial well-being index has a highly significant negative relationship with income inequality and poverty measurements. Although the relationship with unemployment was not statistically significant, the findings emphasize the multifaceted nature of financial well-being and its potential impact on broader development outcomes.

The CFPB defines financial well-being as a state where individuals can confidently find a way to meet their current and future financial obligations, and ultimately enjoy living their lives. Based on our results, countries that have achieved a high level of financial well-being are also the ones with better income distribution and lower measures of poverty. Further studies can look into what measures and policies have enabled some countries to achieve high well-being scores, and whether their residents likewise exhibit high levels of financial inclusion and literacy. Future research could likewise consider additional indicators to improve the index, as well as investigate the index's impact on other development measures.

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Appendix A

Financial Well-Being, Financial Confidence, Financial Resilience, and Uncertainty of All Countries

Rank	Financial Confidence	Financial Resilience	Uncertainty*	Financial Well-Being
1	Denmark	Norway	Chile	Sweden
2	Sweden	Sweden	Nepal	Denmark
3	Norway	Denmark	Guinea	Norway
4	Netherlands	Iceland	Peru	Netherlands
5	New Zealand	Switzerland	Switzerland	New Zealand
6	Iceland	Ireland	United Kingdom	Ireland
7	Ireland	Austria	Norway	Australia
8	United Arab Emirates	Finland	Colombia	Austria
9	United Kingdom	Australia	Greece	Finland
10	Australia	United Kingdom	Romania	United Kingdom
11	Estonia	New Zealand	North Macedonia	Canada
12	Canada	Czech Republic	Ireland	Switzerland
13	Finland	Hong Kong SAR, China	Malaysia	Belgium
14	Switzerland	Netherlands	El Salvador	Czech Republic
15	Belgium	Germany	Bosnia and Herzegovina	United States
16	Austria	Canada	Kyrgyz Republic	France
17	France	United States	South Africa	Germany
18	Italy	Belgium	Nicaragua	Spain
19	Czech Republic	Singapore	Hong Kong SAR, China	Taiwan, China
20	United States	Taiwan, China	Kenya	Italy
21	Israel	Estonia	Moldova	Israel
22	Spain	France	Slovak Republic	Hong Kong SAR, China
23	Saudi Arabia	Japan	Cambodia	United Arab Emirates

24	Croatia	Spain	Nigeria	Slovenia
25	Taiwan, China	Korea, Rep.	Philippines	China
26	Uzbekistan	Malta	Georgia	Saudi Arabia
27	Malta	Slovak Republic	Turkey	Croatia
28	Slovenia	Italy	Panama	Latvia
29	Germany	Israel	Uzbekistan	Korea, Rep.
30	China	China	Costa Rica	Japan
31	Hungary	Slovenia	Brazil	Hungary
32	Hong Kong SAR, China	Latvia	Ukraine	Slovak Republic
33	Serbia	Poland	United Arab Emirates	Lithuania
34	Thailand	Portugal	Dominican Republic	Singapore
35	Latvia	Hungary	Finland	Thailand
36	Lithuania	Lithuania	Armenia	Poland
37	Tajikistan	Saudi Arabia	Lithuania	Bulgaria
38	Slovak Republic	Croatia	Tajikistan	Uzbekistan
39	Kyrgyz Republic	Cyprus	Kazakhstan	Portugal
40	Uruguay	Bulgaria	Singapore	Uruguay
41	Bulgaria	Thailand	Hungary	Jamaica
42	Bosnia and Herzegovina	United Arab Emirates	Poland	Bosnia and Herzegovina
43	Korea, Rep.	Greece	Thailand	Russian Federation
44	Panama	Serbia	Honduras	Romania
45	Tunisia	Romania	Myanmar	Tajikistan
46	Japan	Malaysia	Czech Republic	Tunisia
47	Algeria	Bosnia and Herzegovina	New Zealand	North Macedonia
48	Poland	Jamaica	Mali	Kyrgyz Republic
49	Romania	North Macedonia	Iran, Islamic Rep.	Algeria
50	Russian Federation	Chile	Bolivia	Armenia
51	North Macedonia	Mauritius	Tunisia	Gabon
52	Jamaica	Ukraine	Sri Lanka	Panama
53	Armenia	Uruguay	China	Argentina
54	Kazakhstan	Russian Federation	Croatia	Malaysia
55	Portugal	Ghana	Bangladesh	Iraq
56	Iraq	Kosovo	Bulgaria	Greece
57	Argentina	Myanmar	Slovenia	Kazakhstan
58	Chile	Iran, Islamic Rep.	Australia	Iran, Islamic Rep.
59	Nicaragua	Uganda	Portugal	Costa Rica
60	Costa Rica	South Africa	Liberia	South Africa
61	West Bank and Gaza	Bolivia	Taiwan, China	Lao PDR
62	El Salvador	Moldova	Latvia	Nicaragua
63	Cyprus	Gabon	Denmark	Ukraine
64	South Africa	Tunisia	Iraq	Chile
65	Gabon	Albania	Lao PDR	Myanmar
66	Lao PDR	Dominican Republic	Uruguay	Congo, Rep.
67	Malaysia	West Bank and Gaza	Morocco	Brazil
68	Singapore	Costa Rica	Albania	Togo
69	Brazil	Kenya	Ecuador	Albania
70	Congo, Rep.	Liberia	Uganda	Bolivia
71	Iran, Islamic Rep.	Armenia	Korea, Rep.	Ghana
72	Honduras	Argentina	Mongolia	Cameroon
73	Kosovo	Nicaragua	Italy	Moldova
74	Togo	Cameroon	Venezuela, RB	Morocco
75	Mauritius	Lao PDR	Ghana	Namibia
76	Myanmar	Brazil	Indonesia	Cote d'Ivoire
77	Paraguay	Algeria	Argentina	El Salvador
78	Greece	Iraq	France	Uganda
79	Ukraine	Malawi	Netherlands	Honduras
80	Cote d'Ivoire	Philippines	Algeria	Jordan

