Day 1 - Session 3
Fiscal Incidence Analysis in Practice: Construction of Income Concepts
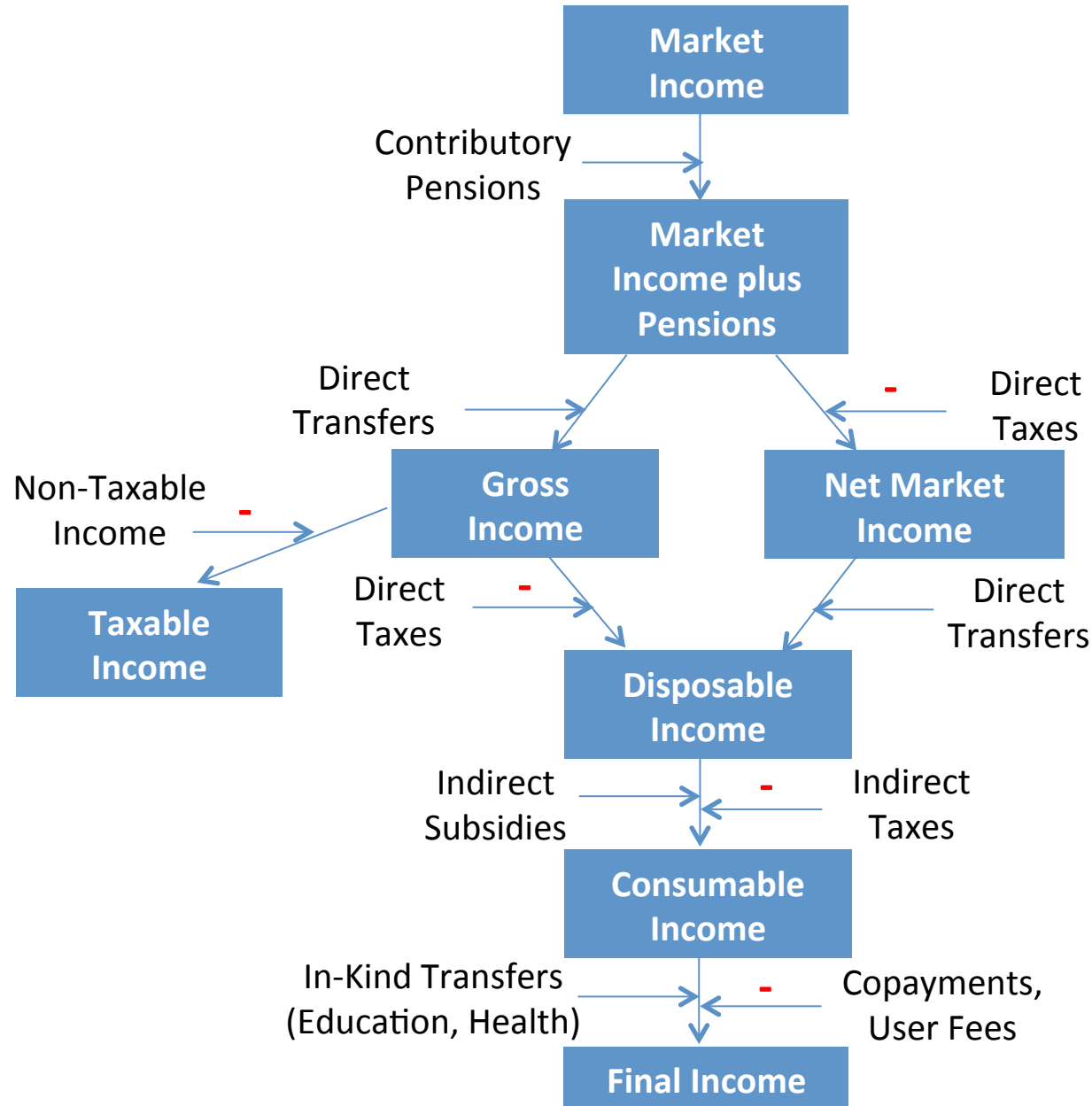# Sean Higgins
UC Berkeley and CEQ Institute

Learning Event on the Commitment to Equity Methodology

CEQ Institute and The World Bank

Washington, DC

July 11-13, 2016

Income Concepts

Allocation Methods

- **Direct Identification**
  - All information to estimate and allocate benefits comes directly from the household survey
- **Imputation**
  - Some information from survey (e.g., respondent reports attending public school, or receiving a direct transfer in a survey that doesn't ask for the amount received)
  - Some information from public/administrative accounts, reports, or program rules
    1. **Direct imputation** – uses information from survey and national accounts; no knowledge of program rules needed
    2. **Simulation** – uses information from program rules to simulate who receives (pays), and/or how much is received (paid)
- **Inference**
  - Used when e.g. social programs grouped with other income sources; compare amount reported to possible benefit amounts

Allocation Methods

- **Prediction**
  - Use of regression to predict income from a particular source, benefits received, or taxes paid
  - For example, using rental data to predict "imputed rent" for owner occupied housing
- **Alternate Survey**
  - When primary survey lacks necessary questions, look for alternate survey
  - Any of above mthods can be used in alternate survey
  - Then allocate benefits in main survey using
    - Matching techniques
    - Prediction (using covariates common to both surveys)
    - Estimate benefits/taxes by quantile (e.g., percentile) in alternate survey, assign averages for everyone in that quantile in primary survey
- **Secondary Sources**
  - Last resort
  - For example, benefits by decile from government report or other study

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Income Concepts
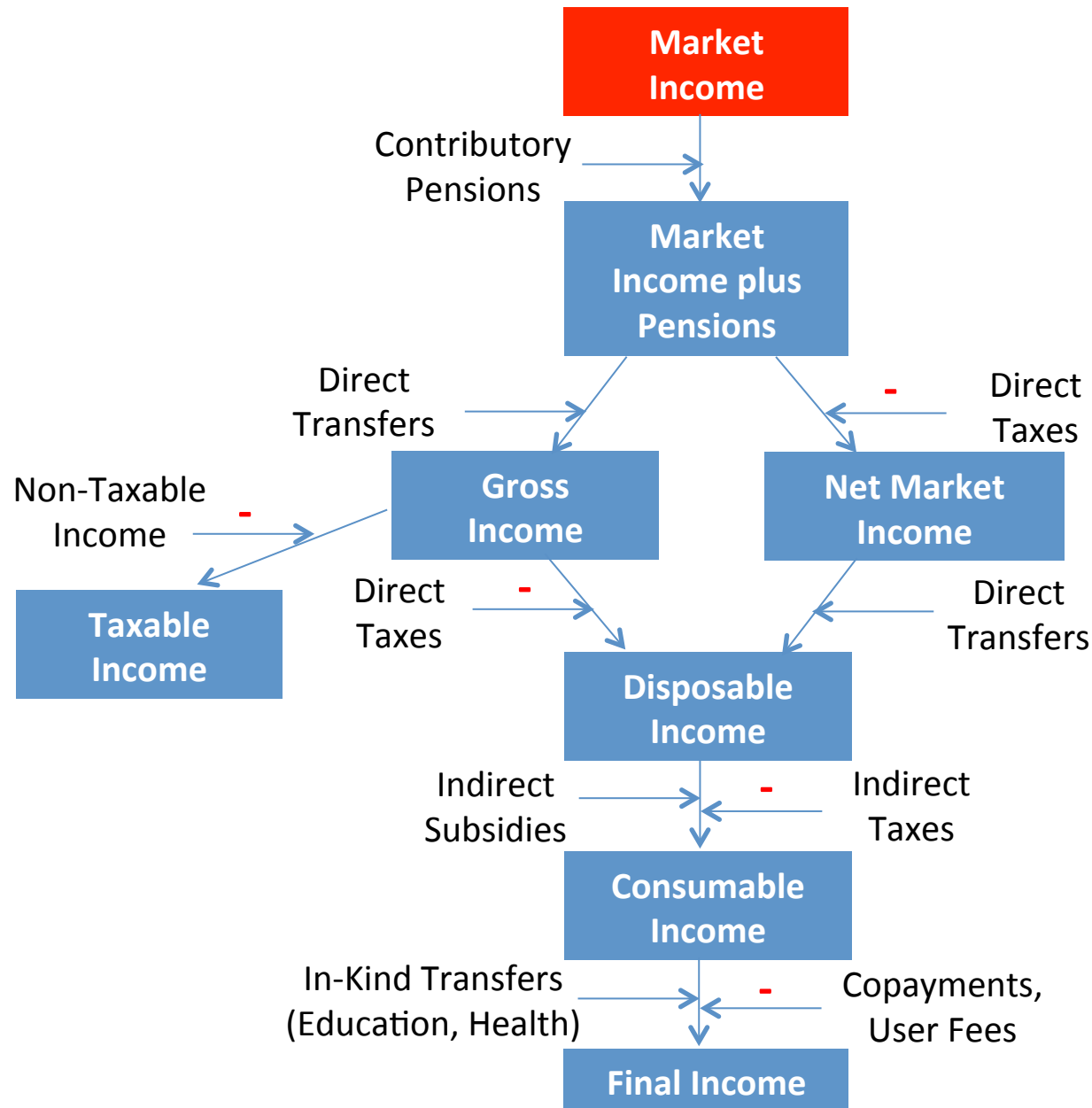
Market Income

