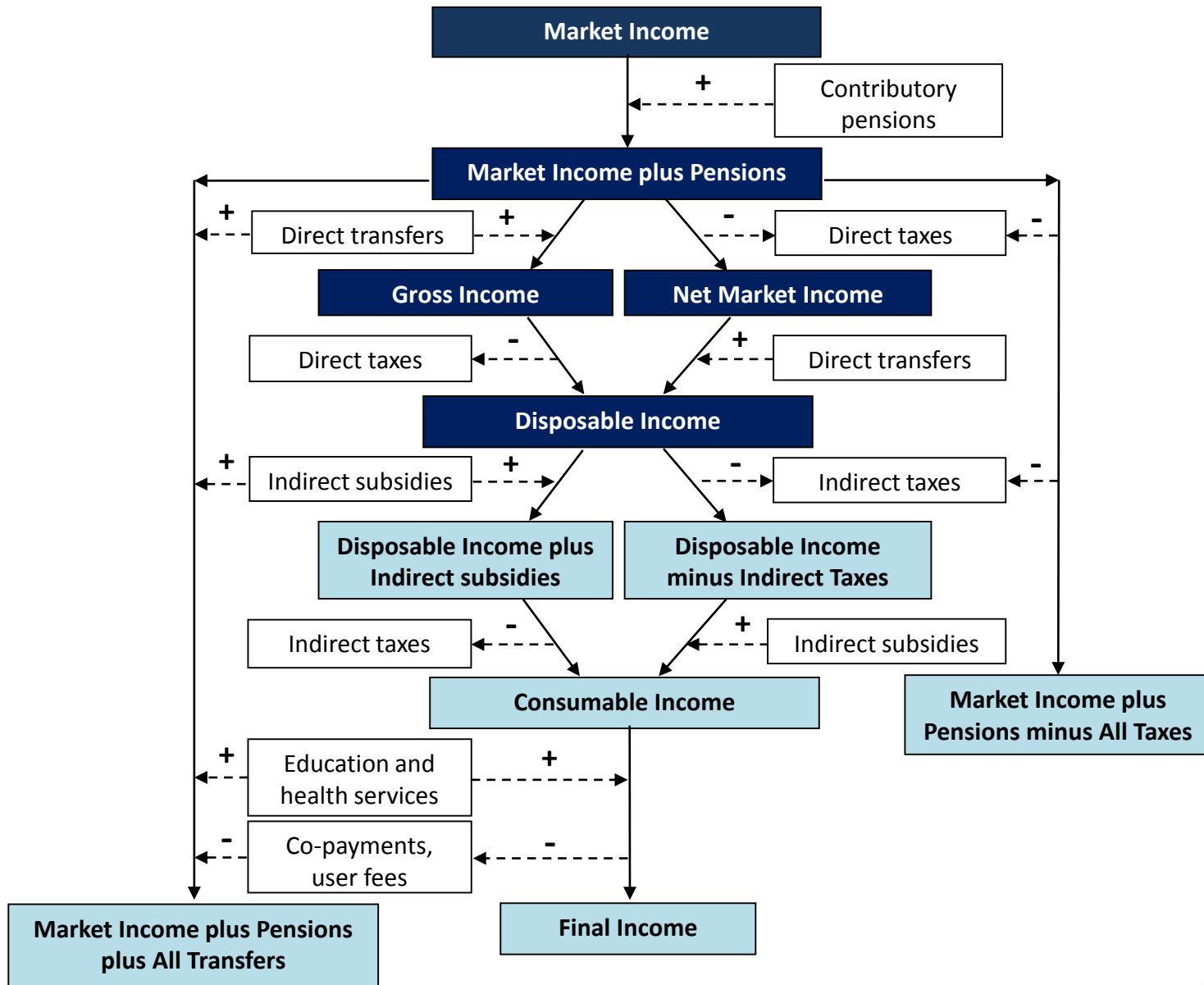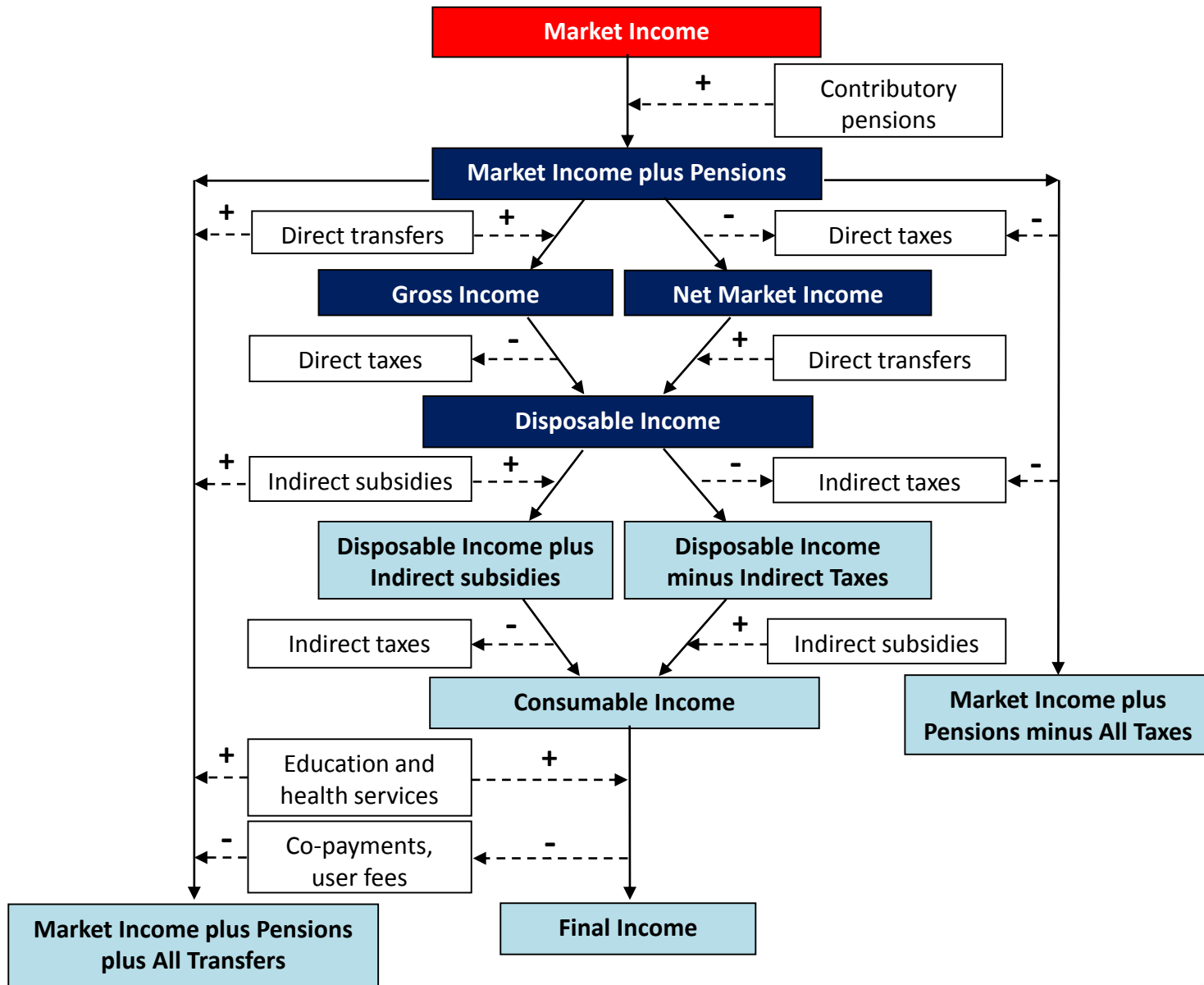# Construction of Income Concepts and Components
Sean Higgins
Tulane University

