Documentation of the Penn World Tables v 9.1

Questions and missing information in the documentation doc are marked in red.

Question to ask PWT team: with new vintages of the PWT, could new vintages of the Maddison database also be released? It would make the Maddison database much more useful if it was updated to the latest year possible.

Bermuda GDP and GDP per capita numbers seem too large.

User guide: <https://www.rug.nl/ggdc/docs/pwt91_user_guide_to_data_files.pdf>

## Real GDP, employment and population levels`§

**Variable name (PWT name):** Expenditure-side real GDP at chained PPPs (rgdpe)

**Variable explanation:** An estimate of GDP based on expenditure data (rather than production). ‘Real’ GDP means GDP has been adjusted for inflation. Chained PPPs prices take a weighted basket of goods that changes year-by-year to better reflect consumer spending decisions. PPPs are explained [here](https://ourworldindata.org/what-are-ppps).

**Unit of measurement in the PWT:** mil. 2011 US-$

**OWID transformation:** multiplied by 1,000,000 to turn it from ‘million US-$’ into ‘US-$’

**What this measure is useful for (and what it should not be used for):** Real (i.e. inflation adjusted) GDP is useful in reflecting the standard of living in an economy rather than the economy’s production possibilities. Useful for comparing standards of living across countries, over time.

**Original sources and how this variable was constructed:** National Accounts (NA) data on gross domestic product primarily sourced from the [UN National Accounts Main Aggregates Database](https://unstats.un.org/unsd/snaama/Index).

**Variable name (PWT name):** Output-side real GDP at chained PPPs (rgdpo)

**Variable explanation:** An estimate of GDP based on output data (rather than expenditure). ‘Real’ GDP means GDP has been adjusted for inflation. Chained PPPs prices take a weighted basket of goods that changes year-by-year to better reflect consumer spending decisions. PPPs are explained [here](https://ourworldindata.org/what-are-ppps).

**Unit of measurement in the PWT:** mil. 2011 US-$

**OWID transformation:** multiplied by 1,000,000 to turn it from ‘million US-$’ into ‘US-$’

**What this measure is useful for (and what it should not be used for):** Real (i.e. inflation adjusted) GDP is used to measure the production possibilities of an economy, not the standard of living. Useful for comparing production possibilities across countries, over time.

**Original sources and how this variable was constructed:** National Accounts (NA) data on gross domestic product primarily sourced from the [UN National Accounts Main Aggregates Database](https://unstats.un.org/unsd/snaama/Index).

**Variable name (PWT name):** Population (pop)

**Variable explanation:** Total population

**Unit of measurement in the PWT:** millions

**OWID transformation:** multiplied by 1,000,000 to turn it from ‘mil.’ into total population

**What this measure is useful for (and what it should not be used for):** In the context of the PWT, total population can be used to calculate per capita measures of GDP variables.

**Original sources and how this variable was constructed:** National accounts (NA) data taken from the UN Main Aggregates database.

**Variable name (PWT name):** Number of persons engaged (emp)

**Variable explanation:** Total number of people employed in production, aged 15 and over. This includes all employees, self-employed workers, unpaid family workers that are economically engaged, apprentices, the military, and those working in agriculture. Employment covers all people who work regardless of nationality, this distinction is relevant for countries with a large migratory workforce. It matches the World Bank/ILO definition of employment.

**Unit of measurement in the PWT:** millions

**OWID transformation:** multiplied by 1,000,000 to turn it from ‘mil.’ into total number of persons engaged

**What this measure is useful for (and what it should not be used for):** The aim is to compare the differences in the number of workers (labor input) in a country.

**Original sources and how this variable was constructed:** The starting point is employment data in the Total Economy Database (TED) compiled by the Conference Board, who build on the work of Angus Maddison. To increase coverage, the PWT uses ILO employment data, and employment and labor force data from the World Bank.

**More information can be found in:** The [Capital, labor and TFP in PWT8.0](http://piketty.pse.ens.fr/files/InklaarTimmer13.pdf) documentation and the [Total Economy Database (TED) sources & methods webpage](https://www.conference-board.org/data/economydatabase/index.cfm?id=27770). Access to TED requires (free) registration.

**Variable name (PWT name):** Average annual hours worked by persons engaged (avh)

**Variable explanation:** Average hours worked by the number of people employed.

**Unit of measurement in the PWT:** Hours worked.

**OWID transformation:** N/A

**What this measure is useful for (and what it should not be used for):** Average annual hours worked accounts for the differences in the average number of hours worked per person. It can be used as a secondary measure of labor input for a particular country.

**Original sources and how this variable was constructed:** Taken from the TED.

**More information can be found in:** For more information see the [PWT8.0 user guide](https://www.rug.nl/ggdc/docs/pwt_80_user_guide.pdf) pg 36/47 and the [TED user guide](https://www.conference-board.org/retrievefile.cfm?filename=TED_SMDetailed_nov2017.pdf&type=subsite) pg 15/51.

**Variable name (PWT name):** Human capital (hc)

**Variable explanation:** Human capital index based on average years of schooling for the population aged 15 and over.

**Unit of measurement in the PWT:** Index based on years of schooling

**OWID transformation:** N/A

**What this measure is useful for (and what it should not be used for):** The aim is to compare the differences in the amount of labor services. Workers with different levels of human capital will have different marginal products, depending on workers’ talent, amount/quality of formal schooling, on-the-job training, and experience. The most useful measure to compare labor services is the average years of schooling as it is the most widely available.

**Original sources and how this variable was constructed:** The PWT combines the Barro and Lee (2013) and Cohen and Lecker (2014) data.

**More information can be found in:** The [Human Capital in PWT9.0](https://www.rug.nl/ggdc/docs/human_capital_in_pwt_90.pdf) documentation, [Capital, labor and TFP in PWT8.0](http://piketty.pse.ens.fr/files/InklaarTimmer13.pdf) documentation, [Barro and Lee (2013)](https://www.sciencedirect.com/science/article/pii/S0304387812000855) paper, and [Caselli (2005)](https://www.sciencedirect.com/science/article/pii/S1574068405010099#fd008).

**For more information on the variables listed above see:**

[Feenstra et al (2015)](https://www.rug.nl/ggdc/productivity/pwt/related-research-papers/the_next_generation_of_the_penn_world_table.pdf), The Next Generation of the Penn World Table; the [‘National Accounts in PWT8.0’](https://www.rug.nl/ggdc/docs/national_accounts_in_pwt80.pdf) document; and <http://unstats.un.org/unsd/snaama/Introduction.asp> for further information about the UN Main Aggregates database.

## Current price GDP, capital and TFP

**Variable name (PWT name):** Real consumption of households and government at current PPPs (ccon)

**Variable explanation:** Total spending on consumption by households and the government. Household consumption includes goods and services purchased by individual households. Government consumption includes spending on public goods such as defence; public order and safety, economic affairs; health; social protection etc. Real consumption excludes investment. ‘Real’ consumption means it has been adjusted for inflation. PPPs are explained [here](https://ourworldindata.org/what-are-ppps).

