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Exploring the limitations of GDP per capita as an indicator of economic development: a cross-country perspective

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Abstract: In this paper, we explore the drawbacks of GDP per capita in purchasing power parity as an indicator of economic development and well-being and evaluate the factors which diminish its ability to represent the level of life. Firstly, we theoretically outline the issues that might be undermining the suitability of GDP per capita as a measure of well-being, and debate other development indicators. Subsequently, we confront GDP per capita with the most well-known development indicator – the Human Development Index HDI – and calculate the deviations between these two indicators for a panel of 141 countries. To empirically evaluate the potential limitations of GDP in measuring development, we regress the computed deviations between development and GDP on an array of economic, social, and political variables employing a heterogeneous panel dataset and robust fixed effects estimators. The results reveal that countries with higher income inequality and level of economic freedom are characterised by lower development than implied by their GDP per capita. Contrarily, the size of the shadow economy is negatively linked to the deviations of HDI from GDP. Certain sociocultural, geographic, and ecological factors, such as higher fertility rates, cold climate, and the depletion of natural resources, are prevalent among nations ranking higher in GDP per capita than in development.

Keywords: Economic development, Quality of life, GDP per capita, Human Development Index.

JEL Classifications I31, O11, O15

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Introduction

In today's world, macroeconomic policies are aimed primarily at the quantitative growth of the economy understood as an increase of the gross domestic product, which has long since become a basic indicator of economic development and is often perceived as a measure of well-being. Among its pros are the simplicity, long history of usage (and thus, long enough time series for the economic theorists to indulge in), elaborate methodology and calculation techniques (Stiglitz et al. 2009). Due to that, even less economically

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advanced countries possess statisticians qualified enough for the computed numbers of GDP to be considered relatively exact.

GDP as a gauge of economic size and productive capacities gave birth to the most popular approach to quantification of people's level of life and overall economic welfare – GDP per capita[3] (Stiglitz et al. 2009; Atkinson and Marlier 2015). It is commonly employed to compare the economic well-being of countries; the increase of GDP per capita is regarded as an outcome of successful economic policies (at the very least, by their authors – Syrovatka, 2008).

However, the ability of GDP per capita to serve as an appropriate measure of economic development has become a subject of criticism[4] (Costanza et al. 2009; Stiglitz et al. 2009; Dynan and Sheiner, 2018). The debates[5] concern both the methodological drawbacks of GDP and the fact that the quantitative increase of the economy (even in per capita terms) often does not affect an array of individual components of human well-being, with social inequality, safety, health and civil rights being foremost among them (Costanza et al. 2009). These concerns brought up an opinion that GDP-oriented economic policies are frequently unable to augment the actual level of life and may be undermining the governments' ability to tend to the needs of the population (Sagar & Najam 1998; Stiglitz et al. 2009). It spurred the genesis of a wide range of economic and institutional indexes and indicators that are meant to provide a clearer picture of what is perceived as economic development and to capture its dynamics over time (Clapp and Sen 1999). A covetable level of popularity among both the economists and the general public has been attained by the so-called Human Development Index (HDI), which has stood as one of the United Nations' centrepieces in regard to economic development since 1990 and encompasses measurements of income, the length of life and educational standards (Klasen 2018). Other indicators that concentrate on the real consumption, quality of institutions, depletion of natural resources and economic sustainability, albeit being quite accurate in their intentions, are lagging behind (besides being fairly complicated for calculation) in the general public's awareness, struggle with the lack of data and are only irregularly published (Stiglitz et al. 2009). Nevertheless, the calls for wider adoption of these indicators as goals of economic policy appear to be loudening (Sagar and Najam 1998; Stiglitz et al. 2009).

The viability of such demands is amplified by the fact that GDP per capita exhibits only a limited degree of correlation with the most common development indexes (Hopkins 1991; Deb 2015). A clear illustration emerges from a simple operation: the rankings of the countries by GDP per capita (PPP) and HDI commonly diverge from each other by 30-80 places for both high- and low-income countries alike. The roots of this divergence

[3] As a rule, in purchasing power parity.

[4] In this paper, we use the terms "development", "well-being" and "level of life" as defined by the modern development economics – a multidimensional concept which embodies the aspects that are of direct or indirect impact on the quality of human life, such as health, income and education (Syrovatka 2008). Therefore, for simplicity, these terms may be viewed as synonymous.

[5] Which were started by one of the inventors of the GDP – Simon Kuznets often stated that the criticism stems from the fact that GDP became employed in a fashion it had never been meant to – according to him, GDP was developed to measure and compare the individual countries' productive capacities and cannot serve as a technique to evaluate economic development and well-being (Sagar and Najam 1998).

(i.e., the discrepancy between the mere per capita size of the economy and the level of life it facilitates) arose as the subject of this paper's research.

Up to this time, the existent surveys either inquired into individual methodological drawbacks of GDP per capita or attempted to explain its inability to serve as the standard of well-being, using common logic and conventional wisdom. This paper takes a more general approach and seeks to construct a rigorous framework for the identification of factors that cause the so-called development-GDP gaps – situations in which the level of life captured by HDI deviates from the level implied by GDP per capita. To achieve this, we quantify these deviations and regress them on a wide selection of economic, political, sociocultural, geographic and ecological indicators which may represent the fundamental reasons for discrepancies between well-being and GDP, while affecting either one of them or both. The aim of this work lies in providing answers to the following questions: in what instances cannot the increase of GDP per capita be associated with the rise of quality of life and what are the fundamentals accountable for it. The novelty of this paper lies not only in the estimation of these discrepancies and not mere correction of GDP or usage of ordered rankings of development indicators, but in the incorporation of divergent dimensions standing behind the development-GDP gaps, which are to explain their existence and persistence not only in economic, but social, cultural and political terms as well. Consequently, our findings bring forward a range of implications feasible for the development policies aimed at the revision of the growth-development nexus.

The above-written defines the goals of this paper, which may be put as follows. We are to theoretically identify the determinants of the potential discrepancies between the level of economic well-being and GDP per capita; then, we will test their actual impact on those discrepancies for the broadest country sample available. Therefore, we will arrive at an array of concrete factors that undermine the GDP per capita as a common development indicator. The results that we seek to provide will be underscoring the potential areas of interest for governments and international organizations attempting to increase countries' level of life and well-being for a given level of GDP per capita.

Firstly, we thoroughly identify the hindrances to the usage of GDP per capita as an indicator of economic well-being. Subsequently, we analyse the existent development indicators and reason our choice of well-being measure by highlighting the advantages of HDI as a development proxy. Afterwards, we introduce the econometric framework employed to quantify the factors standing behind the deviations between GDP per capita and HDI using a range of multidimensional variables and panel dataset for up to 141 countries, which is followed by a discussion of the results and the implications they provide.

1. Limitations of GDP per capita as an indicator of economic development

Despite common preconceptions, the rise of GDP as the cornerstone indicator of economic power (together with GDP growth being a criterion of economic policy success) occurred relatively recently – it has been in the scope of economists' attention for less than 100 years (Clapp and Sen 1999). The elaborate methodology resembling the one we possess today is no older than the American government's essays on the evaluation of their productive capacities before entering the WW2 (Clapp and Sen 1999).