- Wage and salary income
- Fringe benefits
  - Bonus pay
  - Employer contributions to health insurance
- Self-employment income (farm and non-farm)
- Retirement income
- Captial income
  - Interest
  - Dividends
  - Rent
- Private transfers
  - Child support
  - Alimony
  - Remittances
  - Private contributory pensions
- Imputed rent for owner-occupied housing
- Value of own production

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Imputed Rent for Owner-Occupied Housing

- Direct identification
  - Vast majority of countries with CEQ Assessments
  - "How much would this house be rented for if it were rented?"
- Prediction
  - e.g., Bolivia, Georgia, Honduras
  - Take households that rent and use the question asking how much they pay in rent
  - Predict rental rates based on characteristics (number of rooms; access to electricity, sanitation, piped water; geographic location; household income or consumption; etc.)
  - Use coefficients from this regression in an out-of-sample prediction to predict rental value of owner occupied housing

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Imputed Rent for Owner-Occupied Housing

- Alternate Survey + Prediction
  - e.g., United States
  - No question on how much paid in rent
  - Predict using alternate housing survey with this question
- Secondary Source (National Accounts)
  - e.g., Armenia
  - Use a secondary source estimate of average imputed rent as a proportion of income and inflate market income by that amount
  - National Income Accounts have imputed rent for owner-occupied housing, and it is 2.74% of household expenditure
  - Imputed rent = expenditure (equivalent to disposable income) * 2.74% for households that own their dwelling

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Value of Own Production

- Direct Identification (for each item consumed)
  - e.g., Brazil
  - For each item purchased, ask how obtained
  - If own production or taken from own business inventory, value is still asked; use this value
- Direct Identification (one question only)
  - Some surveys ask one question about the total value of own production
  - Use this value in market income
- Exclude
  - In Bolivia, one question that could be used, but upon examination the responses were highly unreliable
 - In Honduras, not included in survey and no credible way to estimate and allocate

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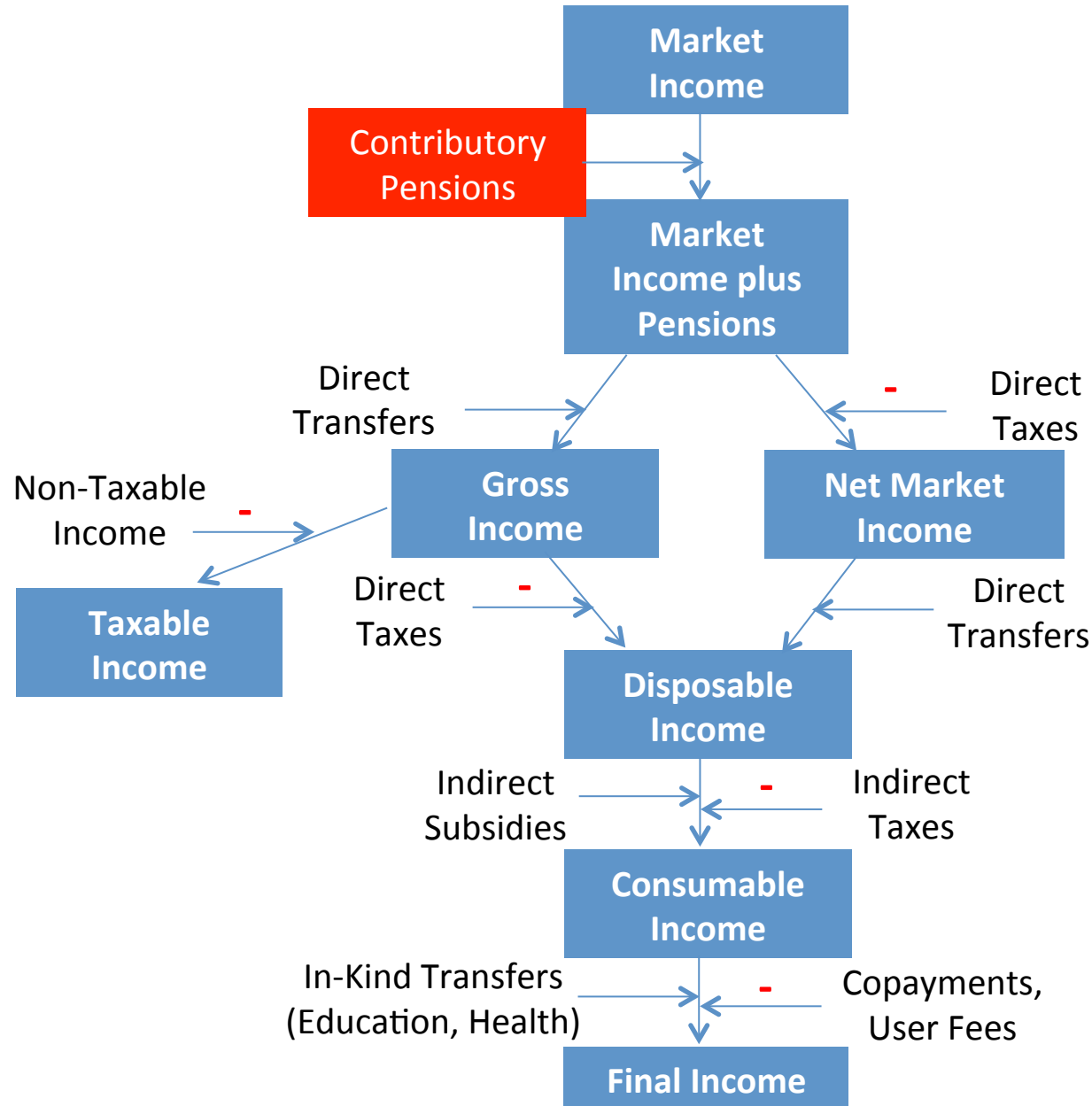
Contributory Pensions

- Only includes pensions from the <u>public contributory system</u>
  - Non-contributory pensions are included in **direct transfers**
  - Private contributory pensions are included in **market income**
- Direct identification
  - Most countries
- Simulation
  - e.g., Indonesia
  - No question on pension receipt, so simulate it based on program rules using characteristics from household survey such as likely sector of work before retirement
- Inference
  - e.g., Argentina
  - One question about pensions; use amount to infer whether it was a contributory or non-contributory pension since the latter was a specified amount

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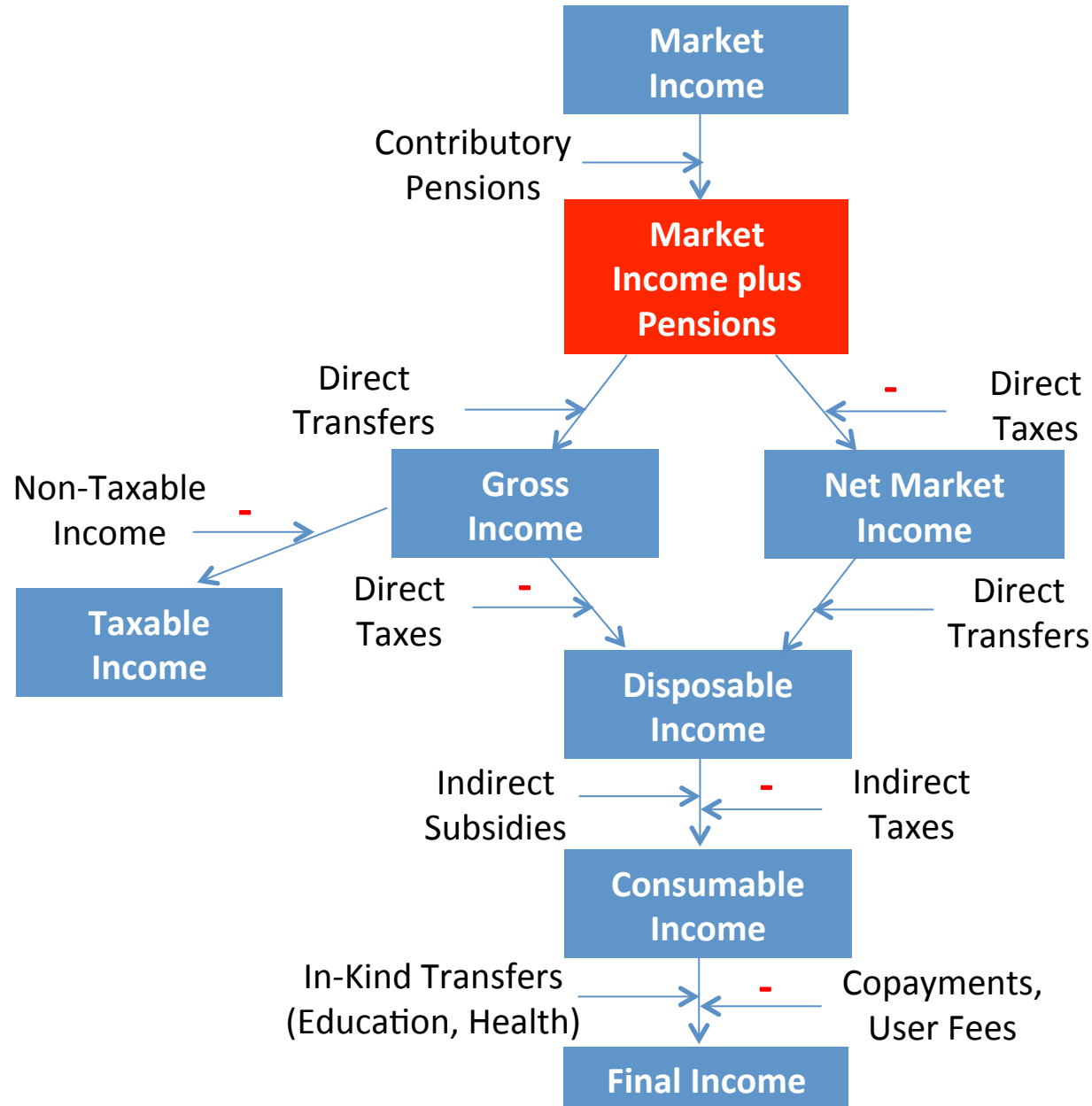
Income Concepts