**Unit of measurement in the PWT:** mil. 2011 US-$

**OWID transformation:** multiplied by 1,000,000 to turn it from ‘million US-$’ into ‘US-$’

**What this measure is useful for (and what it should not be used for):** Real consumption of households and government at current PPPs can be used for comparing standards of living across countries in one year, not over time.

**Original sources and how this variable was constructed:** Constructed using national accounts (NA) data with expenditure categories following the SNA. See the [SNA 2008](https://unstats.un.org/unsd/nationalaccount/docs/SNA2008.pdf) pg 247/722

**Variable name (PWT name):** Real domestic absorption at current PPPs (cda)

**Variable explanation:** Real domestic absorption consists of consumption (of both households and government) plus real investment. ‘Real’ domestic absorption means it has been adjusted for inflation. Investment is the value purchases of machinery, equipment, buildings etc. by producers less disposals of these same goods. PPPs are explained [here](https://ourworldindata.org/what-are-ppps).

**Unit of measurement in the PWT:** mil. 2011 US-$

**OWID transformation:** multiplied by 1,000,000 to turn it from ‘million US-$’ into ‘US-$’

**What this measure is useful for (and what it should not be used for):** Useful for comparing living standards across countries in one year, not over time.

**Original sources and how this variable was constructed:** Constructed using national accounts (NA) data with expenditure categories following the SNA. Investment is measured by a country’s gross capital formation. See the [SNA 2008](https://unstats.un.org/unsd/nationalaccount/docs/SNA2008.pdf) pg 66/722

**Variable name (PWT name):** Expenditure-side real GDP at current PPPs (cgdpe)

**Variable explanation:** An estimate of GDP based on expenditure data (rather than production). It includes goods and services consumed by residents and non-residents of the country (produced by either residents or non-residents). Real GDP has been adjusted for inflation. Current GDP uses prices that are constant across countries in a particular year. PPPs are explained [here](https://ourworldindata.org/what-are-ppps).

**Unit of measurement in the PWT:** mil. 2011 US-$

**OWID transformation:** multiplied by 1,000,000 to turn it from ‘million US-$’ into ‘US-$’

**What this measure is useful for (and what it should not be used for):** Current expenditure-side GDP is useful for comparing standard of living across countries in one year, not over time.

**Original sources and how this variable was constructed:** Constructed using national accounts (NA) data with expenditure categories following the SNA.

**Variable name (PWT name):** Output-side real GDP at current PPPs (cgdpo)

**Variable explanation:** An estimate of GDP based on output data (rather than expenditure). ‘Real’ GDP means GDP has been adjusted for inflation. Current GDP uses prices that are constant across countries in a particular year. PPPs are explained [here](https://ourworldindata.org/what-are-ppps).

**Unit of measurement in the PWT:** mil. 2011 US-$

**OWID transformation:** multiplied by 1,000,000 to turn it from ‘million US-$’ into ‘US-$’

**What this measure is useful for (and what it should not be used for):** Current expenditure-side GDP is useful for comparing production possibilities across countries in one year, not over time.

**Original sources and how this variable was constructed:** Constructed using national accounts data (NA) with expenditure categories following the SNA.

**Variable name (PWT name):** Capital stock at current PPPs (cn)

**Variable explanation:** Capital stock at time t is based on all previous investments leading up to year t. Current PPPs uses prices that are constant across countries in a particular year. PPPs are explained [here](https://ourworldindata.org/what-are-ppps).

**Unit of measurement in the PWT:** mil. 2011 US-$

**OWID transformation:** multiplied by 1,000,000 to turn it from ‘million US-$’ into ‘US-$’

**What this measure is useful for (and what it should not be used for):** Useful for comparing the capital stock across countries in one year, not over time.

**Original sources and how this variable was constructed:** The PWT estimates the capital stock for each asset based on the perpetual inventory method.The capital stock at time t is based on all previous investments leading up to that year. Country-specific information is used to estimate capital stock in the first year of the data.

**More information can be found in:** See [Capital, labor and TFP in PWT8.0](http://piketty.pse.ens.fr/files/InklaarTimmer13.pdf) documentation, [Feenstra et al (2015)](https://www.rug.nl/ggdc/productivity/pwt/related-research-papers/the_next_generation_of_the_penn_world_table.pdf), The Next Generation of the Penn World Table, and the [PWT9.1 What’s New](https://www.rug.nl/ggdc/docs/pwt91_whatsnew.pdf) document.

**Variable name (PWT name):** Capital services levels at current PPPs (USA=1) (ck)

**Variable explanation:** Capital services is a corrected measure of countries’ investment in capital inputs. Previously used capital stock methodologies may underestimate the role of capital in contributing to income differences. Using the capital services estimate, high-income countries’ investment in capital inputs increases relative to low-income countries. PPPs are explained [here](https://ourworldindata.org/what-are-ppps).

**Unit of measurement in the PWT:** USA value = 1 in all years

**OWID transformation:** N/A

**What this measure is useful for (and what it should not be used for):** Useful for comparing capital stock across countries in one year, not over time.

**Original sources and how this variable was constructed:** Inklaar et al (2019) estimate the user cost of capital and capital services following Jorgenson and Nishimizu’s (1978) framework. Estimation of capital services relaxes the assumption of homogeneous capital used in estimations of capital stock, recognising capital assets have different marginal products, and that richer countries tend to invest in capital with a higher marginal product.

**Notes:** Patterns of investment differ systematically by country income with richer countries investing more in short-lived assets with a higher marginal product (e.g. computers and software) than in long-lived assets (e.g. buildings or roads).

**More information can be found in:** [Inklaar et al (2019)](https://www.rug.nl/ggdc/docs/pwt91_capitalservices_ipmrevision.pdf) The Composition of Capital and Cross-country Productivity Comparisons and the [PWT9.1 What’s New](https://www.rug.nl/ggdc/docs/pwt91_whatsnew.pdf) document.

**Variable name (PWT name):** TFP level at current PPPs (USA=1) (ctfp)

**Variable explanation:** Total factor productivity is the portion of output that cannot be accounted for by an economy’s factors of production (e.g. labor, capital). PPPs are explained [here](https://ourworldindata.org/what-are-ppps).

**Unit of measurement in the PWT:** USA value = 1 in all years

**OWID transformation:** N/A

**What this measure is useful for (and what it should not be used for):** Useful for comparing productivity levels across countries in a particular year, not over time.

**Original sources and how this variable was constructed:** Productivity is calculated using current output-side GDP, capital services, labor input data, and the share of labor income of employees and self-employed workers in GDP.

**Notes:** Labor input is based on emp, avh, and hc. For countries where avh is not reported, the PWT relies on estimates based on avh for the US. (The same applies for rtfpna, rwtfpna).