The subsequent global spread of GDP was spurred by the post-war reconstruction of Europe and, more importantly, the wave of decolonization, which generated demand for an indicator enabling to compare the level of economic development in the newly emerged countries and evaluate the successfulness of economic policies designed for them by the international institutions (Clapp and Sen 1999). It resulted in developing countries being categorized according to their GDP per capita; it served as the benchmark for providing development aid, whereas its increase was perceived as the basic output of the development policies (Clapp and Sen 1999; Costanza et al. 2009; Stiglitz et al. 2009). This approach had remained almost exclusive up to the end of the 1990s, albeit certain concerns had already been expressed by those on the frontier of the development economics (Dasgupta 1990; Hopkins 1991; Clapp and Sen 1999). The criticism was related to relatively evident but largely ignored issues: GDP per capita failed to reliably encompass an assortment of economic activities that may possess an immense impact on the population's life and living standards in less developed countries[6] (which may be labelled as GDP calculation drawback for not including neither the outputs of shadow economy nor the non-monetary and non-market production – Giannetti et al. 2015), while also glossing over many aspects of well-being, such as inequalities, quality of institutions, public safety or the economic sustainability (Dasgupta 1990; Syrovatka 2008; Bala 2013). Subsequent academic discussions yielded the first development-oriented indicators – complex and multidimensional, but data-demanding and unnoticed by anyone outside the economic community (Clapp and Sen 1999; Syrovatka 2008; Atkinson and Marlier 2015). The change came when the policymakers from both developed and developing worlds were confronted with the harsh reality of GDP per capita growth not being perceived as an increase of well-being by the population, which started to raise doubts about the rightness of conventional economic policies' direction (Osberg and Sharpe 2001). However sharp was the GDP per capita increase, many countries neither experienced a decrease in poverty nor the positive changes to the unemployment (Clapp and Sen 1999). This was especially evident in the countries with a high percentage of capital owned by foreigners as well as those with distinctly inegalitarian political systems, which were often combined with commodity-driven growth (Clapp and Sen 1999; Lange et al. 2017). The limitations of GDP per capita drifted out of the shadows and arrived in the scope of the policymakers' and mainstream economics' attention (Syrovatka, 2008; Stiglitz et al. 2009; Giannetti et al. 2015). The rising popularity of the already-existent development indexes such as HDI went hand in hand with that (Klasen 2018).

As for today, the quantitative data to either support or disprove the criticism of GDP or to explain its deviations from the common development indexes are still scarce. Nevertheless, the previous research has enabled us to outline the basic aspects responsible for the GDP per capita losing its position as the gauge of economic development and level of life.[7]

Firstly, albeit being perceived as an indicator of material (or financial) well-being, it still falters to capture certain significant components of such well-being (Osberg and Sharpe

[6] With the exact computation of shadow economy's size still posing a problem even for middle-income countries (Bala 2013).

[7] As simple as it gets, those limits approximately fall into two spheres: one deals with the quantitative issues that GDP per capita fails to include, while the other relates to the points that are of qualitative nature and cannot be included into the accounting monetary indicator.

2001). Constructed as a measurement of production, GDP per capita struggles with an accurate depiction of the living standards due to the difference between production and private consumption, which may be a more precise view of the level of life in material terms (Osberg and Sharpe 2001). Furthermore, it fails to encompass the issues that undermine its ability to speak for an average member of the population, i.e., the distribution of income; and the production/consumption that remains unnoticed by the statisticians accountable for the GDP computation (Bala 2013; Giannetti et al. 2015). Hence, inequality and informal economy were proclaimed the GDP per capita's main adversaries and should not be left out if one is to explain the divergence between the quantitative size of the economy and the well-being it generates (Clapp and Sen 1999; Giannetti et al. 2015). It brings forward more egalitarian indicators of median income or consumption, as well as the demands for a more precise inclusion of the shadow economy (Dynar and Sheiner 2018; Nolan et al. 2018).

The inadequacy of GDP per capita is relatively plain in the case of countries with a large share of assets owned by foreigners: in such situations, GDP incorporates the rents and profits of the external asset holders and deviates from what can be understood as the national well-being (Nolan et al. 2018). However, this drawback is easily overcome by utilizing a range of GDP-based indicators, such as gross national income (GNI) or gross national disposable income (GNDI), which are correcting GDP for the non-resident incomes, while including the resident incomes from abroad (Osberg and Sharpe 2001). While those indicators are derived from the national accounting and balance of payments and are often computed by the same institutions that are entrusted with the GDP estimation, they remain less employed by the policymakers (Stiglitz et al. 2009).

More abstract discussions are related to the nature of well-being itself, which allegedly cannot be equated to quantitative GDP-based indicators and which should embody less straightforward and quantifiable concepts (Stiglitz et al. 2009). Whereas well-being is synonymized with the quality of life, it is hard to avoid philosophic discourses[8] on the components of such construct; nevertheless, it is difficult to ignore the social fundamentals of the economic production, or, in other words, at what cost the GDP is produced (Stiglitz et al. 2009). This may relate to healthcare, education, social safety or employment, which are undoubtedly the constituents of what we generally understand as the living standards (Deb 2015; Hudakova 2018). Albeit there are certainly some linkages between the GDP growth and the aforementioned elements of life, the strength and causality of such linkages are debatable (Deb 2015). Furthermore, the quality of life may be linked to a handful of other factors that the GDP fails to embrace and struggles to influence – these may be of ecological, geographical or sociocultural nature (Giannetti et al. 2015). Additionally, such non-economic traits may be perceived not only as drawbacks of GDP, but as the factors standing behind the deviations of GDP from already established development indexes[9] as well (Giannetti et al. 2015).

[8] Which are supported by a handful of relatively popular "happiness indexes" of too lax or too complicated methodology, that aim at quantifying the quality of life without turning to the economic framework of GDP (Stiglitz et al. 2009).

[9] For example, those idiosyncrasies may be affecting the non-economic components of HDI and explain the well-known divergence between the countries' rankings in both GDP per capita and HDI (Hopkins 1991; Deb 2015).

It is also evident that GDP per capita cannot be associated with the economic development in countries with a poor institutional environment (Deb 2015; Teker and Guner 2016). The conventional explanation is twofold: firstly, the high-quality institutions themselves (including but not limited to a democratic political system, inviolability of basic rights, social and economic security, personal safety etc.) form an inseparable part of well-being and quality of life; secondly, the institutional imperfections (such as unequal distribution of national wealth or economic restrictions for certain groups of population) could be affecting the way GDP per capita is produced, calculated[10] and dispensed (Syrovatka 2008). Moreover, certain displays of institutional deficiencies are stated to undermine the informative value of GDP per capita as an indicator of development due to their impact on the beforementioned factors of the development-GDP deviations (for example, corruption is negatively affecting the income distribution and inequalities, which are believed to produce discrepancies between well-being and GDP per capita – Syrovatka 2008; Giannetti et al. 2015).

Discussions also arise in regard to the sustainability of economic growth and the linkages between development and, for example, natural resources depletion or environmental damage (Costanza et al. 2009). When the production of GDP pours into an excessive deterioration of ecology or exhaustion of non-renewable resources, the overall effect on well-being and long-term development is stated to be debatable at best (Costanza et al. 2009). Furthermore, such economic growth (together with the growth policies oriented at the quantitative increase of GDP at any cost common in resource-rich countries) bears clearly unsustainable nature and elicits questions about the future perspectives of such advance (Costanza et al. 2009). The limited effects of the commodity-driven growth on the development are indirectly confirmed by the long-lasting and substantial divergence between HDI and GDP in resource-rich countries – while their GDP per capita makes them high-income nations, their level of well-being (captured by HDI) corresponds to much poorer countries (Hopkins 1991; Syrovatka 2008; Lange et al. 2017). This divergence reaches the extremes in those commodity producers where the substantial mineral stocks are accompanied by non-democratic and extractive institutions supporting the uneven distribution of the commodity revenues (Teker and Guner 2016; Lange et al. 2017).

Generally, it poses an insidious task to distinguish between the limits of GDP per capita as such (i.e., something to be dealt with by the construction of a better indicator) and the factors standing behind the deviation between the GDP per capita and economic development captured by some of the already existent indexes (Sagar and Najam 1998; Dynan and Sheiner 2018). The twofold nature of those limits comes as little help – both the GDP's methodological drawbacks and development's less quantifiable components may be perceived as the causes of deviations or the demands for switching GDP per capita for a more encompassing indicator. Given that there is still no (and likely will not be in the foreseeable future) academic consensus on the latter, we incline to accept the former and view the factors reviewed in this section as the ones producing the divergence between development and GDP.