Market Income plus Pensions

- Market Income plus Pensions =
    Market Income + Contributory Pensions
- <u>Important</u>
    - If pensions are treated as deferred income (PDI), **market income** is treated as the "pre-fisc" income concept
    - If pensions are treated as government transfers (PGT), **market income plus pensions** is treated as the "post-fisc" income concept

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Income Concepts
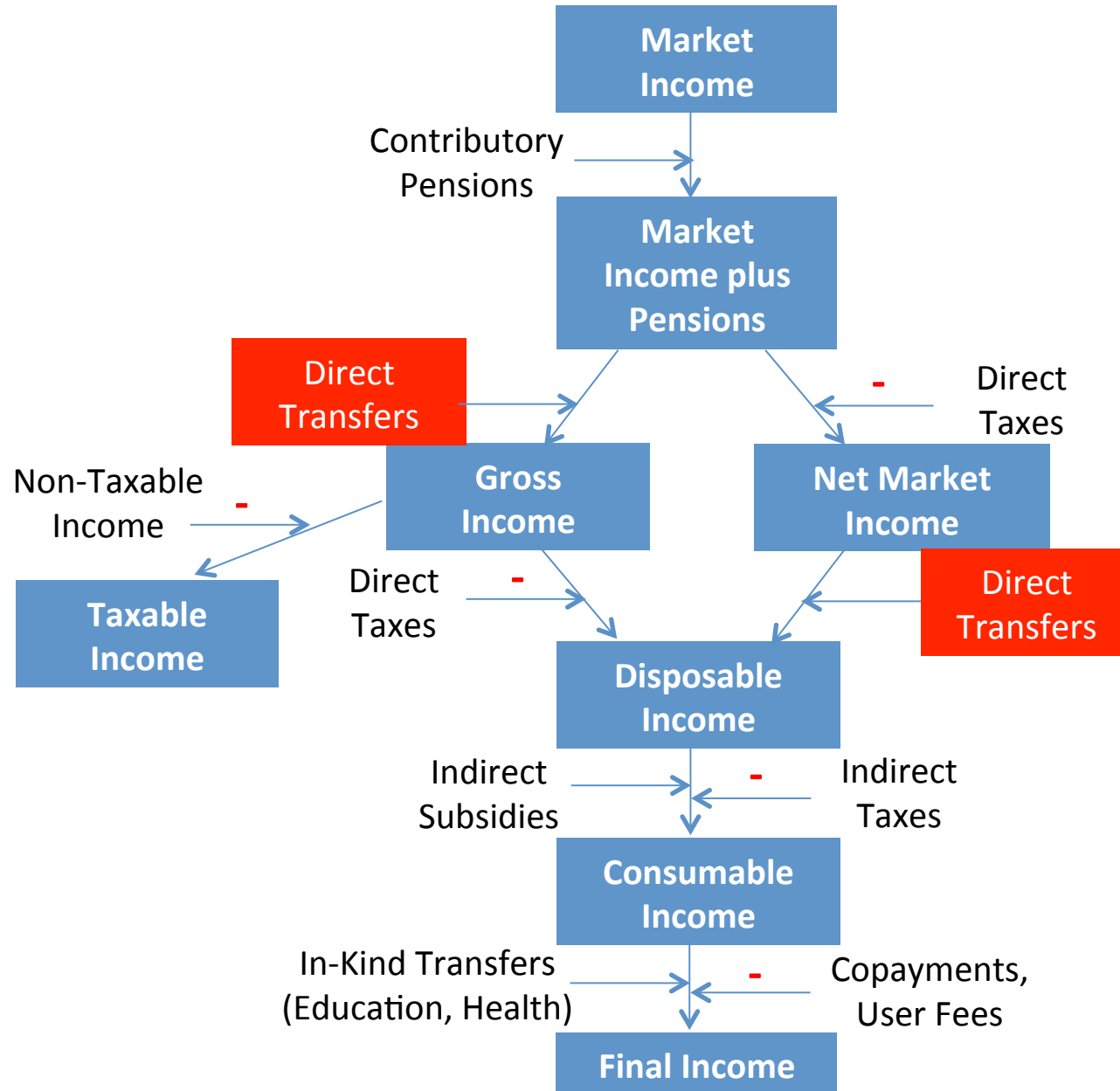
Direct Transfers: Components

- Cash Transfer Programs
  - Conditional and Unconditional
- Non-Contributory Pensions
- Scholarships
- Public Works Programs
  - Also known as "Pay for Work" and "Welfare to Work" programs
  - Include full wage and do not attempt to subtract opportunity cost of individual's time
- Food transfers
  - Considered direct transfers because have well-defined market value, are close substitutes for cash
- Refundable Tax Credits
  - Pay cash to low-income families with no tax liability
  - Function as a transfer

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Direct Transfers: Allocation

- Direct Identification
  - Many examples from all countries
- Inference
  - Non-Contributory Pensions in Argentina
    - All pensions grouped together; infer whether non-contributory or contributory based on amount and program rules for non-contributory pensions
  - Milk Transfers in Brazil
    - For families that live in eligible region, assume that if they reported the milk they consumed as having been donated, it was from the government
  - Public Scholarships in United States
    - All scholarships grouped together; infer whether Pell grant (government scholarship for low-income) based on amount and program rules

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Direct Transfers: Allocation

- Direct Imputation
  - Food aid in Ethiopia
    - Whether a household receives food aid is reported in survey, but not amount received
    - Total government spending on food aid distributed equally across households that report receiving aid
  - School lunches, uniforms, and textbooks in Ecuador
    - Whether a child receives free school lunches, uniform, and textbooks is reported in the survey
    - Value imputed by distributing total spending from national accounts to households that receive these benefits
  - School uniforms and textbooks in Sri Lanka
    - Same method as in Ecuador
  - Important: scale down totals from national accounts

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Direct Transfers: Allocation

- Simulation
  - Targeted Transfers in various countries
    - Simulated according to program rules and eligibility criteria (based on income, having children, etc.)
    - Argentina, Bolivia: Assumed perfect targeting, full coverage and take-up of target population, and no leakages
    - In Uganda, perfect targeting and full coverage and take-up would have over-estimated, so randomly allocate among eligible until exhausting total number beneficiaries
  - Refundable Tax Credits in US
    - Simulated according to program rules and eligibility criteria (based on income, having children, etc.)
    - Adjusted for imperfect take-up by attributing no benefit to households in which no members reported filing a tax return

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Direct Transfers: Allocation

- Alternate Survey (with Direct Identification)
  - Conditional Cash Transfer in Indonesia
    - Included in a 2013 survey but not the 2012 survey used in the analysis
    - Compute distribution of benefits by region and expenditure decile in 2013 survey
    - Distribute benefits in 2012 survey among eligible households within each region-decile pair

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Underestimation of Beneficiaries

- Combines Direct Identification with Imputation
- In most surveys, number of recipients of direct transfers underestimated
  - Compared to national accounts
  - e.g., Bolsa Família in Brazil
    - 7.3 million beneficiaries according to survey
    - 12.4 million beneficiaries according to Ministry of Social Development
  - Even a large problem in developed country surveys (Meyer et al., 2015)
- Solution
  - Assume some beneficiaries erroneously did not report receiving benefit
  - Assume they are similar to beneficiaries that did report receiving benefits
  - Impute benefits to households that did not report benefit but similar to those that did