**Variable name (PWT name):** Welfare-relevant TFP levels at current PPPs (USA=1) (cwtfp)

**Variable explanation:** Total factor productivity is the portion of output that cannot be accounted for by an economy’s factors of production (e.g. labor, capital). TFP is welfare-relevant as it uses real domestic absorption as the GDP measure, accounting for consumption and investment in the economy. PPPs are explained [here](https://ourworldindata.org/what-are-ppps).

**Unit of measurement in the PWT:** USA value = 1 in all years

**OWID transformation:** N/A

**What this measure is useful for (and what it should not be used for):** Useful for comparing living standards across countries in a particular year, not over time.

**Original sources and how this variable was constructed:** The welfare-relevant TFP level is calculated using domestic absorption, capital services, labor input data, and the share of labor income of employees and self-employed workers in GDP.

**For more information on the variables listed above see:**

[Feenstra et al (2015)](https://www.rug.nl/ggdc/productivity/pwt/related-research-papers/the_next_generation_of_the_penn_world_table.pdf), The Next Generation of the Penn World Table; the [SNA 2008](https://unstats.un.org/unsd/nationalaccount/docs/SNA2008.pdf); and the [‘National Accounts in PWT8.0’](https://www.rug.nl/ggdc/docs/national_accounts_in_pwt80.pdf) document.

## National accounts-based variables

**Variable name (PWT name):** Real GDP at constant 2011 national prices (rgdpna)

**Variable explanation:** An estimate of GDP based on national prices that are constant over time. ‘Real’ means prices have been adjusted for inflation.

**Unit of measurement in the PWT:** mil. 2011 US-$

**OWID transformation:** multiplied by 1,000,000 to turn it from ‘million US-$’ into ‘US-$’

**What this measure is useful for (and what it should not be used for):** Useful for comparing the growth of GDP over time in one country, not across countries.

**Original sources and how this variable was constructed:** Data is taken from the national accounts (NA) of each country. The main source is the UN’s Main Aggregates Database.

**Variable name (PWT name):** Real consumption at constant 2011 national prices (rconna)

**Variable explanation:** An estimate of total household and government consumption based on national prices that are constant over time. ‘Real’ means prices have been adjusted for inflation.

**Unit of measurement in the PWT:** mil. 2011 US-$

**OWID transformation:** multiplied by 1,000,000 to turn it from ‘million US-$’ into ‘US-$’

**What this measure is useful for (and what it should not be used for):** Useful for comparing the growth of consumption over time in one country, not across countries.

**Original sources and how this variable was constructed:** Data is taken from the national accounts (NA) of each country.

**Variable name (PWT name):** Real domestic absorption at constant 2011 national prices (rdana)

**Variable explanation:** The total final expenditures of residents in a country including consumption, government spending, and investment based on national prices that are constant over time. ‘Real’ means prices have been adjusted for inflation.

**Unit of measurement in the PWT:** mil. 2011 US-$

**OWID transformation:** multiplied by 1,000,000 to turn it from ‘million US-$’ into ‘US-$’

**What this measure is useful for (and what it should not be used for):** Useful for comparing the growth of domestic absorption over time in one country, not across countries.

**Original sources and how this variable was constructed:** Data is taken from the national accounts (NA) of each country.

**Variable name (PWT name):** Capital stock at constant 2011 national prices (rnna)

**Variable explanation:** Capital stock at time t is based on all previous investments leading up to year t using national prices that are constant over time.

**Unit of measurement in the PWT:** mil. 2011 US-$

**OWID transformation:** multiplied by 1,000,000 to turn it from ‘million US-$’ into ‘US-$’

**What this measure is useful for (and what it should not be used for):** Useful for comparing capital stock over time in one country, not across countries.

**Original sources and how this variable was constructed:** The PWT estimate the capital stock for each asset based on the perpetual inventory method.The capital stock at time t is based on all previous investments leading up to that year. Country-specific information is used to estimate capital stock in the first year of the data.

**Variable name (PWT name):** Capital services at constant 2011 national prices (rkna)

**Variable explanation:** Capital services is a corrected measure of countries’ investment in capital inputs based on national prices that are constant over time. Previously used capital stock methodologies may underestimate the role of capital in contributing to income differences. Using the capital services estimate, high-income countries’ investment in capital inputs increases relative to low-income countries.

**Unit of measurement in the PWT:** (2011 = 1)

**OWID transformation:** N/A

**What this measure is useful for (and what it should not be used for):** Useful for comparing the growth of capital stock over time in one country, not across countries.

**Original sources and how this variable was constructed:** The capital stock is based on investment and prices of structures and equipment. Inklaar et al (2019) estimate the user cost of capital and capital services following Jorgenson and Nishimizu’s (1978) framework. Estimation of capital services relaxes the assumption of homogeneous capital used in prior estimations of capital stock, recognising capital assets have different marginal products, and that richer countries tend to invest in capital with a higher marginal product.

**More information can be found in:** [Inklaar et al (2019)](https://www.rug.nl/ggdc/docs/pwt91_capitalservices_ipmrevision.pdf) The Composition of Capital and Cross-country Productivity Comparisons and the [PWT9.1 What’s New](https://www.rug.nl/ggdc/docs/pwt91_whatsnew.pdf) document.

**Variable name (PWT name):** TFP at constant national prices (rtfpna)

**Variable explanation:** Total factor productivity is the portion of output that cannot be accounted for by an economy’s factors of production (e.g. labor, capital) based on national prices that are constant over time.

**Unit of measurement in the PWT:** (2011 = 1)

**OWID transformation:** N/A

**What this measure is useful for (and what it should not be used for):** Useful for comparing the growth of productivity over time in each country, not across countries.

**Original sources and how this variable was constructed:** Productivity is calculated using real GDP at constant national prices, capital services at constant 2011 national prices, labor input data, and the share of labor income of employees and self-employed workers in GDP.

**Notes:** Labor input is based on emp, avh, and hc. For countries where avh is not reported, the PWT relies on estimates based on avh for the US. (The same applies for ctfp, rwtfpna).

**Variable name (PWT name):** Welfare-relevant TFP at constant national prices (rwtfpna)

**Variable explanation:** Total factor productivity is the portion of output that cannot be accounted for by an economy’s factors of production (e.g. labor, capital) based on national prices that are constant over time.

**Unit of measurement in the PWT:** (2011=1)

**OWID transformation:** N/A

**What this measure is useful for (and what it should not be used for):** Useful for comparing the growth of welfare-relevant productivity over time in one country, not across countries.

**Original sources and how this variable was constructed:** Welfare-relevant productivity is calculated using real GDP at constant national prices, capital services at constant 2011 national prices, labor input data, and the share of labor income of employees and self-employed workers in GDP.