[10] It refers to the inklings of undemocratic regimes deliberately overvaluing their economic indicators due to ideological or propagational needs (Syrovatka 2008).

2. Human development index as an indicator of well-being

Whereas GDP per capita persists to play the role of the most well-known indicator for comparing the living standards, a coherent depiction of well-being has been in the scope of development economists' attention for decades (Dasgupta 1990; Hopkins 1991; Clapp and Sen 1999). The approaches corresponded with the GDP's drawbacks – the newly constructed indicators were either meant to correct GDP for the items irrelevant for development and the level of life (such as non-resident incomes) or to embody non-economic and often non-measurable aspects, such as institutions, safety or even happiness (Costanza et al. 2009; Stiglitz et al. 2009).

Many of the popular indicators such as GNI[11] were not developed to measure well-being and appear to be another version of production indicators, but even they perform better in evaluating the actual well-being than the traditional GDP per capita (Osberg and Sharpe 2001; Stiglitz et al. 2009; Nolan et al, 2018). Nevertheless, if one is to examine the nature of deviations between GDP and development, it is certainly not enough to define development as one of the GDP's corrected renditions (Stiglitz et al. 2009).

More sophisticated quantitative approaches encompassing the concepts of education, natural resources depletion and environmental damage have already been designed[12] – the indicators of net adjusted savings or net adjusted wealth may be a favourable future of development measurement, but they are still difficult to compute, lack statistical infrastructure for data collection and historical time series of any substantive length (Lange et al. 2017). Given that the same problems are encountered when working with even more wide-ranging indexes of well-being incorporating dozens of variables, feasible options of well-being quantification are reduced to few (Stiglitz et al. 2009; Giannetti et al. 2015; Klasen, 2018).

In view of the multidimensional nature of economic well-being and living standards, we ought to highlight the viability of complex indexes that combine income (usually GDP-based) and non-income indicators and produce means to evaluate and compare different iterations of development. The most widespread of such indexes is the already mentioned HDI – Human Development Index, which is annually computed and published by the United Nations (Klasen 2018). This index covers nearly all countries of the world and evaluates them according to three parameters that may be viewed as the dimensions of development: gross national income per capita as an indicator of income; average life expectancy as a gauge of healthcare and living conditions; and the level of education[13] which is to capture the human capital development (Klasen 2018). While its methodology is relatively straight-forward, it quickly rose as the most prominent indicator of the level of life due to its components being regarded as relatively accurate renderings of the well-being's different sides (Klasen 2018). Furthermore, being computed from the beginning of the 1990s, it has a relatively long time series enabling econometric estimations.

[11] Or its more elaborated iteration, adjusted net national income, which is the GNI minus natural resources depletion and fixed capital amortization (Lange et al. 2017).
[12] See Lange et al. (2017) for the concrete methodology of these approaches.
[13] Which is calculated using mean years of schooling and expected years of schooling (Klasen 2018).

HDI harvests its portion of criticism for certain methodological drawbacks such as the interchangeability of its individual components (Syrovatka 2008). Besides that, the nature of its parts appears to be oriented towards developing countries; with the healthcare and educational constituents' being less relevant for already developed countries (Syrovatka 2008). Moreover, the smaller difference in those indicators common for economically advanced nations makes HDI less fit for comparing high-income economies (Klasen 2018). Further reproaches are stated to lay in the HDI's inability to capture the impact of the institutional environment[14], episodic unreliability of data sources (though the things are getting better with the increase in HDI's popularity and usability – Stiglitz et al. 2009) and presumption of a high correlation with GDP per capita (Hopkins 1991; Clapp and Sen 1999). Notwithstanding, this correlation appears to be substantial only for the least developed countries, while those with middle and high income exhibit no such idiosyncrasy (Deb 2015; Hudakova 2018).

Despite the criticism, the value of HDI for academic research is hard to overestimate – it has left the discussions of solely development economists and became widespread amongst the general public, and while it is still a rough measure of what we perceive as development and well-being, HDI stands out as a relatively consistent and easy-to-understand gauge. Our research intends to utilize this in order to clarify the roots of the divergence between purely economical and production-based GDP per capita and burdensomely quantifiable development.

3. Data and Methodology

To estimate the circumstances of deviations between economic development/well-being represented by the Human Development Index and GDP per capita (PPP), we calculate those deviations (further referred to as the development-GDP gaps) and regress them on a wide array of aforediscussed variables that may be understood as both the limitations of GDP per capita and factors affecting the development and quality of life without any direct relation to the economic capacities.

The results are meant to present a comprehensive view of the issues that stand behind the development-GDP gaps and empirically evaluate the numerous theoretical discussions regarding this topic. While the obvious drawback and a reasonable ground for criticism may be linked to the choice of the development indicator, we believe that there is no other viable option given either the one-dimensionality or lack of data for other indicators that were developed to assess well-being and living standards.

[14] Albeit some may argue that its components are directly affected by the institutions and therefore may be viewed as fairly representative in terms of this matter (Syrovatka 2008).

3.1 Data

For econometric analysis, we employ an unbalanced panel dataset of up to 141 countries across all stages of economic development and a time period of 2000–2017. The intention was to include as extensive and heterogeneous selection of countries as possible, and the exclusions from the sample were primarily due to the lack of data on crucial variables. The same principle was applied to the sample's time period.

All the data[15] are accessible from publicly available sources – these include the United Nations Development Programme database for HDI, the United Nations for infants mortality, the Heritage Foundation for economic freedom index, the World Inequality Database for the Gini index, the United Nations Office on Drugs and Crime for the homicide rate, the World Health Organization for data on suicide rates, alcohol consumption, HIV prevalence, and health expenditure, International Monetary Fund for net international investment position, OECD for lists of development aid recipients, Center for International Earth Science Information Network for climate zone populations, WorldData for the government form, the Pew Research Center for data on religion, Medina and Schneider (2019) for the estimate of the shadow economy, and the remaining variables are from the World Bank.

3.2 Dependent variable

In order to capture the discrepancies between the economic development and GDP per capita, we construct a time series of differentials between these two indicators expressed in indexed values. The development-GDP gap can be expressed as

$$GAP_{i,t} = HDI_{i,t} - GDPI_{i,t}, \tag{1}$$

where $HDI_{i,t}$ is the Human Development Index and $GDPI_{i,t}$ is GDP per capita index calculated utilizing the UN methodology[16] for calculation of the GNI component of HDI, such that

$$\mathrm{GDPI}_{i,t} = \frac{\ln\left(\text{GDP per capita}_{i,t}\right) - \ln(100)}{\ln(75{,}000) - \ln(100)}. \tag{2}$$

3.3 Model

As the dependent variable is the difference between two individual variables – $HDI_{i,t}$ and $GDPI_{i,t}$ –, if we consider that

$$HDI_{i,t} = c_i + ZZ_{i,t}a + GDPI_{i,t}b + \omega_{i,t}, \tag{3}$$

[15] For the description of the variables, see Appendix 1. Descriptive statistics and correlation tables available upon request.