Learning Event on the
Commitment to Equity Methodology

Tulane University and the World Bank
Washington, D.C. – February 18, 2015

Market Income

$+$ Contributory pensions

Market Income plus Pensions

$+$ Direct transfers $+$ $-$ Direct taxes $-$

Gross Income   **Net Market Income**

$-$ Direct taxes $+$ Direct transfers

Disposable Income

$+$ Indirect subsidies $+$ $-$ Indirect taxes $-$

Disposable Income plus Indirect subsidies   **Disposable Income minus Indirect Taxes**

$-$ Indirect taxes $+$ Indirect subsidies

Consumable Income

Market Income plus Pensions minus All Taxes

$+$ Education and health services $+$

$-$ Co-payments, user fees $-$

Market Income plus Pensions plus All Transfers

Final Income

```
                          ┌─────────────────────────┐
                          │     Market Income       │
                          └─────────────────────────┘
                                      │        +  ┌──────────────────┐
                                      │ ◄─ ─ ─ ─ ─│   Contributory   │
                                      ▼           │     pensions     │
                          ┌─────────────────────────┐ └──────────────┘
              ┌───────────│ Market Income plus Pensions │───────────┐
              │      +    └─────────────────────────┘     -         │
              │ ◄─ ─ ┌──────────────┐ +        -  ┌──────────────┐ ◄─ ─ │
              │      │Direct transfers│─ ─ ─►   ─ ─ ─►│  Direct taxes  │      │
              │      └──────────────┘              └──────────────┘      │
              │          ┌──────────────┐   ┌──────────────────┐          │
              │          │ Gross Income │   │ Net Market Income│          │
              │          └──────────────┘   └──────────────────┘          │
              │ ┌──────────────┐  -           +  ┌──────────────┐          │
              │ │ Direct taxes │◄─ ─ ─        ─ ─│Direct transfers│        │
              │ └──────────────┘                 └──────────────┘          │
              │              ┌──────────────────────┐                      │
              │              │   Disposable Income  │                      │
              │              └──────────────────────┘                      │
              │   +  ┌──────────────┐ +        -  ┌──────────────┐ -       │
              │ ◄─ ─ │Indirect subsidies│─ ─►  ─ ─►│ Indirect taxes│◄─ ─   │
              │      └──────────────┘              └──────────────┘        │
```