**Notes:** Labor input is based on emp, avh, and hc. For countries where avh is not reported, the PWT relies on estimates based on avh for the US. (The same applies for ctfp, rtfpna).

**Variable name (PWT name):** Share of labour compensation in GDP (labsh)

**Variable explanation:** The share of labor income paid to employees and self-employed workers from total GDP.

**Unit of measurement in the PWT:** %,current national prices

**OWID transformation:** N/A

**What this measure is useful for (and what it should not be used for):** Useful for comparing total inputs across countries and over time.

**Original sources and how this variable was constructed:** Use national accounts (NA) data on the compensation of employees, GDP at basic prices, and mixed income. Feenstra et al (2015) construct a ‘best estimate’ labor share which is adjusted for the labor compensation of self-employed workers. For more discussion of adjustment methods see [Gollin (2002)](https://econpapers.repec.org/article/ucpjpolec/v_3a110_3ay_3a2002_3ai_3a2_3ap_3a458-474.htm).

**Variable name (PWT name):** Real internal rate of return (irr)

**Variable explanation:** The real internal rate of return on capital is the share of capital income in GDP. ‘Real’ means prices have been adjusted for inflation.

**Unit of measurement in the PWT:** %

**OWID transformation:** N/A

**What this measure is useful for (and what it should not be used for):** Useful for tracking the development of the return on capital over time and compare levels across countries.

**Original sources and how this variable was constructed:** Apply method by Jorgenson and Nishimizu (1978), a more accurate measure of the return to capital than the marginal product of capital because it accounts for differences in the composition of the capital stock.

**Variable name (PWT name):** Average depreciation rate of the capital stock (delta)

**Variable explanation:** The depreciation rate of capital stock is the rate of decrease in the economic value of capital. E.g. obsolescence of the equipment or wear-and-tear.

**Unit of measurement in the PWT:** %

**OWID transformation:** N/A

**What this measure is useful for (and what it should not be used for):** Useful for comparing the rate of depreciation of capital stocks across countries over time.

**Original sources and how this variable was constructed:** Depreciation rate of asset = capital consumption at current prices / current-cost net capital stock. The depreciation rate of an asset depends on the capital stock.

**For more information on the variables listed above see:**

[Feenstra et al (2015)](https://www.rug.nl/ggdc/productivity/pwt/related-research-papers/the_next_generation_of_the_penn_world_table.pdf), The Next Generation of the Penn World Table; the [PWT9.1 What’s New](https://www.rug.nl/ggdc/docs/pwt91_whatsnew.pdf) document; and [PWT 9.0](https://www.rug.nl/ggdc/docs/user_guide_to_pwt90_data_files.pdf) documentation.

## Exchange rates and GDP price levels

**Variable name (PWT name):** Exchange rate, national currency/USD (market+estimated) (xr)

**Variable explanation:** The exchange rate provides the national currency units per US $.

**Unit of measurement in the PWT:** national currency/USD (market+estimated)

**OWID transformation:** N/A

**What this measure is useful for (and what it should not be used for):** Useful for converting local currency units to US $, i.e. how many currency units are needed to buy $1.

**Original sources and how this variable was constructed:** The exchange rate uses the UN’s National Accounts Main Aggregates Database exchange rate series that includes estimated rates rather than fully market-based series. Feenstra et al (2015) have also estimated exchange rates for additional observations using the UN methodology.

**Notes:** The aim is to provide price level estimates interpreted in light of income levels and other structural features of the economy rather than short term market fluctuations

**More information can be found in:** [Exchange rates in PWT8.0](https://www.rug.nl/ggdc/docs/exchange_rates_in_pwt80.pdf) documentation

**Variable name (PWT name):** Price level of CCON (PPP/XR) (pl\_con)

**Variable explanation:** Price level of real consumption of households and government at current PPPs defined relative to the US in 2011. PPPs are explained [here](https://ourworldindata.org/what-are-ppps).

**Unit of measurement in the PWT:** 2011=1

**OWID transformation:** N/A

**What this measure is useful for (and what it should not be used for):** Useful for comparing how consumption price levels differ across countries.

**Original sources and how this variable was constructed:** Price level of CCON is equal to the PPP (ratio of nominal CON to CCON) divided by the nominal exchange rate.

**Variable name (PWT name):** Price level of CDA (PPP/XR) (pl\_da)

**Variable explanation:** Price level of real domestic absorption at current PPPs defined relative to the US in 2011. PPPs are explained [here](https://ourworldindata.org/what-are-ppps).

**Unit of measurement in the PWT:** price level of USA GDPo, 2011=1

**OWID transformation:** N/A

**What this measure is useful for (and what it should not be used for):** Useful for comparing how expenditure price levels differ across countries.

**Original sources and how this variable was constructed:** The price level of CDA and CGDPE is equal to the PPP (ratio of nominal DA to CDA) divided by the nominal exchange rate.

**Variable name (PWT name):** Price level of CGDPo (PPP/XR) (pl\_gdpo)

**Variable explanation:** Price level of output-side GDP defined relative to the US in 2011. PPPs are explained [here](https://ourworldindata.org/what-are-ppps).

**Unit of measurement in the PWT:** 2011=1

**OWID transformation:** N/A

**What this measure is useful for (and what it should not be used for):** Useful for comparing how output price levels differ across countries.

**Original sources and how this variable was constructed:** The price level of CGDPO is equal to the PPP (ratio of nominal GDP to CGDPO) divided by the nominal exchange rate.

**For more information on the variables listed above see:**

[Feenstra et al (2015)](https://www.rug.nl/ggdc/productivity/pwt/related-research-papers/the_next_generation_of_the_penn_world_table.pdf), The Next Generation of the Penn World Table

## Data information variables

**Variable name (PWT name):** Information on relative price data for consumption, investment, and government (i\_cig)

**Variable explanation:** The relative price data for consumption, investment and government is extrapolated (0), benchmark (1) or interpolated (2)

**Unit of measurement in the PWT:** Categorical variable: 0/1/2

**OWID transformation:** N/A

**What this measure is useful for (and what it should not be used for):** xx

**Original sources and how this variable was constructed:** xx

**Variable name (PWT name):** Information on relative price data for exports and imports (i\_xm)

**Variable explanation:** The relative price data for exports and imports is extrapolated (0), benchmark (1) or interpolated (2)