[16] The GNI component of HDI is an index variable which takes values between 0 and 1. The minimum GNI value (which takes into account the nonmarket production) is considered at 100 USD and the maximum value is 75,000 USD (according to Kahneman and Deaton, 2010, a boundary above which the benefits of additional GDP per capita are negligible). The index is a relative measure of GNI within the considered interval in a natural logarithm form. For more details, see UNDP (2020).

where c_i is the intercept; $ZZ_{i,t}$ is the vector of factors affecting HDI other than GDP per capita; $\omega_{i,t}$ is the idiosyncratic error; a is the vector of parameters for respective factors in $ZZ_{i,t}$; and b is the parameter for $GDPI_{i,t}$ and

$$ZZ_{i,t} = \alpha_i + W_{it}\beta + S_{it}\gamma + u_{i,t}, \tag{4}$$

$$GDPI_{i,t} = \delta_i + S_{it}\theta + Z_{it}\mu + v_{i,t}, \tag{5}$$

where W_{it} is the vector of exogenous factors affecting $HDI_{i,t}$ without an effect on $GDPI_{i,t}$ component; S_{it} is the vector of exogenous factors affecting $GDPI_{i,t}$ as well as other components of $HDI_{i,t}$; Z_{it} is the vector of other exogenous factors affecting $GDPI_{i,t}$ component; α_i is the vector of intercepts for respective factors in $ZZ_{i,t}$; δ_i is the intercept for $GDPI_{i,t}$; β, γ, θ and μ are the vectors of respective parameters; $u_{i,t}$ is the vector of respective idiosyncratic errors for $ZZ_{i,t}$; and $v_{i,t}$ is the idiosyncratic error for $GDPI_{i,t}$, then

$$HDI_{i,t} = c_i + \left(\alpha_i + W_{it}\beta + S_{it}\gamma + u_{i,t}\right)a + \left(\delta_i + S_{it}\theta + Z_{it}\mu + v_{i,t}\right)b + \omega_{i,t} \tag{6}$$

and

$$HDI_{i,t} - GDPI_{i,t} = c_i + \alpha_i a + (b-1)\delta_i + W_{it}\beta a + S_{it}\left(\gamma a + \theta(b-1)\right) + Z_{it}\mu(b-1) + u_{i,t}a + (b-1)v_{i,t} + \omega_{i,t}. \tag{7}$$

In compact form, we can write

$$HDI_{i,t} - GDPI_{i,t} = d_i + W_{it}\pi + S_{it}(\rho + \tau) + Z_{it}\varphi + \varepsilon_{i,t}[17], \tag{8}$$

where

$$d_i = c_i + \alpha_i a + (b-1)\delta_i, \tag{9}$$

$$\pi = \beta a\,, \tag{10}$$

$$\rho = \gamma a, \tag{11}$$

$$\tau = \theta(b-1), \tag{12}$$

$$\varphi = \mu(b-1), \tag{13}$$

$$\varepsilon_{i,t} = u_{i,t}a + (b-1)v_{i,t} + \omega_{i,t}. \tag{14}$$

If we, based on the $HDI_{i,t}$ calculation methodology, presume that the parameter b, i.e., the effect of $GDPI_{i,t}$ on $HDI_{i,t}$, is greater than 0 and lower than 1, positive parameters of individual explanatory variables in our estimated models may result from one of the three scenarios – 1) positive impact (π) of factors W_{it} through a positive impact on $HDI_{i,t}$, 2) positive impact (φ) of factors Z_{it} through a negative impact (μ) on $GDPI_{i,t}$ and 3) positive impact ($\rho + \tau$) of factors S_{it} due to 3a) positive impact (ρ) through $ZZ_{i,t}$ and positive impact (τ) from a negative effect (θ) on $GDPI_{i,t}$ ($\rho > 0$; $\tau > 0$; $\theta < 0$), 3b) positive impact through $ZZ_{i,t}$ surpassing the negative impact from a positive effect on $GDPI_{i,t}$ ($\rho > 0$; $\tau < 0$; $\theta > 0$; $|\rho| > |\tau|$) and 3c) positive impact from a negative effect on $GDPI_{i,t}$ surpassing the negative impact through $ZZ_{i,t}$ ($\rho < 0$; $\tau > 0$; $\theta < 0$; $|\rho| < |\tau|$).

[17] For idiosyncratic error $\varepsilon_{i,t}$ in fixed-effects and random-effects models, we consider the assumptions $E\left(\varepsilon_{i,t}\middle|d_{i,t}, W_{it}, S_{it}, Z_{it}\right) = 0, Var\left(\varepsilon_{i,t}\middle|d_{i,t}, W_{it}, S_{it}, Z_{it}\right) = Var\left(\varepsilon_{i,t}\right) = \sigma_\varepsilon^2$ in all time periods t, $Cov\left(\varepsilon_{i,t}, \varepsilon_{i,s}\middle|d_{i,t}, W_{it}, S_{it}, Z_{it}\right) = 0$ for all $t \neq s$ and for fixed-effects ideally also $\left(\varepsilon_{i,t}\middle|d_{i,t}, W_{it}, S_{it}, Z_{it}\right) \sim N(0, \sigma_\varepsilon^2)$.

3.4 Explanatory variables

The selection of independent variables which are meant to explain the development-GDP gaps is based on the theoretical underpinnings outlined in section 2. We aim to include the variables correcting the methodological drawbacks of GDP as well as those which might impact well-being/development without any direct effect on the quantitative side of the economy. The theoretical background behind the below-described variables is summarized in the works of Hopkins (1991), Syrovatka (2008), Stiglitz et al. (2009) and Giannetti et al. (2015).

To capture the potential effects of the institutional environment, we used an index of economic freedom[18] – a complex measure of socio-political and economic institutions in individual countries. It is reasonable to expect the institutional quality to be of impact not only on the level of life directly, but on the creation and distribution of GDP as well (Syrovatka 2008; Teker and Guner 2016). Higher economic freedom might have a positive impact on the development-GDP gap due to its positive impact on the components of development other than GDP which are of higher priority, especially in more economically advanced countries typically characterized by their more developed institutions and higher economic freedom. However, a negative effect on the gap cannot be ruled out due to the potentially disproportionate beneficial effect of the economic freedom on the GDP versus other development components.

The extent of the shadow economy[19] should not only account for discrepancies in national estimate methodologies (many countries underestimate the extent of the shadow economy, which is especially prevalent in developing countries – Bala 2013) but also act as a proxy partially representing the ingrained crime culture, corruption, moral values and institutional quality, and thus evaluate their impact on the development-GDP gap. Presumed underestimation of the shadow economy is expected to have a positive impact on the development-GDP gap. Nonetheless, an extensive shadow economy might have the opposite effect due to its accompanying root causes.

Furthermore, we add the balance of payments items, such as primary and secondary income flows, in order to correct GDP for the non-resident transactions and control for the development-sensible issues, such as the remittance flows and foreign asset ownership (Hopkins 1991; Stiglitz et al. 2009). Higher foreign incomes are expected to have a positive impact on the development-GDP gap due to the HDI being already corrected for them.

Another crucial determinant of the development-GDP gaps to be included into the estimations is the Gini index, which represents the income inequality and impacts both the distribution of GDP and the potential social tensions in highly inegalitarian societies (Giannetti et al. 2015; Nolan et al. 2018). It is reasonable to expect it to have a negative impact on the development-GDP gap due to the presumed ineffective utilization of aggregate income for securing basic development elements, such as healthcare and education in a highly unequal economy.

[18] An increase of the index represents an improvement in the institutional quality and vice versa.

[19] In contrast with the estimates included in the GDP figures by the national statistical offices, the proxy estimated by Medina and Schneider (2019) offers a uniform methodology and thus universally comparable values.

We control for the upper boundary present in the GDPI calculation by the inclusion of the so-called GDP excess variable[20] into the econometric estimation, which reflects the effects of GDP per capita exceeding the upper boundary on the development-GDP gap. It is assumed to have a positive impact on the gap due to the index computation methodology.

In addition to the aforementioned explanatory variables which constitute the foundation of the model we label as the baseline, we estimate an array of separate extended models, with each of them including (aside from the baseline model variables) specific factors representing certain social, cultural, geographic, healthcare, ecological, political and economic idiosyncrasies with potential impact on the development-GDP gaps.