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Underestimation of Beneficiaries

- Let
  - N = number of recipients according to national accounts
  - S = number of recipients according to survey
  - H = N - S = number of recipients we will impute benefits to
- Requirement: H < S < N
- Estimate propensity score for program participation
  - Probit of program participation dummy on
    - household income
    - possession of various household assets, consumer durables
    - number of children
    - race of household head
    - region or state
    - rural or urban area
    - etc.
- Randomly sample H of the S beneficiary households
- Match them to non-beneficiary households with closest propensity score

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Underestimation of Beneficiaries

- Caveat: probit has to converge for method to work
  - In other words, covariates predict program participation
  - Works well for targeted transfer programs
  - Unlikely to work for non-targeted programs
- Whether to make this adjustment is country team's decision
- Depends on
  - size of discrepancy
  - local knowledge about which is closer to truth: survey or national accounts
- Ideally, run results both ways

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Income Concepts
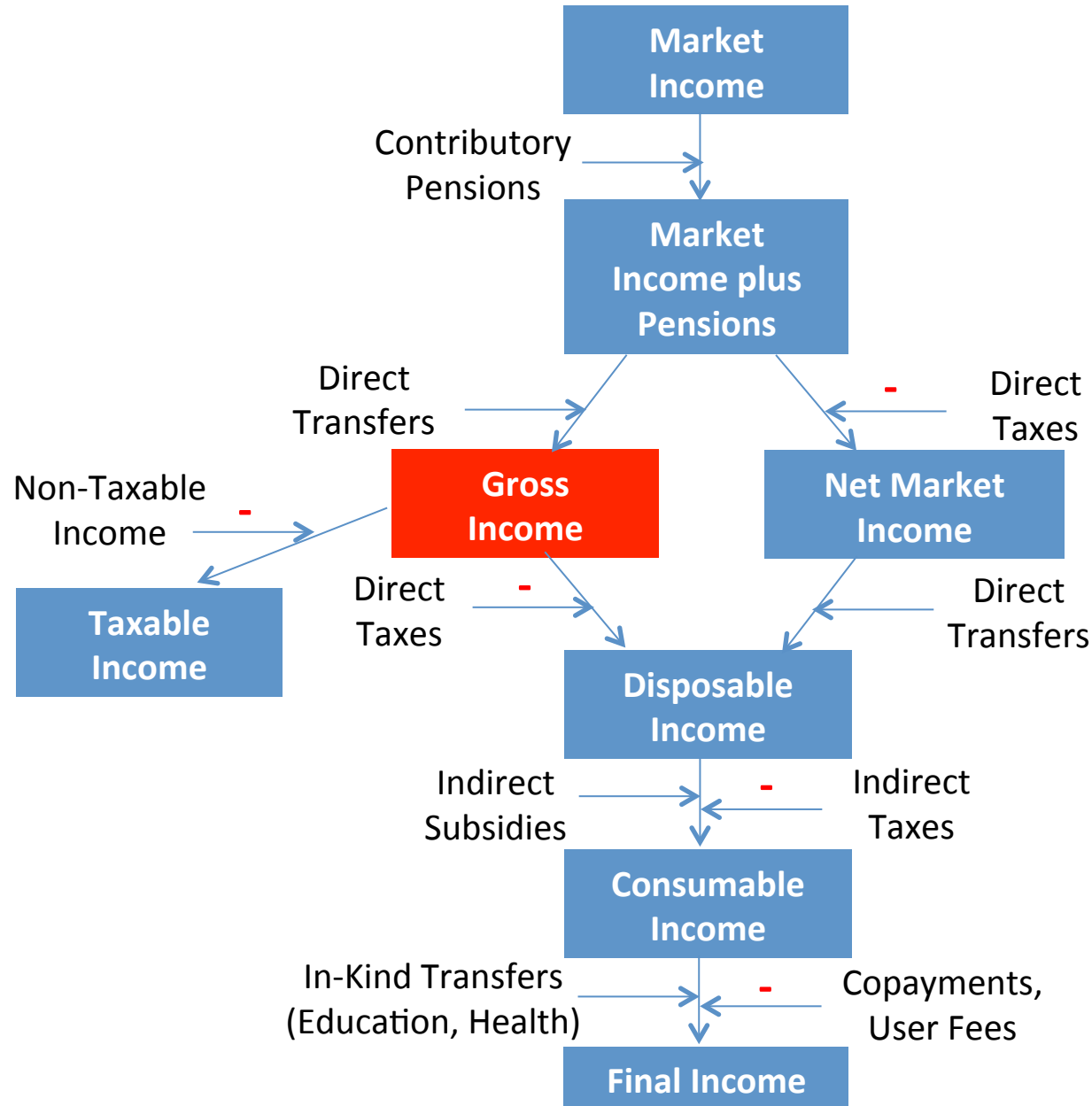
Gross Income

- Gross Income =
  Market Income plus Pensions + Direct Transfers
- <u>Important</u>
  - If pensions treated as deferred income, compare market income plus pensions with gross income to see effect of direct transfers
  - If pensions treated as government transfer, compare market income with gross income to see effect of direc transfers (including pensions)
    - Master Workbook includes results for "Direct transfers excluding pensions" and "Direct transfers including pensions"

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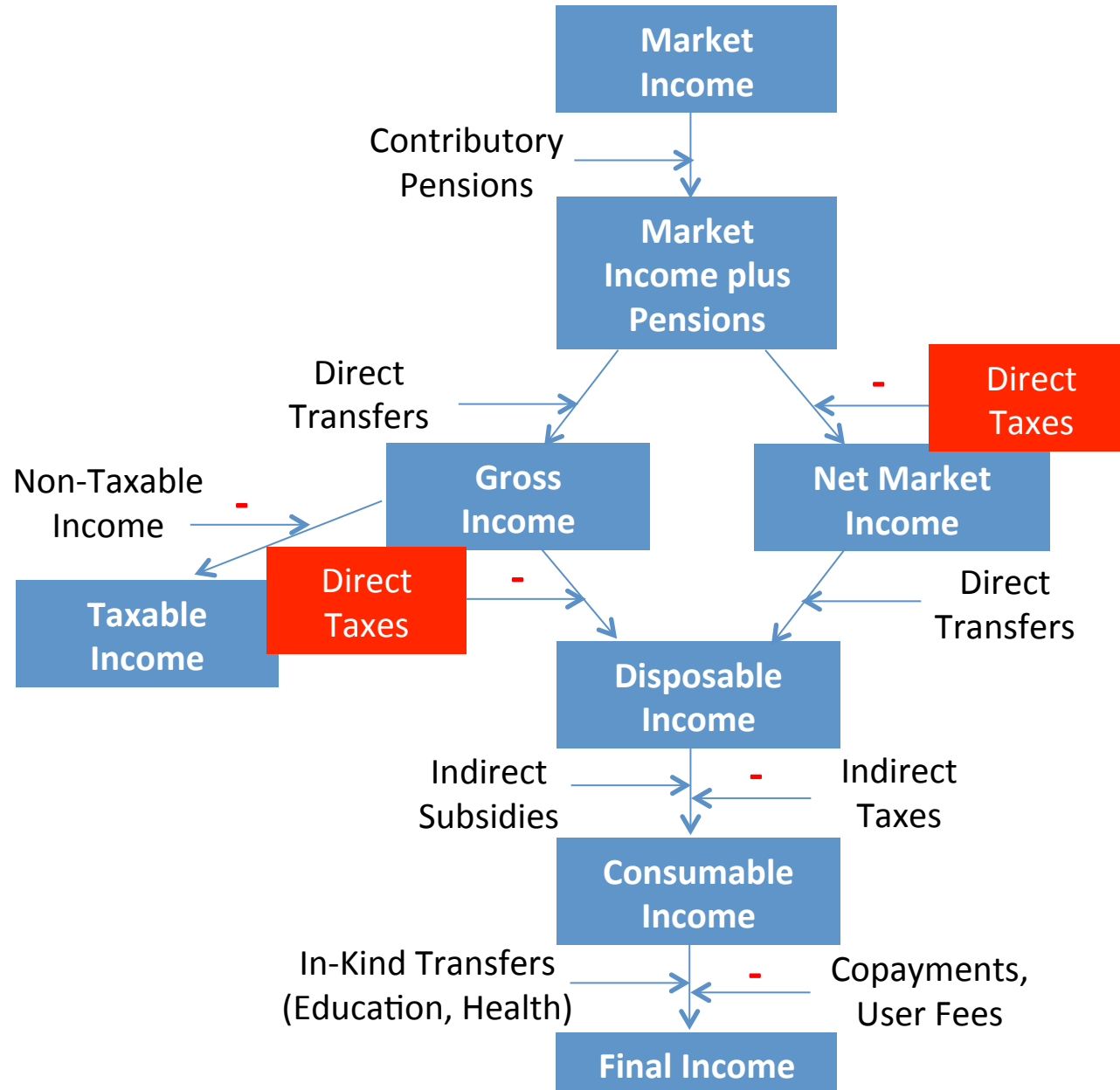
Direct Taxes: Components