**Unit of measurement in the PWT:** Categorical variable: 0/1/2

**OWID transformation:** N/A

**What this measure is useful for (and what it should not be used for):** xx

**Original sources and how this variable was constructed:** xx

**Variable name (PWT name):** Information on the exchange rate (i\_xr)

**Variable explanation:** Determines whether the exchange rate is market-based (0) or estimated (1)

**Unit of measurement in the PWT:** Categorical variable: 0/1

**OWID transformation:** N/A

**What this measure is useful for (and what it should not be used for):** xx

**Original sources and how this variable was constructed:** xx

**Variable name (PWT name):** Information on outliers for pl\_gdpo (i\_outlier)

**Variable explanation:** The observation on pl\_gdpe or pl\_gdpo is not an outlier (0) or an outlier (1)

**Unit of measurement in the PWT:** Categorical variable: 0/1

**OWID transformation:** N/A

**What this measure is useful for (and what it should not be used for):** xx

**Original sources and how this variable was constructed:** xx

**Variable name (PWT name):** Information on the real internal rate of return on capital (i\_irr)

**Variable explanation:** The observation for irr is not an outlier (0), may be biased due to a low capital share (1), hit the lower bound of 1 percent (2), or is an outlier (3)

**Unit of measurement in the PWT:** Categorical variable: 0/1/2/3

**OWID transformation:** N/A

**What this measure is useful for (and what it should not be used for):** xx

**Original sources and how this variable was constructed:** xx

**Variable name (PWT name):** Correlation of expenditure shares of country and the US (benchmark observations only) (cor\_exp)

**Variable explanation:** Correlation between product expenditure shares of a particular country and the US (benchmark observations only) Benchmark observations refer to data points corresponding to the benchmark years by the International Comparisons Program (ICP).

**Unit of measurement in the PWT:** Measurement between -1 and 1

**OWID transformation:** N/A

**What this measure is useful for (and what it should not be used for):** Useful for comparing how strongly related a country’s expenditure shares are to that of the US.

**Original sources and how this variable was constructed:** xx

**Variable name (PWT name):** Statistical capacity indicator (statcap)

**Variable explanation:** The statistical capacity indicator measures a nation’s ability to collect, analyse, and disseminate high quality data about its population and economy. The higher the score, the higher a country’s statistical capacity.

**Unit of measurement in the PWT:** Score between 0 and 100.

**OWID transformation:** N/A

**What this measure is useful for (and what it should not be used for):** Useful for comparing statistical capacity scores across countries over time.

**Original sources and how this variable was constructed:** The SCI is a composite score assessing the capacity of a country’s statistical system against 25 criteria using publicly available data. The framework based on a country’s methodology; data sources; periodicity and timeliness. The capacity score is a simple average over these 3 categories on a scale of 0-100.

**More information can be found in:** World Bank [Statistical Capacity Indicator](http://datatopics.worldbank.org/statisticalcapacity/) page

**For more information on the variables listed above see:**

[PWT9.1](https://www.rug.nl/ggdc/productivity/pwt/) stata and excel files

## Shares in CGDPO

**Variable name (PWT name):** Share of household consumption (csh\_c)

**Variable explanation:** Household consumption as a share of output-side real GDP at current PPPs. Current means prices are constant across countries in a particular year. PPPs are explained [here](https://ourworldindata.org/what-are-ppps).

**Unit of measurement in the PWT:** current PPPs

**OWID transformation:** N/A

**What this measure is useful for (and what it should not be used for):** Useful for comparing the share of household consumption across countries in a particular year.

**Original sources and how this variable was constructed:** Constructed using national accounts (NA) data with the expenditure categories following the definitions used in the System of National Accounts (SNA).

**Variable name (PWT name):** Share of gross capital formation (csh\_i)

**Variable explanation:** Gross capital formation as a share of output-side real GDP at current PPPs. Gross capital formation is investment in capital goods net of obsolete capital equipment. Current means prices are constant across countries in a particular year. PPPs are explained [here](https://ourworldindata.org/what-are-ppps).

**Unit of measurement in the PWT:** current PPPs

**OWID transformation:** N/A

**What this measure is useful for (and what it should not be used for):** Useful for comparing the share of gross capital formation across countries in a particular year.

**Original sources and how this variable was constructed:** Constructed using national accounts (NA) data with the expenditure categories following the definitions used in the System of National Accounts (SNA).

**Variable name (PWT name):** Share of government consumption (csh\_g)

**Variable explanation:** Government consumption as a share of output-side real GDP at current PPPs. Current means prices are constant across countries in a particular year. PPPs are explained [here](https://ourworldindata.org/what-are-ppps).

**Unit of measurement in the PWT:**  current PPPs

**OWID transformation:** N/A

**What this measure is useful for (and what it should not be used for):** Useful for comparing the share of government consumption across countries in a particular year.

**Original sources and how this variable was constructed:** Constructed using national accounts (NA) data with the expenditure categories following the definitions used in the System of National Accounts (SNA).

**Variable name (PWT name):** Share of merchandise exports (csh\_x)

**Variable explanation:** Merchandise exports as a share of output-side real GDP at current PPPs. Merchandise trade excludes services and is limited to trade in goods. Current means prices are constant across countries in a particular year. PPPs are explained [here](https://ourworldindata.org/what-are-ppps).

**Unit of measurement in the PWT:** current PPPs

**OWID transformation:** N/A

**What this measure is useful for (and what it should not be used for):** Useful for comparing the share of merchandise exports across countries in a particular year.

**Original sources and how this variable was constructed:** Constructed using national accounts data (NA) with the expenditure categories following the definitions used in the System of National Accounts (SNA).

**Variable name (PWT name):** Share of merchandise imports (csh\_m)

**Variable explanation:** Merchandise imports as a share of output-side real GDP at current PPPs. Merchandise trade excludes services and is limited to trade in goods. Current means prices are constant across countries in a particular year. PPPs are explained [here](https://ourworldindata.org/what-are-ppps).

**Unit of measurement in the PWT:** current PPPs

**OWID transformation:** N/A

**What this measure is useful for (and what it should not be used for):** Useful for comparing the share of merchandise imports across countries in a particular year.

**Original sources and how this variable was constructed:** Constructed using national accounts (NA) data with the expenditure categories following the definitions used in the System of National Accounts (SNA).

**Variable name (PWT name):** Share of residual trade and GDP statistical discrepancy (csh\_r)

**Variable explanation:** Residual trade is the value of output-side GDP that is not accounted for by either household consumption, gross capital formation, government consumption, or merchandise imports/exports, as a share of total output-side real GDP. This also includes any statistical discrepancy between to ensure that expenditure-side accounting (C + I + G + X - M) adds up to GDP from the National Accounts. Current means prices are constant across countries in a particular year. PPPs are explained [here](https://ourworldindata.org/what-are-ppps).

**Unit of measurement in the PWT:** current PPPs

**OWID transformation:** N/A

**What this measure is useful for (and what it should not be used for):** Useful for comparing the share of residual trade and the statistical discrepancy across countries in a particular year.

**Original sources and how this variable was constructed:** Constructed using national accounts (NA) data with the expenditure categories following the definitions used in the System of National Accounts (SNA).