Certain potentially viable explanatory variables were excluded from the estimation process due to an excessive pairwise correlation with the baseline model variables or due to the unavailability of relevant data for a large enough sample of countries and/or time periods. It is, for instance, the case why we were not able to include any of the education-related explanatories: the most informative of them, such as, for example, the share of educational expenses on GDP, are almost entirely unavailable for the majority of the developing countries in our sample, while the basic ones – such as the literacy rate or years of schooling – exhibit either near-zero variation and/or strong correlation to the baseline explanatories. We acknowledge the potential drawbacks of the explanatory variable selection approach, which resides in the inevitable arbitrariness linked to the selection of the explanatory variables. Thus, we cannot rule out the possibility of the omitted variable bias or chosen factor combinations' explanatory power shortage. Nevertheless, the issue is dealt with by using a range of alternative regressors in each extended estimation, while those from the baseline model fulfil the role of the necessary control variables.

3.5 Methods

When analysing panel data, the three most common model options come into consideration – pooled OLS model, fixed-effects model and random-effects model. Pooled OLS and two-way (individual and time) fixed-effects models both utilize OLS estimation. Our one-way (individual) random-effects models utilize feasible generalized least squares, in order to take into account the effects-induced correlation with help of the two-step estimation method of Swamy and Arora (1972), in our case modified by Baltagi and Chang (1994) for use in unbalanced panels.

Baseline and extended models were estimated using all of the aforementioned methods where applicable (exception being the models including a time-invariant variable, which leads to the consequential inapplicability of fixed-effects). The most suitable models were selected by conducting appropriate tests – F-test for the presence of fixed-effects, LM test for random-effects and the Hausman test to evaluate the random-effects consistency. The most consistent results were produced by the fixed-effects models, which we subsequently refer to in the discussion of the results. We also report the OLS and random-effects baseline model estimates for comparative purposes, albeit their low quality makes

[20] GDP excess equals zero in the case of GDP per capita being below 75,000 dollars and increases with the GDP per capita's increase above that boundary.

them non-feasible to draw any conclusions from. In addition, the use of random-effects estimation (preferred over OLS based on the conducted tests) was necessary for certain extended models which included time-invariable factors.

Constructed models were tested for cross-sectional dependence by using the Pesaran CD test; multicollinearity utilizing VIF; serial correlation by performing the Breusch-Godfrey/Wooldridge test; stationarity by implementing the Augmented Dickey-Fuller test; and heteroskedasticity by enacting the Breusch-Pagan test. Due to the test-indicated presence of serial correlation and heteroskedasticity and consequent potential invalidity of statistical tests of significance, t-statistics of all the variables in each model were estimated using a robust covariance matrix as suggested by Arellano (1987); appropriate robust model statistic tests were conducted utilizing these robust t-statistics.

4. Results and Discussion

In Table 1, the baseline model estimates are displayed. Across all estimates, every explanatory variable except Shadow Economy in the case of random-effects model are of the same sign, thus indicating at least elementary consistency of the results. The economic freedom index, which proxies the institutional environment, is negatively linked to the development-GDP gap, which most likely stems from the fact that the improvement of the institutions is of higher positive impact on the GDP than on development. Shadow economy variable positively affects the dependent variable in OLS and fixed-effects model but negatively in random-effects. Based on the conducted statistical tests, the relationship suggested by the fixed-effects model is expected to be more viable; the random-effects model is viewed as the one with smaller explanatory power due to the conducted tests pointing out at it as being less fit for the estimations than the fixed-effects. The reasoning of positive linkage may be stemming from the national statistical authorities' inability to estimate the exact extent of the shadow economy[21], thus underestimating actual GDP per capita. Net primary and secondary incomes are both positively tied to the development-GDP gap, which is in line with conventional expectations due to these BoP items being commonly used to correct the GDP per capita for the income flows irrelevant for the national population. Income inequality in form of the Gini index is negatively interconnected with the development-GDP gap. First and foremost, income inequality might be strongly associated with inequality in education and healthcare. Furthermore, an inegalitarian distribution of GDP can be expected to undermine its effects on the well-being of the general population: the economic growth may be occurring only in certain sectors and benefit only specific social groups. As one can expect in view of the index calculation methodology, GDP excess variable is in positive relation with the gap in the fixed-effects and random-effects estimates. The negative linkage suggested by the OLS model estimate should not compromise the results consistency since the OLS method is viewed as the least fit of the three as indicated by the conducted tests and is presented mainly for comparative purposes.

[21] Commonly underestimating it.

Table 1. Baseline model estimates

	(1)	(2)	(3)
Intercept	0.084** (0.039)		0.102*** (0.033)
Economic Freedom Index$^{(\rho+\tau)}$	-0.0004 (0.0004)	-0.001** (0.0003)	-0.0004 (0.0003)
Shadow Economy$^{(\rho+\tau)}$	0.001* (0.0004)	0.002*** (0.001)	-0.001*** (0.0004)
Net Primary Income$^{\pi}$	0.027 (0.089)	0.075** (0.033)	0.087** (0.035)
Net Secondary Income$^{\pi}$	0.288*** (0.056)	0.047 (0.029)	0.050 (0.035)
Gini Index$^{(\rho+\tau)}$	-0.191*** (0.047)	-0.080* (0.046)	-0.113** (0.051)
GDP Excess$^{\pi}$	-1.845*** (0.503)	0.520 (0.360)	0.677* (0.344)
Fixed Effects	—	Country, Year	—
Observations	2,364	2,364	2,364
R^2	0.304	0.120	0.080
Adjusted R^2	0.302	0.055	0.078
F Stat. (Robust)	13.997*** (df = 6; 140)	6.1101*** (df = 6; 140)	4.1929*** (df = 6; 140)
χ^2	83.979*** (df = 6)	36.661*** (df = 6)	25.157*** (df = 6)

*Note: robust t-statistics in parentheses; *p<0.1; **p<0.05; ***p<0.01; (1) OLS (2) Fixed effects (3) Random Effects; for the explanation of the parameters (ρ+τ) and π, see section 4.3; for presumed category of the influence of the individual factors, see Appendix 1, (ρ+τ): clustered parameter of factors linked to GDP as well as other components of HDI – positive value implies positive relation with the development gap due to various relations combinations (see section 4.3); π: parameters of factors not linked to GDP but linked to other components of HDI – positive value implies a positive relation with the development aspects not captured by GDP per capita*

The extended estimates targeting the links between sociocultural factors and the development-GDP gaps are presented in Table 2. The statistically significant variables' interconnection with the dependent variable was discovered to be in accordance with conventional wisdom and common logic. Firstly, the negative signs of the fertility-based variables (estimates 5 and 6) may be linked to the fact that high fertility (and especially high adolescent fertility) is present in less economically and institutionally developed countries of Sub-Saharan Africa and South Asia. Even though a high tempo of population growth may result in a so-called demographic dividend in the future, we may assume that under today's conditions, it primarily puts pressure on the already overloaded social systems of these nations, therefore negatively affecting the societal well-being as a whole. Furthermore, high fertility may be reflecting certain traits of socio-cultural nature, such as gender inequality or a low level of education. This similarly applies to alcohol consumption – its negative linkage to the development-GDP gaps rests both in excessive mortality associated with it and the potentially oppressive social environment spurring the alcohol consumption. On the other side, higher prevalence of religious beliefs (except for Islam and Hinduism) significantly boosts the development in relation to GDP – the explanation may reside in the religiousness being accompanied by a sense of community, mutual support and piety, which improves the population's well-being without a direct impact on the economy.