81	Morocco	Mongolia	Lebanon	Dominican Republic
82	Nepal	Morocco	United States	Burkina Faso
83	Moldova	Kyrgyz Republic	Cote d'Ivoire	Tanzania
84	Jordan	Namibia	Pakistan	Paraguay
85	Turkey	Uzbekistan	Afghanistan	Mongolia
86	Sri Lanka	Senegal	Jordan	Benin
87	Namibia	Togo	Japan	Sri Lanka
88	Albania	Congo, Rep.	Saudi Arabia	Turkey
89	Dominican Republic	Burkina Faso	Russian Federation	Kenya
90	Cameroon	Tanzania	Zimbabwe	Egypt, Arab Rep.
91	Bolivia	Benin	Germany	Nigeria
92	Egypt, Arab Rep.	Kazakhstan	Spain	Indonesia
93	Tanzania	Panama	Senegal	Mozambique
94	Burkina Faso	Nepal	Namibia	Ecuador
95	India	Nigeria	Benin	Nepal
96	Mongolia	Cote d'Ivoire	Mozambique	Senegal
97	Nigeria	Jordan	Canada	Lebanon
98	Colombia	Ecuador	Belgium	India
99	Benin	Peru	Sierra Leone	Philippines
100	Ghana	Honduras	Zambia	Venezuela, RB
101	Uganda	Mali	Tanzania	Liberia
102	Bangladesh	Lebanon	Togo	Colombia
103	Kenya	Indonesia	Cameroon	Bangladesh
104	Indonesia	Mozambique	Egypt, Arab Rep.	Sierra Leone
105	Pakistan	Turkey	Paraguay	Pakistan
106	Peru	Cambodia	Israel	Zimbabwe
107	Ecuador	El Salvador	Austria	Peru
108	Mozambique	Tajikistan	Congo, Rep.	Zambia
109	Lebanon	Colombia	India	Cambodia
110	Guinea	Sri Lanka	Jamaica	Georgia
111	Venezuela, RB	Guinea	Burkina Faso	Mali
112	Philippines	Zimbabwe	Sweden	Malawi
113	Senegal	Sierra Leone	Malawi	Guinea
114	Georgia	Venezuela, RB	Gabon	Afghanistan
115	Sierra Leone	Zambia	..	..
116	Cambodia	Paraguay	..	..
117	Zimbabwe	Georgia	..	..
118	Zambia	Egypt, Arab Rep.	..	..
119	Liberia	India	..	..
120	South Sudan	Bangladesh	..	..
121	Mali	Pakistan	..	..
122	Afghanistan	South Sudan	..	..
123	Malawi	Afghanistan	..	..

* Data was unavailable for Cyprus, Estonia, Iceland, Kosovo, Malta, Mauritius, Serbia, South Sudan, and West Bank and Gaza. These countries were excluded in the overall Financial Well-being Index

Appendix B

Principal Component Analysis Estimates

Financial Resilience					
Components	PC1	PC2	PC3	PC4	Norm Weight
emergency 30	0.5188	0.3541	-0.3424	-0.6987	0.26
emergency 7	0.5209	0.3204	-0.3385	0.7151	0.27
per capita income	0.4887	0.1192	0.8643	-0.0002	0.28
savings	0.4698	-0.8705	-0.1455	-0.0210	0.19
<i>eigenvalues</i>	3.4327	0.3134	0.2354	0.0184	

Financial Confidence					
Components	PC1	PC2	PC3	PC4	Norm Weight
medical	0.5087	-0.2516	0.1769	0.8042	0.26
education	0.4851	0.8539	-0.1882	0.0017	0.26
retirement	0.5000	-0.4346	-0.6859	-0.3013	0.23
recurring bills	0.5059	-0.1365	0.6804	-0.5124	0.25
<i>eigenvalues</i>	3.6695	0.1824	0.0922	0.0559	
Overall Financial Well-being					
Components	PC1	PC2	PC3	PC4	Norm Weight
financial confidence	0.7054	-0.0486	0.7071		0.37
financial resilience	0.7054	-0.0485	-0.7071		0.32
uncertainty	-0.0686	-0.9976	-0.0001		0.31
<i>eigenvalues</i>	1.8753	0.9959	0.1288		

Source: Author's calculations.

Weights were normalized to sum to 1.

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