**For more information on the variables listed above see:**

[National Accounts in PWT8.0](https://www.rug.nl/ggdc/docs/national_accounts_in_pwt80.pdf) doc, and the [SNA 2008](https://unstats.un.org/unsd/nationalaccount/docs/SNA2008.pdf)

## Price levels, expenditure categories and capital

**Variable name (PWT name):** Price level of household consumption (pl\_c)

**Variable explanation:** Average level of prices of household consumption relative to the price level in the US in 2011. pl\_c > 1 corresponds to price levels higher than the US in 2011, and pl\_c < 1 price levels lower than in the US in 2011.

**Unit of measurement in the PWT:** Price level of USA GDPo in 2011=1

**OWID transformation:** N/A

**What this measure is useful for (and what it should not be used for):** Useful for comparing the price level of household consumption across countries in each year.

**Original sources and how this variable was constructed:** ICP, OECD, & Eurostat PPPs.

**Question OWID has for PWT:** What is the best documentation to read about the price level variables aside from[Technical Guide to PWT8.0](https://www.rug.nl/ggdc/docs/technical_guide_to_pwt80.pdf), and [Feenstra et al (2015)](https://www.rug.nl/ggdc/docs/the_next_generation_of_the_penn_world_table.pdf) documents?

**Variable name (PWT name):** Price level of capital formation (pl\_i)

**Variable explanation:** Average level of prices of investment relative to the price level in the US in 2011. pl\_i > 1 corresponds to price levels higher than the US in 2011, and pl\_i < 1 price levels lower than in the US in 2011.

**Unit of measurement in the PWT:** Price level of USA GDPo in 2011=1.

**OWID transformation:** N/A

**What this measure is useful for (and what it should not be used for):** Useful for comparing the price level of investment across countries in each year.

**Original sources and how this variable was constructed:** ICP, OECD, & Eurostat PPPs.

**Variable name (PWT name):** Price level of government consumption (pl\_g)

**Variable explanation:** Average level of prices of government consumption relative to the price level in the US in 2011. pl\_g > 1 corresponds to price levels higher than the US in 2011, and pl\_g < 1 price levels lower than in the US in 2011.

**Unit of measurement in the PWT:** Price level of USA GDPo in 2011=1

**OWID transformation:** N/A

**What this measure is useful for (and what it should not be used for):** Useful for comparing the price level of government consumption across countries in each year.

**Original sources and how this variable was constructed:** ICP, OECD, & Eurostat PPPs.

**Variable name (PWT name):** Price level of exports (pl\_x)

**Variable explanation:** Average level of prices of exports relative to the price level in the US in 2011. pl\_x > 1 corresponds to price levels higher than the US in 2011, and pl\_x < 1 price levels lower than in the US in 2011.

**Unit of measurement in the PWT:** Price level of USA GDPo in 2011=1

**OWID transformation:** N/A

**What this measure is useful for (and what it should not be used for):** Useful for comparing the price level of exports across countries in each year.

**Original sources and how this variable was constructed:** ICP, OECD, & Eurostat PPPs.

**Variable name (PWT name):** Price level of imports (pl\_m)

**Variable explanation:** Average level of prices of government consumption relative to the price level in the US in 2011. pl\_m > 1 corresponds to price levels higher than the US in 2011, and pl\_m < 1 price levels lower than in the US in 2011.

**Unit of measurement in the PWT:** Price level of USA GDPo in 2011=1

**OWID transformation:** N/A

**What this measure is useful for (and what it should not be used for):** Useful for comparing the price level of imports across countries in each year.

**Original sources and how this variable was constructed:** ICP, OECD, & Eurostat PPPs.

**Variable name (PWT name):** Price level of the capital stock (pl\_n)

**Variable explanation:** Average level of prices of the capital stock relative to the price level in the US in 2011. pl\_n > 1 corresponds to price levels higher than the US in 2011, and pl\_n < 1 price levels lower than in the US in 2011.

**Unit of measurement in the PWT:** Price level of USA GDPo in 2011=1

**OWID transformation:** N/A

**What this measure is useful for (and what it should not be used for):** Useful for comparing the price level of exports across countries in each year.

**Original sources and how this variable was constructed:** ICP, OECD, & Eurostat PPPs.

**Variable name (PWT name):** Price level of the capital services (pl\_k)

**Variable explanation:** Average level of prices of capital services relative to the price level in the US for every year. pl\_k > 1 corresponds to price levels higher than the US, and pl\_k < 1 price levels lower than in the US for every year.

**Unit of measurement in the PWT:** Price level of USA GDPo equals 1 for every year.

**OWID transformation:** N/A

**What this measure is useful for (and what it should not be used for):** Useful for comparing the price level of capital services across countries in each year.

**Original sources and how this variable was constructed:** ICP, OECD, & Eurostat PPPs.

**For more information on the variables listed above see:**

[Technical Guide to PWT8.0](https://www.rug.nl/ggdc/docs/technical_guide_to_pwt80.pdf), and [Feenstra et al (2015)](https://www.rug.nl/ggdc/docs/the_next_generation_of_the_penn_world_table.pdf) The Next Generation of the Penn World Table

## OWID produced variables

The variables below have been constructed by OWID based on the PWT v9.1 data release.

**Variable name:** Total output-side real GDP (tot\_rgdp\_o)

Tot\_rgdp\_o = rgdpo \* 1,000,000

Total output-side real GDP is calculated as output-side real GDP at chained PPPs multiplied by 1,000,000 (in 2011 US$).

**Variable explanation:** An estimate of GDP based on output data (rather than expenditure). ‘Real’ GDP means GDP has been adjusted for inflation. Chained PPP prices take a weighted basket of goods that changes year-by-year to better reflect consumer spending decisions. PPPs are explained [here](https://ourworldindata.org/what-are-ppps).

**Unit of measurement in the PWT:** chained PPPs (in mil. 2011 US$)

**What this measure is useful for (and what it should not be used for):** Real (i.e. inflation adjusted) GDP is used to measure the production possibilities of an economy, not the standard of living. Useful for comparing production possibilities across countries, over time.

**Original sources and how this variable was constructed:** National Accounts (NA) data on gross domestic product primarily sourced from the [UN National Accounts Main Aggregates Database](https://unstats.un.org/unsd/snaama/Index).

**Variable name:** Total expenditure-side real GDP (tot\_rgdp\_e)

Tot\_rgdp\_e = rgdpe \* 1,000,000

Total expenditure-side GDP is calculated using expenditure-side real GDP at chained PPPs multiplied by 1,000,000 (in 2011 US$).

**Variable explanation:** An estimate of GDP based on expenditure data (rather than production). ‘Real’ GDP means GDP has been adjusted for inflation. Chained PPPs prices take a weighted basket of goods that changes year-by-year to better reflect consumer spending decisions. PPPs are explained [here](https://ourworldindata.org/what-are-ppps).

**Unit of measurement in the PWT:** chained PPPs (in mil. 2011 US$)

**What this measure is useful for (and what it should not be used for):** Real (i.e. inflation adjusted) GDP is useful in reflecting the standard of living in an economy rather than the economy’s production possibilities. Useful for comparing standards of living across countries, over time.