Table 2. Extended model estimates – sociocultural factors

	(4)	(5)	(6)	(7)	(8)	(9)
Intercept						0.050 (0.038)
Economic Freedom Index$^{(\rho+\tau)}$	-0.001*** (0.0003)	-0.0005* (0.0003)	-0.0005 (0.0003)	-0.001** (0.0003)	-0.001* (0.0003)	-0.0004 (0.0003)
Shadow Economy$^{(\rho+\tau)}$	0.003*** (0.001)	0.002*** (0.001)	0.002*** (0.001)	0.002*** (0.001)	0.002*** (0.001)	-0.001*** (0.0004)
Net Primary Income$^{\pi}$	0.017 (0.019)	0.061* (0.033)	0.066** (0.028)	0.069** (0.041)	0.076** (0.034)	0.093*** (0.036)
Net Secondary Income$^{\pi}$	0.044 (0.033)	0.041* (0.024)	0.021 (0.024)	0.045 (0.028)	0.042 (0.030)	0.050 (0.035)
Gini Index$^{(\rho+\tau)}$	-0.011 (0.037)	-0.072* (0.041)	-0.074* (0.043)	-0.080* (0.046)	-0.073* (0.045)	-0.116** (0.051)
GDP Excess$^{\pi}$	0.571*** (0.174)	0.143 (0.619)	0.582 (0.410)	0.460 (0.342)	0.441 (0.324)	0.714** (0.343)
Homicide$^{\pi}$	-0.0001 (0.0001)					
Fertility Rate$^{\pi}$		-0.020*** (0.004)				
Adolescent Fertility Rate$^{\pi}$			-0.001*** (0.0002)			
Suicide Rate$^{\pi}$				-0.0002 (0.0003)		
Alcohol Consumption$^{\pi}$					-0.002* (0.001)	
Christians$^{\pi}$						0.001** (0.0003)
Muslims$^{\pi}$						0.0004 (0.0003)
Buddhists$^{\pi}$						0.001** (0.0004)
Hindus$^{\pi}$						0.0005 (0.0004)
Folk Religions$^{\pi}$						0.002** (0.001)
Fixed Effects	Country, Year	Country, Year	Country, Year	Country, Year	Country, Year	—
Observations	1,801	2,364	2,364	2346	2,341	2,328
R^2	0.176	0.209	0.243	0.123	0.137	0.094
Adjusted R^2	0.102	0.150	0.187	0.058	0.072	0.090
F Stat. (Robust)	10.216*** (df = 7; 125)	11.425*** (df = 7; 140)	12.43*** (df = 7; 140)	5.4293*** (df = 7; 139)	6.7984*** (df = 7; 139)	3.1066*** (df = 11; 138)
χ^2	71.512*** (df = 7)	79.972*** (df = 7)	87.008*** (df = 7)	38.005*** (df = 7)	47.589*** (df = 7)	34.173*** (df = 11)

Note: robust t-statistics in parentheses; * p<0.1; ** p<0.05; *** p<0.01; (4)–(8) Fixed effects (9) Random Effects; for explanation of the parameters (ρ+τ) and π, see section 4.3

Table 3. Extended model estimates – geographic factors

	(10)	(11)	(12)	(13)
Intercept	0.103*** (0.033)	0.098*** (0.034)	0.114*** (0.035)	0.090*** (0.031)
Economic Freedom Index$^{(\rho+\tau)}$	-0.0004 (0.0003)	-0.0004 (0.0003)	-0.0004 (0.0003)	-0.0003 (0.0003)
Shadow Economy$^{(\rho+\tau)}$	-0.001*** (0.0004)	-0.001*** (0.0004)	-0.001*** (0.0004)	-0.001*** (0.0004)
Net Primary Income$^{\pi}$	0.087** (0.035)	0.086** (0.035)	0.088** (0.035)	0.090** (0.035)
Net Secondary Income$^{\pi}$	0.050 (0.035)	0.048 (0.035)	0.049 (0.035)	0.046 (0.035)
Gini Index$^{(\rho+\tau)}$	-0.114** (0.051)	-0.113** (0.051)	-0.120** (0.052)	-0.137** (0.054)
GDP Excess$^{\pi}$	0.678** (0.346)	0.646* (0.337)	0.712* (0.387)	0.743* (0.387)
Island$^{(\rho+\tau)}$	-0.004 (0.013)			
Landlocked$^{(\rho+\tau)}$		0.016 (0.014)		
Population in Mild Climate$^{(\rho+\tau)}$			-0.024* (0.013)	
Africa (reference – Europe)$^{(\rho+\tau)}$				0.038*** (0.014)
Asia$^{(\rho+\tau)}$				0.021 (0.015)
Australia$^{(\rho+\tau)}$				0.015* (0.008)
Central America$^{(\rho+\tau)}$				0.073*** (0.018)
North America$^{(\rho+\tau)}$				0.010 (0.017)
Oceania$^{(\rho+\tau)}$				0.016* (0.009)
South America$^{(\rho+\tau)}$				0.063*** (0.016)
Fixed Effects	—	—	—	—
Observations	2,364	2,364	2,364	2,364
R^2	0.080	0.082	0.083	0.091
Adjusted R^2	0.078	0.079	0.080	0.086
F Stat. (Robust)	3.628*** (df = 7; 140)	4.7753*** (df = 7; 140)	3.6049*** (df = 7; 140)	80.615*** (df = 13; 140)
χ^2	25.396*** (df = 7)	32.427*** (df = 7)	25.234*** (df = 7)	1048*** (df = 13)

*Note: robust t-statistics in parentheses; *p<0.1; **p<0.05; ***p<0.01; (10)–(13) Random Effects; for the explanation of the parameters (ρ+τ) and π, see section 4.3*

Inclusion of the geographic factors (Table 3) into the estimations produced only limited results in favour of the so-called geographical determinism, which connects the economic development to certain natural predispositions in order to explain the global divergence in well-being. The outputs worth mentioning are that higher development-GDP gaps are observed throughout the countries in the Southern hemisphere[22], which may be economically underdeveloped in comparison with the "Global North", but nevertheless able to secure higher population well-being than is otherwise suggested by their GDP per capita. These results also underscore the fact that development measures like HDI were created and are more appropriate for measuring well-being in less developed countries, while being less suitable for advanced nations.

[22] Given the persistence of the effects, we cannot rule out the positive impact of climate and overall "Southern lifestyle" on well-being.

Our attempt at explaining the development-GDP gaps via an array of healthcare factors is captured in Table 4. The statistically significant and robust link with that aspect is proved by logically correct signs of various indicators representing the quality of national healthcare systems – countries with insufficient healthcare quality are commonly the ones expressing higher infant mortality and the HIV prevalence, together with a low level of vaccination. These issues naturally lead to a lower quality of life, even in spite of potential economic growth. Furthermore, the only insignificant factor (estimate 14) may be suggesting that the mere number of hospital beds may be an inappropriate indicator of healthcare development.

Table 4. Extended model estimates – healthcare factors

	(14)	(15)	(16)	(17)	(18)
Economic Freedom Index$^{(\rho+\tau)}$	-0.0005** (0.0002)	-0.0003 (0.0003)	-0.001** (0.0003)	-0.001** (0.0003)	-0.001*** (0.0002)
Shadow Economy$^{(\rho+\tau)}$	0.003*** (0.001)	0.003*** (0.0004)	0.002*** (0.001)	0.003*** (0.001)	0.003*** (0.001)
Net Primary Income$^{\pi}$	0.033 (0.022)	0.060* (0.033)	0.070** (0.030)	0.064* (0.033)	0.064** (0.028)
Net Secondary Income$^{\pi}$	0.019 (0.026)	0.063** (0.028)	0.046* (0.026)	0.037 (0.025)	0.031 (0.024)
Gini Index$^{(\rho+\tau)}$	-0.043 (0.040)	-0.065 (0.048)	-0.073* (0.044)	-0.082** (0.040)	-0.051 (0.039)
GDP Excess$^{\pi}$	0.670*** (0.177)	0.321 (0.462)	0.547 (0.354)	0.795* (0.457)	0.699** (0.298)
Hospital Beds$^{\pi}$	0.002 (0.001)				
HIV Prevalence$^{\pi}$		-0.010*** (0.002)			
Immunization DPT$^{\pi}$			0.0004*** (0.0001)		
Infant Mortality$^{\pi}$				-0.001*** (0.0002)	
Maternal death$^{\pi}$					-0.016*** (0.003)
Fixed Effects	Country, Year	Country, Year	Country, Year	Country, Year	Country, Year
Observations	1,211	1,117	2,364	1,342	2,364
R^2	0.247	0.276	0.155	0.259	0.264
Adjusted R^2	0.134	0.179	0.092	0.161	0.209
F Stat. (Robust)	10.359*** (df = 7; 136)	11.265*** (df = 7; 116)	8.9932*** (df = 7; 140)	14.053*** (df = 7; 140)	12.795*** (df = 7; 140)
χ^2	72.511*** (df = 7)	78.855*** (df = 7)	62.952*** (df = 7)	98.368*** (df = 7)	89.568*** (df = 7)

Note: robust t-statistics in parentheses; * p<0.1; ** p<0.05; *** p<0.01; (14)–(18) Fixed Effects; for the explanation of the parameters ($\rho+\tau$) and π, see section 4.3

The outputs of estimates testing the effects of ecological factors on the development-GDP gaps (Table 5) reveal that the strength of interconnections between ecological damage and development deterioration, which is advocated by an ever-growing number of economists (see section 2), is substantiated. Two out of three variables representing the potential negative incidence of resource depletion were discovered to be statistically significant, with the proven negative nexus with energy and natural resources depletion.