- Individual income taxes
- Agricultural income tax (e.g., Ethiopia)
- Payroll taxes
  - Paid by both employee and employer
- Contributions to social security
- Property taxes
- Corporate income taxes (we are working on this)
- Assumption: direct taxes fully shifted forward to labor in the form of lower wages
- <u>Important</u>: Determine whether reported incomes are gross or net of taxes
  - Gross in Brazil, Colombia, Dominican Republic, Ecuador, El Salvador, Honduras, Jordan, Peru, Russia
  - Net in Argentina, Armenia, Bolivia, Chile, Georgia, Mexico, South Africa, Sri Lanka, Uruguay

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Grossing Up

-Case in which reported income in the survey is **gross** of taxes. Suppose that:

- Reported income (<u>gross</u> of employee-paid income taxes) in the survey is 10
- Individual income taxes (reported or simulated) are 2
- Employer pays 3 in payroll taxes
- The income gross of taxes of 10 is already *net* of the employer-paid taxes, so we gross up income from this job to 10+3 = 13
  - 13 is the grossed up income use when we construct market income
- Direct taxes (ignoring for illustration other components like property taxes) are 2+3 = 5
- Income net of direct taxes is 13-5 = 8

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Grossing Up

Case in which reported income in the survey is **net** of taxes (if not specified, normally we assume net). Suppose:

- Income reported in the survey, which is <u>net</u> of employee-paid income taxes, is 10
- Direct taxes are 2
- The employer pays 3 in payroll taxes
- The income of 10 is already net of taxes paid by *both* the employee and employer, so we gross it up to 10+2+3 = 15
  - 15 is the grossed up income we use when constructing market income
- Direct taxes (ignoring for illustration other components like property taxes) are 2+3 = 5
- Income net of direct taxes is 15-5 = 10

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Direct Taxes: Allocation

- Direct Identification
  - Individual income taxes in Brazil, Colombia, Ecuador, Peru
    - Brazil: for each income source, next question is how much was paid in direct taxes for that income source
  - Property taxes in Brazil (expenditure module of survey)
- Imputation
  - Agricultural income tax in Ethiopia
    - Distribute total collected from national accounts proportionally to land holdings

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Direct Taxes: Allocation

- Simulation
  - Individual income taxes in many countries
    - Simulated according to reported incomes, household characteristics, and tax code
    - Account for evasion by only simulating for those working in the formal sector
    - In case of US (large formal sector), only simulate for those reporting filing a tax return
  - Payroll taxes paid by employer in many countries
  - Corporate income taxes in Brazil-US comparison study
    - Requires very broad assumptions about burden of corporate income tax
    - (Still working on improved methodology for corporate income taxes)

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Direct Taxes: Allocation

- Alternate Survey (with Direct Identification)
  - Property taxes in US
    - Property taxes paid reported in alternate survey
    - Use common covariates of dwelling and household characteristics to match households between the two surveys
    - Use property taxes paid of matched household
- Secondary Source
  - Individual income taxes in Mexico
    - Distribution of income taxes by decile obtained from Ministry of Finance and allocated by decile in survey data

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Contributions to Social Security

- Contributions by employees
  - Usually direct identification or simulation
- Contributions by employers
  - Can't be directly identified
  - Simulated in Brazil, Russia, Tunisia, others
- Exclude when no (public) contributory social security system
  - Dominican Republic, Georgia
- <u>Important</u>
  - Always include contributions to social security other than the public contributory pension system
  - Only include contributions to the public contributory pension system in the "pensions as government transfers" case
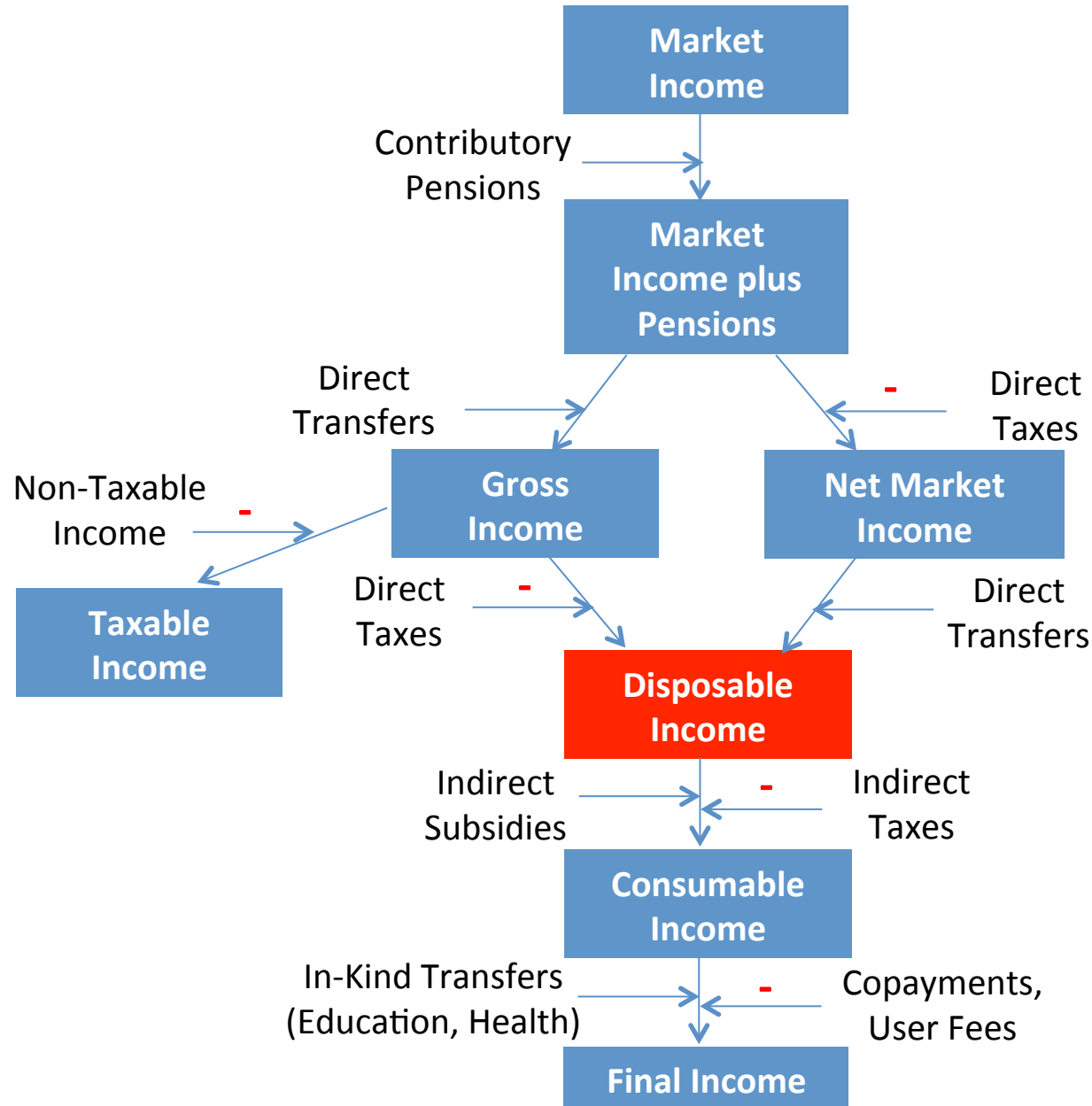
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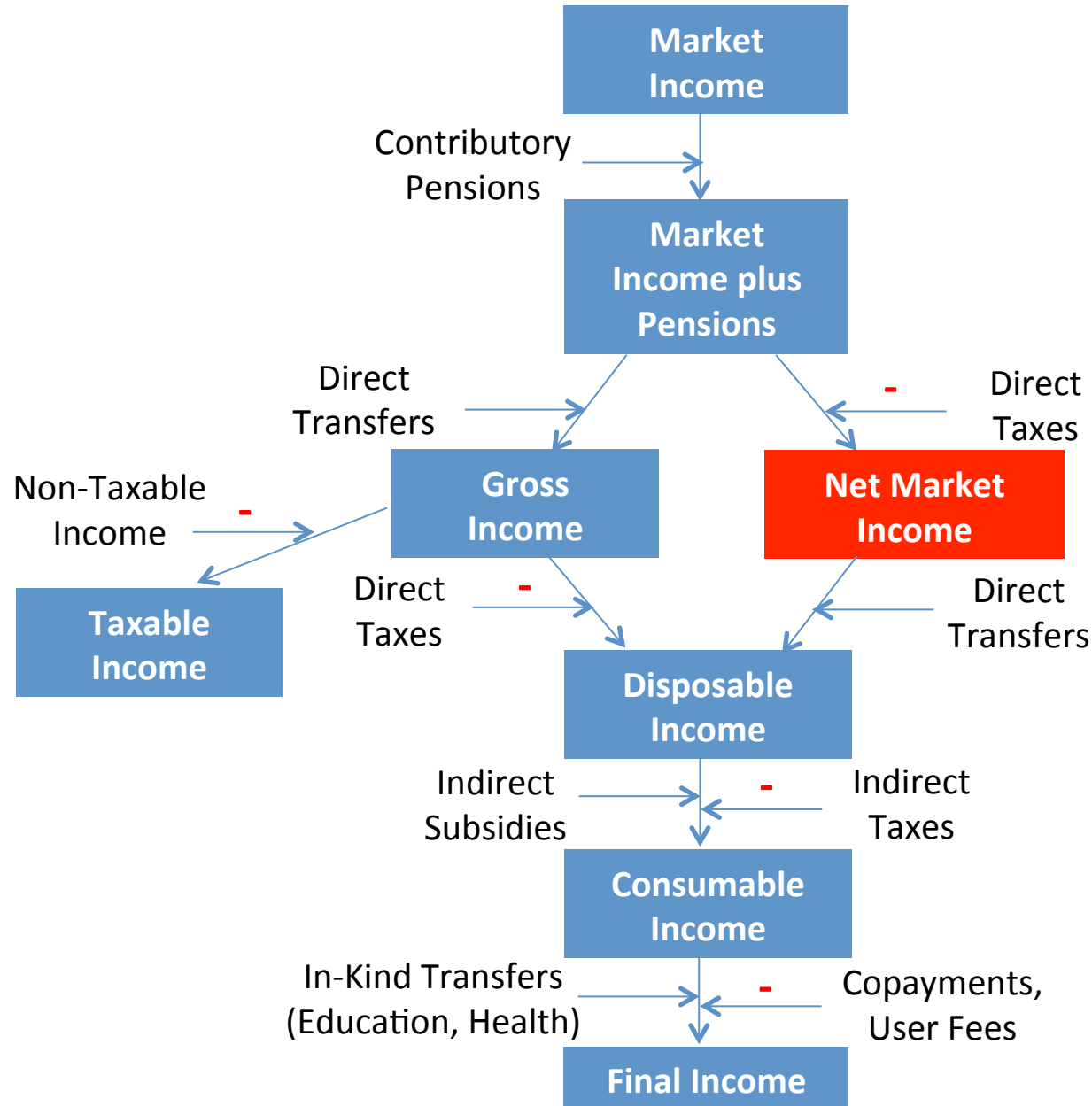
Income Concepts