**Original sources and how this variable was constructed:** National Accounts (NA) data on gross domestic product primarily sourced from the [UN National Accounts Main Aggregates Database](https://unstats.un.org/unsd/snaama/Index). For more discussion of the NA data see the [‘National Accounts in PWT8.0’](https://www.rug.nl/ggdc/docs/national_accounts_in_pwt80.pdf) document.

**Variable name:** Productivity

Productivity = (tot\_rgdp\_o) / (avh\*emp)

Productivity is total real output-side GDP per hour worked; where hours worked are calculated by multiplying the average hours worked per persons engaged by the total number of persons engaged.

**Variable explanation:** Productivity is measured as GDP per hour worked. It conveys how much output (measured in terms of real output-side GDP) is gained per unit of labor hours worked by those employed in the economy.

**Unit of measurement in the PWT:** Uses rgdp\_o, avh, emp variables from PWT9.1

**What this measure is useful for (and what it should not be used for):** The productivity variable is useful for comparing productivity across countries over time.

**Original sources and how this variable was constructed:** Productivity = (tot\_rgdp\_o) / (avh\*emp). See rgdp\_o, avh, emp variables above for more information.

**Variable name:** Output-side real GDP per capita (gdppc\_o)

Gdppc\_o = tot\_rgdpo / pop

Output-side real GDP per capita is calculated by dividing total output-side GDP by the total population.

**Variable explanation:** Output-side real GDP per capita estimates the production possibilities of the country. ‘Real’ means GDP has been adjusted for inflation.

**Unit of measurement in the PWT:** Uses rgdp\_o, pop variables from PWT9.1

**What this measure is useful for (and what it should not be used for):** Useful for comparing production possibilities across countries, over time.

**Original sources and how this variable was constructed:** GDP per capita (output-side) = tot\_rgdp\_o/population

**Variable name:** Expenditure-side real GDP per capita (gdppc\_e)

Gdppc\_e = tot\_rgdpe / pop

Expenditure-side real GDP per capita is calculated by dividing total expenditure-side GDP by the total population.

**Variable explanation:** Expenditure-side real GDP per capita estimates the standards of living of the country. ‘Real’ means GDP has been adjusted for inflation.

**Unit of measurement in the PWT:** Uses rgdp\_e, pop variables from PWT9.1

**What this measure is useful for (and what it should not be used for):** Useful for comparing standards of living across countries, over time.

**Original sources and how this variable was constructed:** GDP per capita (expenditure-side) = tot\_rgdp\_o/population

**Variable name:** Real GDP per capita in 1960 (rgdpo\_60)

Rgdpe\_60 = gdppc\_e in the year 1960

Real GDP per capita in 1960 lists GDP per capita for all countries in 1960.

**Variable explanation:** Real GDP per capita measures real expenditure-side GDP per person in the year 1960.

**Unit of measurement in the PWT:** mil 2011 US$

**What this measure is useful for (and what it should not be used for):** Real (i.e. inflation adjusted) GDP is used to measure standards of living. Useful for comparing living standards over time.

**Original sources and how this variable was constructed:** National Accounts (NA) data on gross domestic product primarily sourced from the [UN National Accounts Main Aggregates Database](https://unstats.un.org/unsd/snaama/Index).

**Variable name:** Real GDP growth per capita 1960-2017 (rgdpo\_17\_60)

Rgdpo\_17\_60 = mean(logrgdppco[\_n] - logrgdppco[\_n-1]) where logrgdppco = log(tot\_rgdp\_o/pop)

Real GDP growth per capita is calculated as the average of the yearly growth rate of GDP per capita over the period 1960-2017.

**Variable explanation:** Average annual growth rate in output-side GDP per capita over the period 1960 to 2017.

**Unit of measurement in the PWT:** mil 2011 US$

**What this measure is useful for (and what it should not be used for):** Useful for comparing growth rates of GDP per capita across countries over time.

**Original sources and how this variable was constructed:** National Accounts (NA) data on gross domestic product primarily sourced from the [UN National Accounts Main Aggregates Database](https://unstats.un.org/unsd/snaama/Index). We calculate the growth rate of GDP per capita from year to year, taking an average of these yearly growth rates between 1960 and 2017.

**Variable name:** Ratio of exports and imports to GDP (%)

Ratio = ((ex\_usd + imp\_usd) / gdp\_usd )\*100, where ex\_usd = v\_x / xr2 to convert export (and v\_x for import) values into US$.

The ratio of exports and imports to GDP is calculated by summing a country’s total imports and exports, then dividing by the country’s GDP - after all values have been converted to US$.

**Variable explanation:** The ratio of exports and imports is total imports plus total exports over GDP. This ratio approximates the trade openness of a country.

**Unit of measurement in the PWT:** Uses v\_x, v\_m, v\_gdp, xr2 variables from the PWT9.1 national accounts.

**What this measure is useful for (and what it should not be used for):** Useful for comparing the ratio of exports and imports across countries over time.

**Original sources and how this variable was constructed:** Uses the national accounts (NA) data. Ratio = ((ex\_usd + imp\_usd) / gdp\_usd )\*100, where ex\_usd = v\_x / xr2 to convert export (and v\_x for import) values into US$.

**Variable name:** World trade (% of GDP)

World trade (% of GDP) = [ (world imports + world exports) / (world GDP) ]\*100

World trade is constructed by summing countries’ total imports to arrive at the ‘world’ estimate of imports, and doing the same for total exports, and GDP in each year to arrive at a ‘world’ estimate for each of the respective variables.

**Variable explanation:** Total exports plus total imports over world GDP.

**Unit of measurement in the PWT:** Uses v\_x, v\_m, v\_gdp, xr2 variables from the PWT9.1 national accounts.

**What this measure is useful for (and what it should not be used for):** Useful for illustrating the change in total world imports and exports as a share of world GDP.

**Original sources and how this variable was constructed:** Uses the national accounts (NA) data. We summed total imports, exports, and GDP in each year to arrive at a ‘world’ estimate of the respective variables. The world trade share = world imports plus world exports / world GDP.

**For more information on the variables listed above see:**

[Feenstra et al (2015)](https://www.rug.nl/ggdc/docs/the_next_generation_of_the_penn_world_table.pdf) The Next Generation of the Penn World Table

# Email conversation with Robert Inklaar

This was the conversation earlier this year with Robert Inklaar who is the prof that is maintaining the Penn World Tables.



---------- Forwarded message ---------

From: **Max Roser** <max.roser@oxfordmartin.ox.ac.uk>

Date: Mon, 2 Mar 2020 at 16:10

Subject: Re: PWT documentation document – and open questions

To: Robert Inklaar <r.c.inklaar@rug.nl>

Cc: Diana Beltekian <diana.beltekian@oxfordmartin.ox.ac.uk>, Jop Woltjer <p.j.woltjer@rug.nl>, Joe Hasell <joe@ourworldindata.org>

Dear Robert,

Thank you very, very much for taking the time to go through this document in such detail and your very helpful answers to our questions.