Table 5. Extended model estimates – ecological factors

	(19)	(20)	(21)
Economic Freedom Index$^{(\rho+\tau)}$	-0.001** (0.0003)	-0.001** (0.0003)	-0.001** (0.0003)
Shadow Economy$^{(\rho+\tau)}$	0.002*** (0.001)	0.002*** (0.001)	0.002*** (0.001)
Net Primary Income$^{\pi}$	0.077** (0.033)	0.085*** (0.029)	0.064** (0.030)
Net Secondary Income$^{\pi}$	0.047 (0.029)	0.046* (0.028)	0.049* (0.029)
Gini Index$^{(\rho+\tau)}$	-0.071 (0.045)	-0.074 (0.047)	-0.067 (0.046)
GDP Excess$^{\pi}$	0.547 (0.359)	0.482 (0.422)	0.393 (0.396)
Mineral Depletion$^{(\rho+\tau)}$	0.0004 (0.001)		
Natural Resources Depletion$^{(\rho+\tau)}$		-0.0005* (0.0003)	
Energy depletion$^{(\rho+\tau)}$			-0.001*** (0.0003)
Fixed Effects	Country, Year	Country, Year	Country, Year
Observations	2,347	2,320	2,347
R^2	0.125	0.137	0.137
Adjusted R^2	0.059	0.072	0.072
F Stat. (Robust)	5.3577*** (df = 7; 140)	6.4497*** (df = 7; 139)	7.5595*** (df = 7; 140)
χ^2	37.504*** (df = 7)	45.148*** (df = 7)	52.917*** (df = 7)

*Note: robust t-statistics in parentheses; *p<0.1; **p<0.05; ***p<0.01; (19)–(21) Fixed Effects; for the explanation of the parameters ($\rho+\tau$) and π, see section 4.3*

Certain conclusions could be drawn from the evaluation of political factors' (Table 6) linkages to the development-GDP gap. Firstly, former communist countries exhibit a higher level of development than is suggested by the size of their economies. This outcome indicates that their communist past, albeit being quite destructive for economic and financial stability, produced a social system exceeding the capacities of other (capitalist) nations with a similar level of income. Secondly, the form of government and the institutional shape of the political system express certain connections with the discrepancies between GDP and development. Less inclusive systems (except for dictatorship and communist one-party system which were discovered to be statistically insignificant) presume a relatively lower level of development than the one observed in their democratic counterparts. Oppositely, democratic centralized governments (represented by presidential and semi-presidential political systems) are able to provide higher well-being than parliamentary democracies with a comparable size of the economy. Thus, we may link economic development to a combination of political centralization and democratic institutions, while the lack of either of those factors favours the quantitative side of the economy over the population's well-being. Finally, our results may please certain development economists by providing them with evidence of positive linkage of the commonly criticized international aid with the dependent variable – nations receiving financial support from development organizations perform better in terms of development than those with no such aid.

Table 6. Extended model estimates – political factors

	(22)	(23)	(24)
Intercept	0.095*** (0.033)	0.094*** (0.032)	
Economic Freedom Index	-0.0004 (0.0003)	-0.0003 (0.0003)	-0.001** (0.0003)
Shadow Economy	-0.001*** (0.0004)	-0.001*** (0.0004)	0.002*** (0.001)
Net Primary Income$^{\pi}$	0.086** (0.035)	0.091** (0.035)	0.074** (0.032)
Net Secondary Income$^{\pi}$	0.050 (0.035)	0.043 (0.036)	0.046 (0.029)
Gini Index$^{(\rho+\tau)}$	-0.105** (0.051)	-0.117** (0.051)	-0.079* (0.046)
GDP Excess$^{\pi}$	0.674** (0.341)	1.116*** (0.382)	0.504 (0.360)
Post-soviet$^{(\rho+\tau)}$	0.051*** (0.015)		
Absolute monarchy (reference – Parliamentary)$^{(\rho+\tau)}$		-0.091*** (0.025)	
Communist one-party system$^{(\rho+\tau)}$		0.028 (0.022)	
Constitutional monarchy$^{(\rho+\tau)}$		-0.080** (0.038)	
Dictatorship$^{(\rho+\tau)}$		0.018 (0.019)	
Theocracy$^{(\rho+\tau)}$		-0.033*** (0.011)	
Presidential$^{(\rho+\tau)}$		0.034*** (0.010)	
Semi-presidential$^{(\rho+\tau)}$		0.035** (0.017)	
Development Aid Recipient$^{\pi}$			0.006** (0.003)
Fixed Effects	—	—	Country, Year
Observations	2,364	2,364	2,364
R^2	0.086	0.108	0.125
Adjusted R^2	0.083	0.103	0.060
F Stat. (Robust)	6.3324*** (df = 7; 140)	12.597*** (df = 13; 140)	6.8495*** (df = 7; 140)
χ^2	44.327*** (df = 7)	163.76*** (df = 13)	47.946*** (df = 7)

*Note: robust t-statistics in parentheses; *p<0.1; **p<0.05; ***p<0.01; (22)–(23) Random Effects (24) Fixed Effects; for the explanation of the parameters (ρ+τ) and π, see section 4.3*

Conclusion

The limitations of GDP per capita as a well-being indicator are already in the scope of economic discussions: it is evident that it is unable to capture a number of components crucial for what is commonly viewed as development. The reaction of the researchers spurred the birth of a variety of so-called development indicators, which are gaining in popularity and highlighting the inadequacy of GDP per capita due to the noticeable deviations between the well-being indexes and the quantitative economic measurement.

However, the roots of the disparity between GDP and development attracted only limited attention from the academic world; and the explanations of that disparity are scarce at best. Furthermore, the past research is usually targeting either a specific methodological drawback of the existent indicators or tying such occurrences – which we label as the development-GDP gaps – to concrete economic or social phenomena, ignoring the

multidimensionality of this issue. Our work presents a different look into this subject due to our understanding that any straightforward stance would be insufficient for the explanation of the deviations between purely economic GDP per capita and more abstract concepts of development, well-being and the level of life. In this paper, we made a rigorous attempt at identifying the factors standing behind these deviations with no intention to either prove or disprove the impact of some specific attribute on the development-GDP gaps. To do so, we calculated the gaps between GDP and one of the most well-known and elaborate indexes of well-being – the Human Development Index created and promoted by the United Nations. The factors associated with these gaps were examined using panel data and a selection of multidimensional indicators that may be linked to the deviations between purely production-based GDP and a more complex concept of economic development. To test the potential ties between the development-GDP gaps and a gamut of economic, sociocultural, political and geographical idiosyncrasies, we estimate the so-called baseline model comprising both the well-known drawbacks of GDP (such as its failure to include BoP income flows) and the most commonly mentioned (though mainly in narrative and non-empirical fashion) roots of discrepancies between the economic production and general well-being; subsequently, we modify the baseline model by incorporating various dimensions potentially standing behind the development-GDP gaps.