Net Market Income

- Net Market Income =
  Market Income plus Pensions – Direct Taxes and
  Contributions
- <u>Important</u>: make sure that "contributions" follows the
  instructions above depending on treatment of pensions

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Income Concepts

Disposable Income

- Disposable income
    - = Net Market Income + Direct Transfers
    - = Gross Income - Direct Taxes
- Note that "disposable income" in PDI case differs slightly from disposable income in "disposable income" in PGT case
    - Contributions to pensions were <u>not</u> subtracted in PDI case
    - But they <u>were</u> subtracted (like taxes) in PGT case

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Using Consumption

- Disposable income = Consumption
- In PDI case, add in contributions to pensions:
  - Disposable income = Consumption + contributions to pensions
  - For consistency with income definition, since these are not subtracted out
- Then work backwards
  - Gross income = disposable income + direct taxes
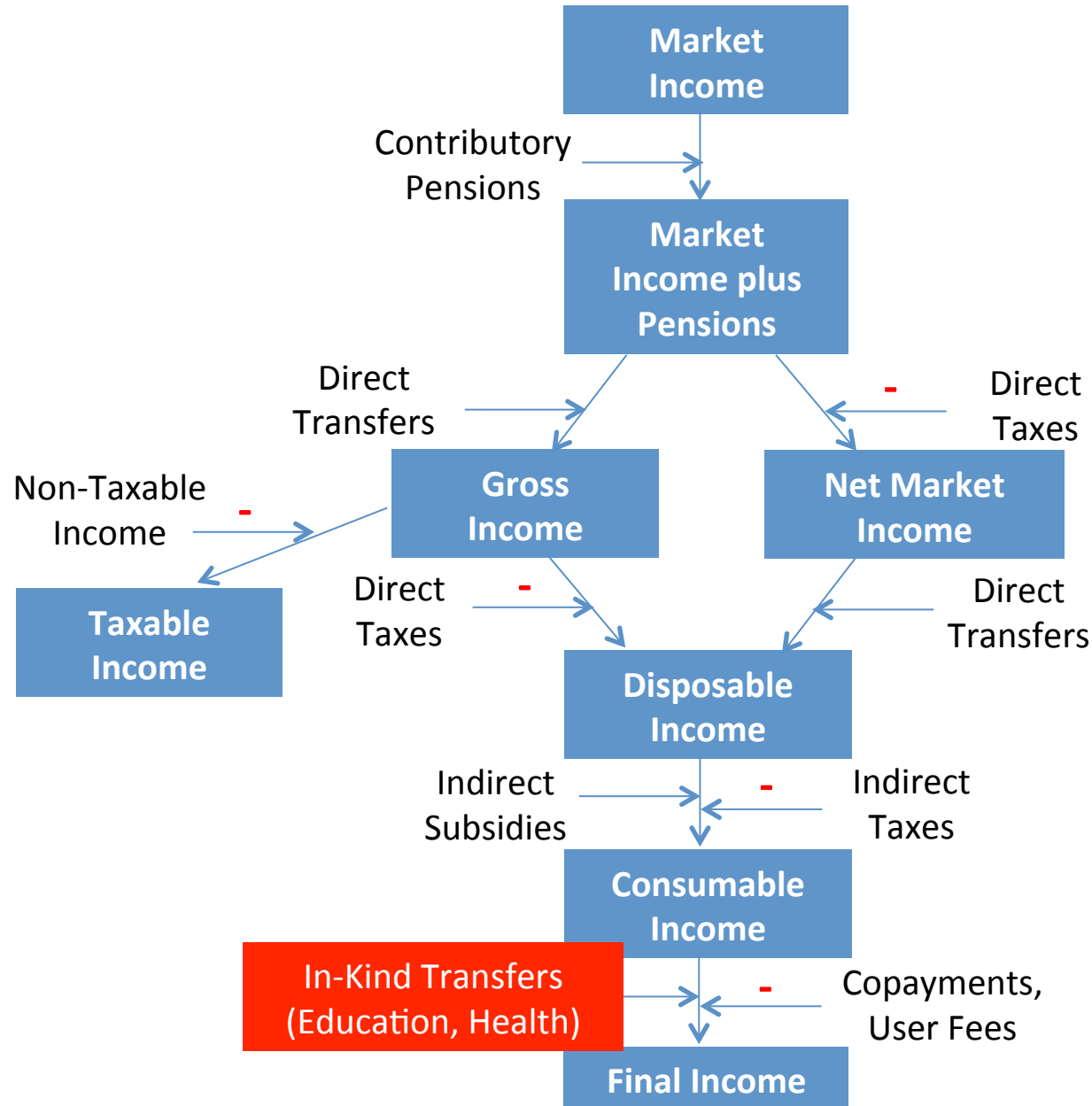 - Market income plus pensions = gross income – direct transfers
  - Etc.