We are revising the document on our side based on your comments and will share it again.

In case you should find it useful for your own purposes please just go ahead and use it.

Many thanks and kind regards,

Max

On Mon, 3 Feb 2020 at 09:31, Robert Inklaar <r.c.inklaar@rug.nl> wrote:

Dear Max,

Apologies that is has taken us a bit longer than expected, but here are the answers:

1. The measure of employment is all persons engaged [in production], so employees, self-employed and unpaid family workers, over the age of 15, working part-time or full-time. That includes people working in agriculture. It also matches the World Bank/ILO definition of employment.
2. There is no additional documentation on these price levels. Your question seems to imply that something is unclear?
3. Yes
4. We agree that syncing these two databases would be desirable. Indeed, we want to move to a situation where the National Accounts data underlying both databases matches (post 1950) and the main differences are the length of the series and the detail provided. However, the redesign of the Maddison Project Database has run into a more mixed reception amongst economic historians, so for the moment we are not pressing ahead with further integration and new versions. Later this year, a new version of PWT, version 10.0, is due for development and release, based on the forthcoming ICP 2017 results with an additional year of data (2018).
5. In PWT 8.X, the PPP data for Bermuda were based on the 1996 PPPs where the benchmark showed high prices. Bermuda participated in ICP 2011 again, showing a much lower (and frankly, more realistic) price level than implied by the 1996 level. If I had to guess (and I’m in a position to give a pretty well-educated guess), the ICP 2017 results (due in April) will show a result more in line with 2011 than the earlier estimates.

The document looks both accurate and indeed very helpful. A few minor comments:

- hc: note, does not directly report years of schooling. Index is based on years of schooling.

- ctfp (and rtfpna rwtfpna): note, labor input is based on emp, avh, and hc. For countries where avh is not reported, we rely on estimates based on avh for the USA.

- rwtfpna: note, variable name is missing: rwtfpna.

- i\_cig: note, missing underscore in variable name.

- i\_outlier: note, p\_gdpe no longer reported.

- pl\_k: note, USA is 1 for every year. Differs from other price level indicators.

I hope this is helpful!

Regards,

Robert

On 15 Jan 2020, 18:58 +0100, Max Roser <max.roser@oxfordmartin.ox.ac.uk>, wrote:

Dear Robert,

I hope you had a good start into 2020!

One of our big projects for this year is to present the research and data on productivity and economic growth – and your work is of course key.

We have started this work by updating our data in line with the PWT Version 9.1 data.

Especially for nonexperts the relevant data can be hard to make sense of. And often I'm also struggling to understand data documentation that is very brief.

We therefore thought it would be helpful for our readers, and others who may use the PWT for their own research to provide definitions for the variables with some added context.

My colleague Diana Beltekian (in cc) has put together [**this google doc**](https://docs.google.com/document/d/1Kg9ZqxXXfDWA7WxfDysB0GjwlQ6kK5x6kNP-m7Sjl-I/edit#) that defines and contextualizes each variable in the PWT and outlines what it should (and shouldn't) be used for.

We hope it is also useful for you and your team: Please feel free to use the document where it is helpful for you. If you want to make it part of your documentation, please feel free to do so.

While going through the documentation and updating to the newest version of the PWT, a couple of questions came up – they are also listed in the document.

I'd be very grateful if you could clarify:

1. How is the emp variable, number of persons engaged defined? Does it include agricultural workers and/or part-time workers? From reading the TED manual, it wasn't entirely clear if these categories were included.
2. Is there additional documentation, aside from the Feenstra et al (2015) paper and the Technical Guide to PWT8.0 which provides more detail on the price level of household consumption; price level of capital formation etc?
3. We have constructed variables using the PWT including a measure for productivity = (tot\_rgdp\_o) / (avh\*emp); we have taken total real output-side GDP and divided it by total hours worked. Is it correct to rely on the avh, emp, and rgdp\_o measures to produce this productivity measure?
4. With new vintages of the PWT, would it be possible to release new vintages of the Maddison database? It would make the Maddison database much more useful if it was updated to the latest year possible. We could do the same on our side and annually stitch the PWT and Maddison data together, but I think it'd be much more ideal if these updated releases of Maddison were simply part of the updates of the PWT.
5. When updating to the PWT v9.1, we noticed Bermuda's GDP and GDP per capita figures seem too large. The discrepancy seems to be coming from the GDP figures, as the population estimates in PWT 9.0 and PWT 9.1 are identical. Looking back at earlier versions of the PWT data, the figures seem to have been introduced from the PWT 9.0 release.

We'd be very grateful for feedback to the documentation Diana prepared.

Kind regards,

Max

# A second email conversation with Robert Inklaar

**(about both MDP and PWT)**

**Joe Hasell <joe@ourworldindata.org>**

**Apr 16, 2019, 2:58 PM**

**to r.c.inklaar, Max**

Dear Prof Inklaar,

I write to you as a researcher working at [ourworldindata.org](http://ourworldindata.org/).

I had a quick query in relation to our coverage of the Maddison Project Database.

The MPD real income series (both *CGDPpc* and *RGDPNApc)* are expressed as being in US$ at 2011 prices.

To make clear to the reader where market exchange rates are being used and where PPPs, our convention is instead to refer to the latter as 'international-$'.

I just wanted to check with you though that we would not be misrepresenting anything by giving the units of the MPD series as 'international-$ in 2011 prices'.

I'd be grateful if you could take a quick glance at our charts presenting [*CGDPpc*](https://ourworldindata.org/grapher/maddison-data-gdp-per-capita-in-2011us)and [*RGDPNApc*](https://ourworldindata.org/grapher/maddison-data-gdp-per-capita-in-2011us-single-benchmark?time=1..2016)(see links). Would you say that the subtitles and notes at the bottom provide a fair reflection?

**Similarly, for the Penn World Table series for real GDP (*rgdpe)* – does 'international-$ in 2011 prices' make sense here also?**

Thanks very much in advance for your help.

Best,

Joe

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Robert Inklaar r.c.inklaar@rug.nl via fwd-01-1.privateemail.com

Apr 16, 2019, 6:23 PM

to Max, Joe

Dear Joe,

Thanks for reaching out and sharing these links!

The reason that we avoid the term ‘international-$’ is that in international trade, this can have a different meaning. We’re taking Rob Feenstra’s word for this, because, as far as I can tell, ‘international dollar’ is defined in the way that you’re using it on all websites that pop up. **So yes, I would indeed go with ‘international-$’ throughout.**

More broadly, I think these are very nice charts and both by their presentation and explanation, they make clear how (we feel) these data should be used, thanks!

Regards,

Robert