The results were found to be in accordance with the commonly stated presumptions related to the divergence between GDP and well-being. Firstly, quantitative economic items either not captured by GDP (such as net international incomes) or purportedly captured incorrectly (such as the extent of shadow economy) are indeed undervaluing the size of the economy in relation to the well-being it secures. Secondly, lower development-GDP gaps are observed in countries where the income is unequally distributed and thus not producing the corresponding well-being for the whole population: thus, the relationship between income and the level of life is contingent upon the level of economic equality in the society. Oppositely, the development-GDP gaps tend to increase with the improvement of the institutional environment due to the common notion of quality institutions enhancing the just and prosperous utilization of economic outputs. Moreover, that linkage may signal about the institutional factors adding to a more egalitarian distribution of national income.

Certain sociocultural idiosyncrasies, such as high fertility (including adolescent one) and alcohol consumption, were discovered to be negatively tied to the development-GDP gap due to these occurrences being more frequently present in less prosperous and well-to-do societies, while the gaps increase together with religious devoutness, implying higher attention to the development attributes in more pious communities. Ecological sustainability also seems to promote development above the levels implied by the quantitative measures of the economy. The interconnection with geographical and political factors expressed lesser persistence, partially denying the importance ascribed to them by certain development economists, but the notable examples include higher gaps in the Southern hemisphere and lower gaps in monarchist and theocratic societies.

Given the panoply of results (with almost each examined factor deserving research of its own), it is complicated to draw straightforward conclusions from the outputs of our empirical analysis. At the same moment, the general implications are relatively clear. Firstly, the above-described factors were empirically proven to be the limitations of the

production-based approach to well-being. Therefore, they serve as an explanation for the frequent phenomenon of economic growth without development. Thus, they may be viewed as potentially viable targets for social, macroeconomic or cultural policies of nations aiming at the increase of well-being instead of purely quantitative growth of GDP. Furthermore, the elimination of the negative development-GDP gaps could be a successful measure to contribute to social stability, thus creating the basis for future growth. The factors standing behind the development-GDP gaps can also explain the divergence in well-being between the seemingly similar countries in terms of income, production and consumption, and so provide the designers of development policies with useful insights. Lastly, our paper appears to be among the first, if not the first indeed, bringing an empirical confirmation to the numerous assumptions concerning the different nature of economic growth and development and the associated discrepancies.

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Appendix 1. Variables description

Variable	Description	Presumed factor category
HDI	See Section 3; 0–1.	
GDP per capita	PPP; constant 2017 international $.	
GDPI	See Eq. (2); 0–1.	
Development-GDP gap	See Eq. (1)	
Economic Freedom Index	Equally-weighted mean of 12 quantitative and qualitative factors from following areas – rule of law, government size, regulatory efficiency, open markets; 0–100.	S
Shadow Economy	Percentage of GDP; 0–100.	S
Net Primary Income	Percentage of GDP; 0–100.	W
Net Secondary Income	Percentage of GDP; 0–100.	W
Gini Index	Pre-tax; 0–1.	S
GDP Excess	$GDP\ Excess_{i,t} = \max\left\{\left[\ln\left(\text{GDPpc}_{i,t}\right) - \ln(75.000)\right]/\left[\ln(75.000) - \ln(100)\right]; 0\right\}$	W
Homicide	Victims per 100,000 population.	W
Fertility Rate	Expected births per woman's life.	W
Adolescent Fertility Rate	Expected births per 1000 women aged 15–19.	W
Suicide Rate	Suicide deaths per 100,000 population.	W
Alcohol Consumption	Recorded litres of pure alcohol per capita (15+).	W
Specific Religion	Percentage of population of the specific religion; 0–100.	W
Population in Mild Climate	Percentage; 0–100.	S
Hospital Beds	Hospital beds per 1,000 people	W
HIV Prevalence	HIV or AIDS; aged 15–49; percentage; 0–100.	W
Immunization DPT	DPT vaccinations; aged 12–23 months; percentage; 0–100.	W
Infants Mortality	Deaths per 1000 live births; aged 0–12 months.	W
Maternal Death	Lifetime probability of maternal death for women aged 15; 0–100.	W
Mineral Depletion	See Lange et al. (2017); percentage of GDP.	S
Natural Resources Depletion	See Lange et al. (2017); percentage of GDP.	S
Energy Depletion	See Lange et al. (2017); percentage of GDP.	S
Other	Continent; Island; Landlocked; Post-soviet; Government Form; Development Aid Recipient	S; S; S; S; S; W

Note: Presumed factor category – S (GDPI and other HDI components); W (other HDI components); Z (GDPI component)

Appendix 2. Model specification test results

Model specification	F		LM		Hausman		Pesaran CD		Breusch-Godfrey/Wooldridge		Breusch-Pagan	
	test stat.	p-val.	test stat.	p-val.	test stat.	p-val.	test stat.	p-val.	test stat.	p-val.	test stat.	p-val.
(1)	156.3	0	111.5	0			144.7	0	1950.5	0	405.0	0
(2)	156.3	0			712.4	0	1.015	0.31	1431.6	0	405.0	0
(3)			111.5	0	712.4	0	83.04	0	1438.1	0	405.0	0
(4)	158.4	0	82.9	0	641.5	0	1.06	0.29	1364.5	0	493.0	0
(5)	174.5	0	111.9	0	415.3	0	-0.73	0.47	1441.9	0	546.0	0
(6)	183.7	0	111.7	0	2261.8	0	-0.09	0.93	1384.2	0	443.2	0
(7)	152.9	0	110.7	0	665.6	0	0.80	0.43	1423.5	0	346.1	0
(8)	158.8	0	111.1	0	686.8	0	2.67	0.01	1411.6	0	402.6	0
(9)			108.6	0			80.32	0	1372.6	0	493.0	0
(10)			111.4	0			82.87	0	1438.3	0	406.5	0
(11)			111.6	0			82.61	0	1439	0	463.4	0
(12)			111.5	0			80.85	0	1434.2	0	408.4	0
(13)			109.7	0			77.32	0	1433	0	564.6	0
(14)	110.1	0	58.2	0	582.0	0	-1.71	0.09	372.6	0	305.1	0
(15)	123.8	0	58.5	0	663.0	0	-0.71	0.48	209.5	0	165.4	0
(16)	153.0	0	112.0	0	669.0	0	-0.29	0.77	1414.1	0	439.6	0
(17)	110.6	0	63.7	0	743.2	0	-1.05	0.30	239.2	0	340.2	0
(18)	184.3	0	112.8	0	749.9	0	-1.22	0.22	1426.5	0	439.8	0
(19)	152.0	0	110.7	0	694.2	0	0.53	0.60	1400.4	0	382.4	0
(20)	124.6	0	111.5	0	702.8	0	0.20	0.84	1384.3	0	462.5	0
(21)	143.3	0	111.6	0	533.1	0	-0.17	0.87	1413.5	0	375.6	0
(22)			111.4	0			82.80	0	1445.5	0	431.1	0
(23)			108.6	0			78.60	0	1423.9	0	464.6	0
(24)	156.6	0	111.8	0	717.1	0	0.90	0.37	1420.8	0	415.9	0

Note: F – H_1: significant fixed effects; LM – H_1: significant random effects; Hausman – H_1: inconsistent random effects; Pesaran CD – H_1: cross-sectional dependence present; Breusch-Godfrey/Wooldridge – H_1: serial correlation in idiosyncratic errors; Breusch-Pagan – H_1: heteroskedasticity present; test results for serial correlation and heteroskedasticity for non-robust models; F and Hausman tests not conducted in model specifications encompassing time-invariable variables; LM listed for extended fixed-effects estimates was conducted on corresponding random-effects variant; p-value 0 in fact < $2.2e^{-16}$