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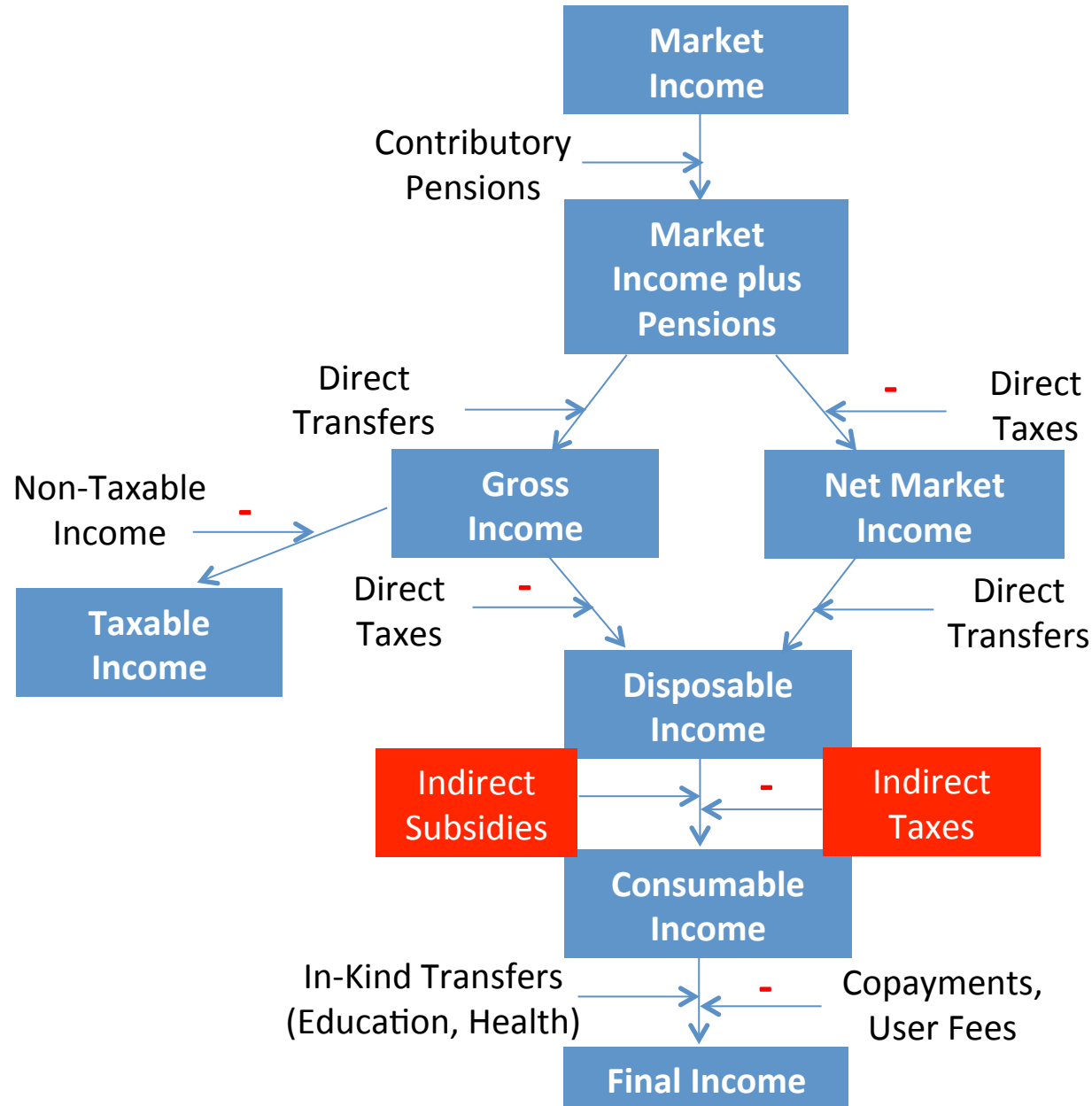
Income Concepts

Income Concepts
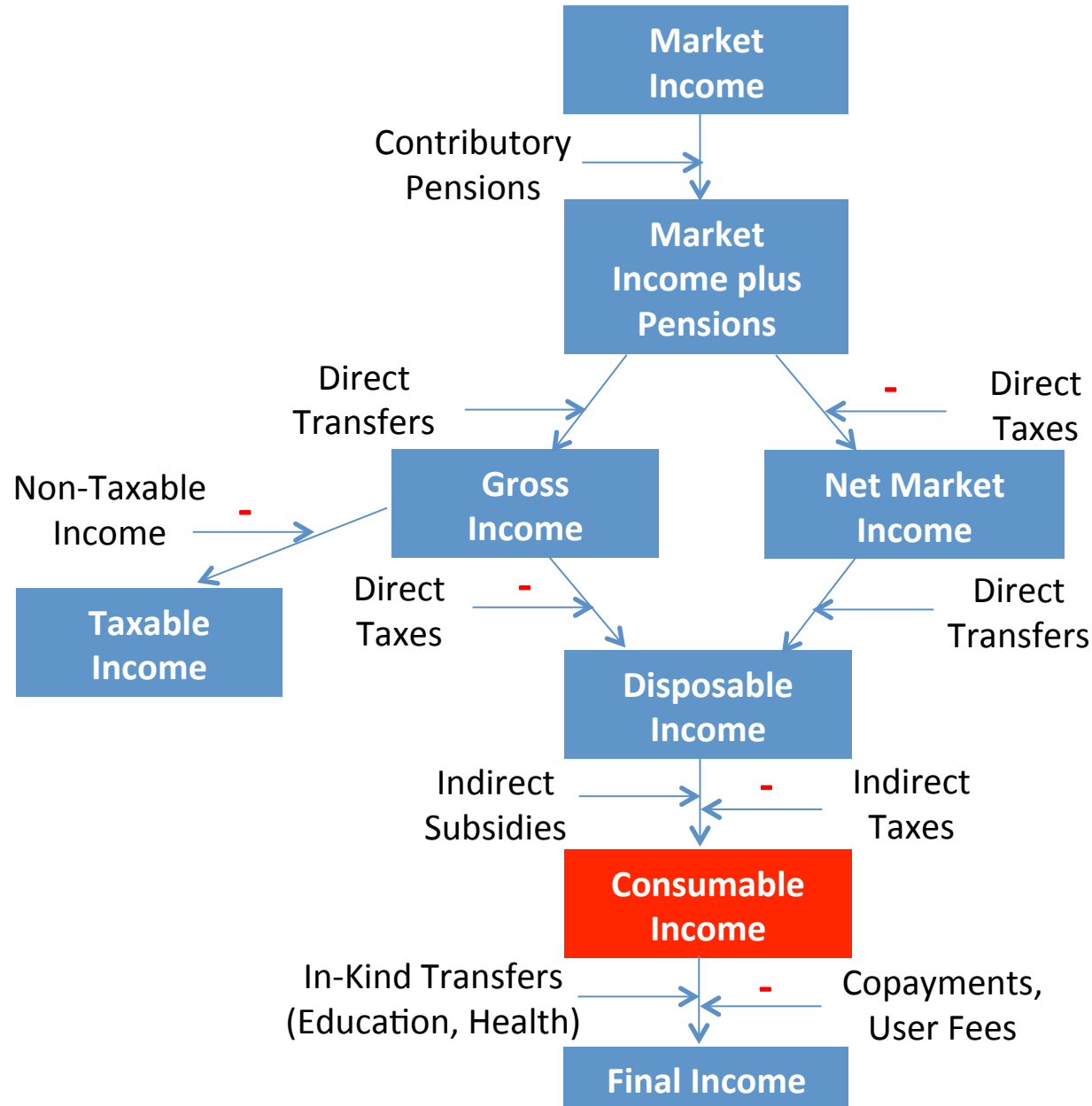
Consumable Income

- Consumable Income
    = Disposable Income
        + Indirect subsidies
        − Indirect taxes

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Income Concepts

Education

- Valued at government cost for each level
  - Include recurring and investment spending
  - Include administrative costs
  - Possible levels:
    - Day care
    - Preschool
    - Primary
    - Secondary
    - Tertiary

- Disaggregate by geographic area if possible

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Education

- Direct imputation method
  - Combine data in survey on who attends public school at each level with national accounts data on spending

If the survey doesn't specifically have a question about whether the child attends public vs. private school:

- Inference + Imputation
  - e.g., Sri Lanka
  - Use question from consumption module on whether household paid facility fees to government schools or school fees to private schools to infer whether child attends public

- Alternate Survey + Prediction + Imputation
  - See next slide

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Education

- Alternate Survey + Prediction + Imputation
  - e.g., United States
  - Main survey asks whether the child attends school, but not public vs. private
  - Find alternate survey that has income data and public vs. private school attendance
  - For sample of children attending school, predict probability of attending public school using covariates common to both surveys as independent variables (probit in alternate survey)
  - Use coefficients to predict probability in main survey
  - Multiply probability by average spending per student by level
    - Expected value of benefit received

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Health

- Two main systems: public facilities or public insurance
- Public facilities
  - Divide total spending in national accounts by number of visits in survey data to obtain spending per visit
  - Disaggregate by type of care as much as possible
    - Primary and in-patient care in Armenia, Indonesia
    - Basic health facility vs. hospital in Peru
    - Three levels of childbirth care in Bolivia
- Public insurance
  - Divide total spending in national accounts by number of covered individuals to obtain spending per insured
  - Disaggregate by age if possible
    - Spending on public health insurance varies greatly by age
  - Disaggregate by type of public health insurance if applicable
- Some countries: combination of both systems
- Disaggregate by geographic area if possible
  - e.g. Brazil: average spending for each care type-state cell

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Health

- Imputation method
  - Combines data from national accounts on amount spent on public health facilities; public health insurance with survey data on who benefits
- Alternate Survey + Imputation
  - Find survey with income data and use of public health facilities or public insurance coverage
  - e.g., Guatemala, South Africa
- Prediction (shouldn't be necessary)
  - If national accounts spending on public health facilities or public health services is not available (very rare)
  - Predict cost of different services using spending on similar services at private facilities in consumption module
- Secondary Source (shouldn't be necessary)
  - Only if no information on use of health services or insurance coverage in main or alternate survey
 - e.g., Chile, Mexico

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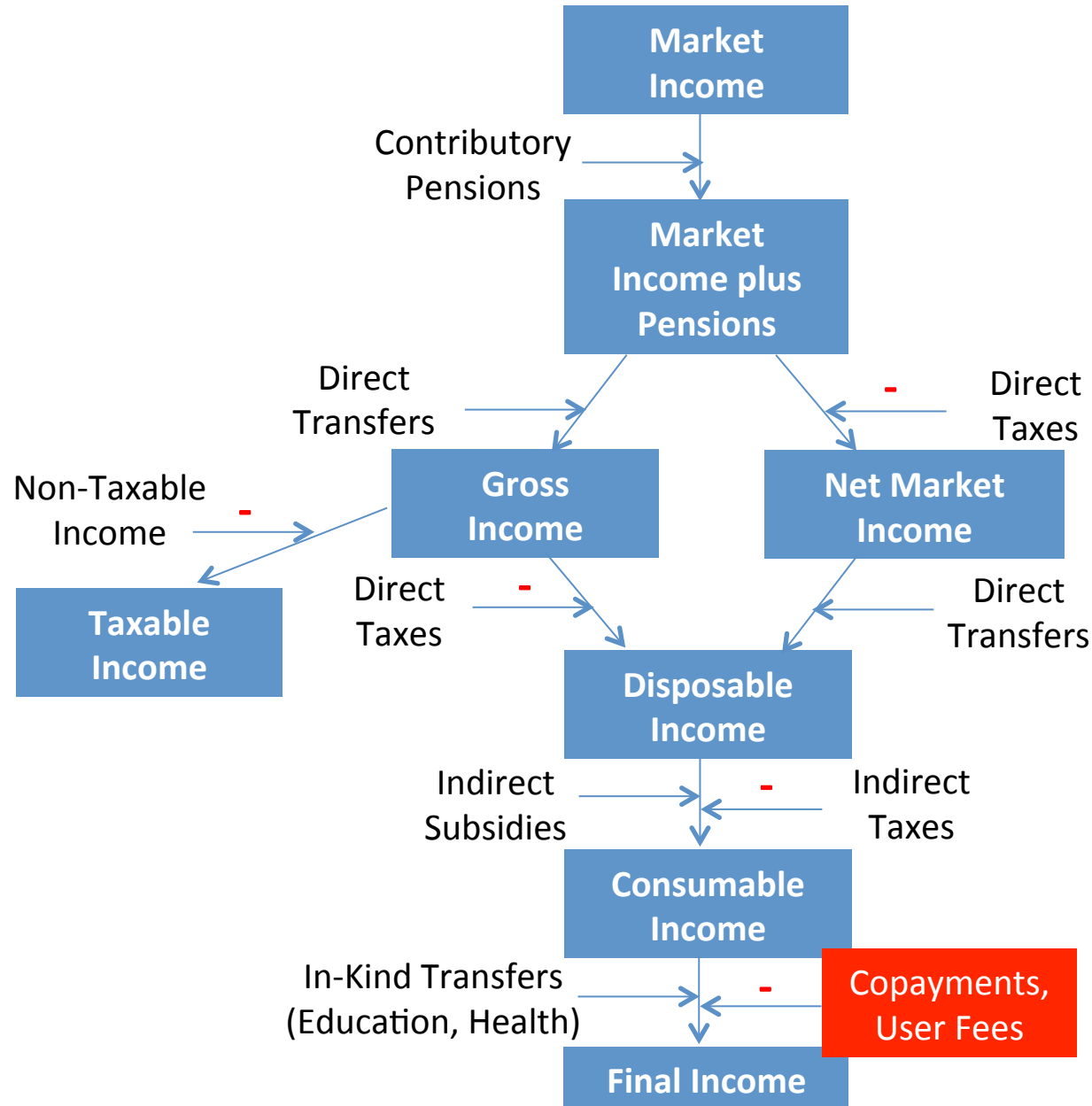
User Fees

- Usually directly identified in survey if common in country
- These user fees can also be used to more accurately approximate education or health benefits
- Use local knowledge to determine most plausible scenario (see Wagstaff, 2012):
  - User fee is independent of benefit (use imputation method described before to calculate benefits)
    - e.g., health in Indonesia
  - Subsidized portion of health care is constant; user fee is total cost minus fixed subsidy
  - User fee is proportion of total cost of care
    - e.g., health in Jordan

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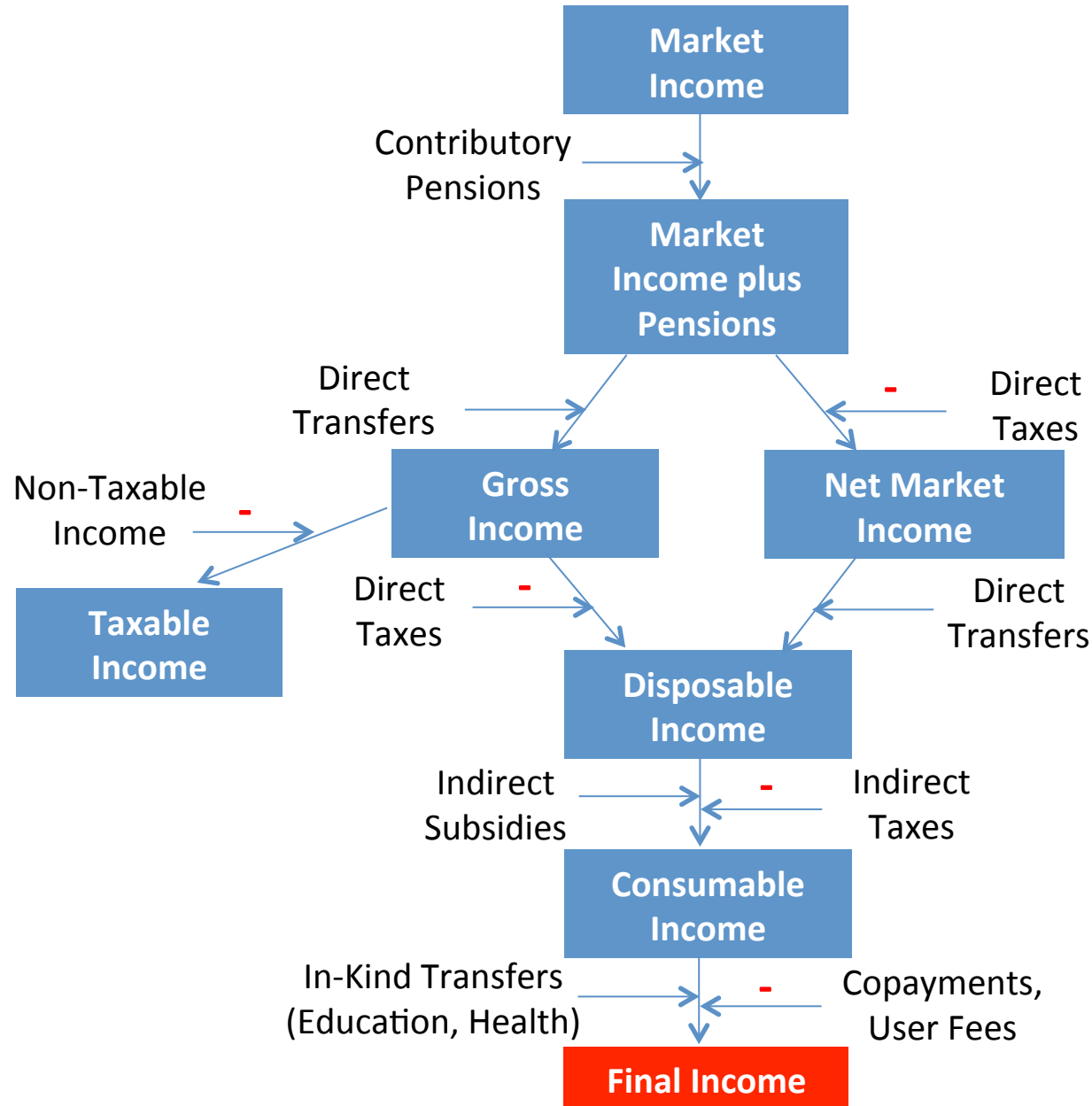
Final Income

- Final Income
    = Consumable Income
        + Education and Health Benefits
        – Co-payments and User Fees

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Scaling Down

- For all income components imputed using amounts from national accounts
- Scale down benefits to avoid overestimating effect of that component
- Example: primary education benefits
  - Divide primary spending in national accounts by disposable income in national accounts to obtain the ratio R
  - Scale down primary education benefits in the survey until the ratio of primary education benefits in the survey to disposable income in survey also equals R