Disposable Income plus Indirect subsidies

Disposable Income minus Indirect Taxes

Indirect taxes −

Indirect subsidies +

Consumable Income

Market Income plus Pensions minus All Taxes

Education and health services +

+

Co-payments, user fees −

−

Market Income plus Pensions plus All Transfers

Final Income

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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

Imputed Rent for Owner-Occupied Housing

- Direct identification
  - e.g., Brazil
  - "How much would this house be rented for if it were rented?"
- Prediction
  - e.g., Bolivia
  - 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; etc.)
  - Use coefficients from this regression in an out-of-sample prediction to predict rental value of owner occupied housing
  - See Appendix C of the CEQ Handbook
- Alternate Survey (with Prediction)
  - e.g., United States
  - No question on how much paid in rent
  - Predict using alternate housing survey with this question

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Imputed Rent for Owner-Occupied Housing

- 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

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
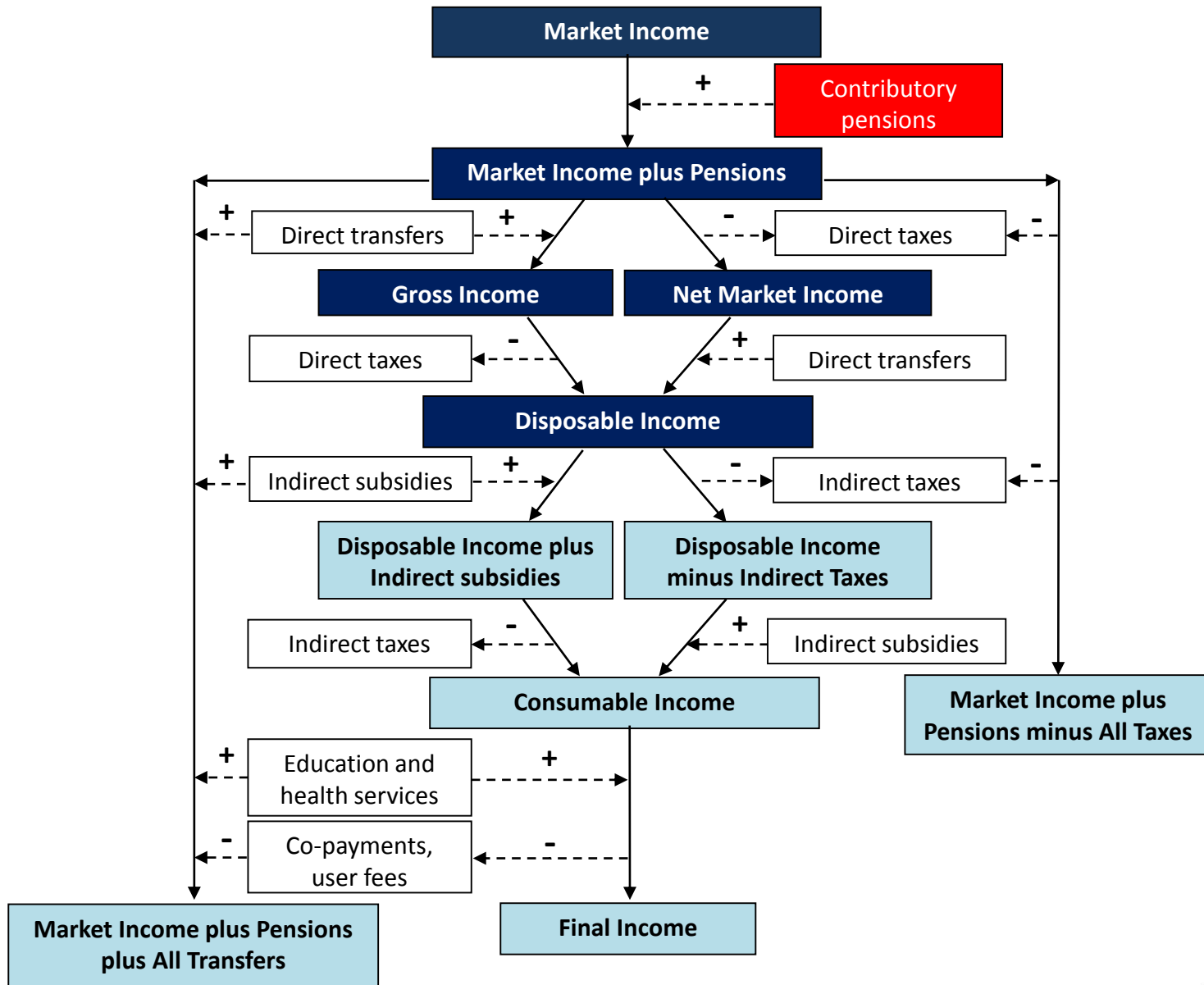
Contributory Pensions

- 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
  - Some surveys ask one question about the total value of own production
  - Use this value in market income
- 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
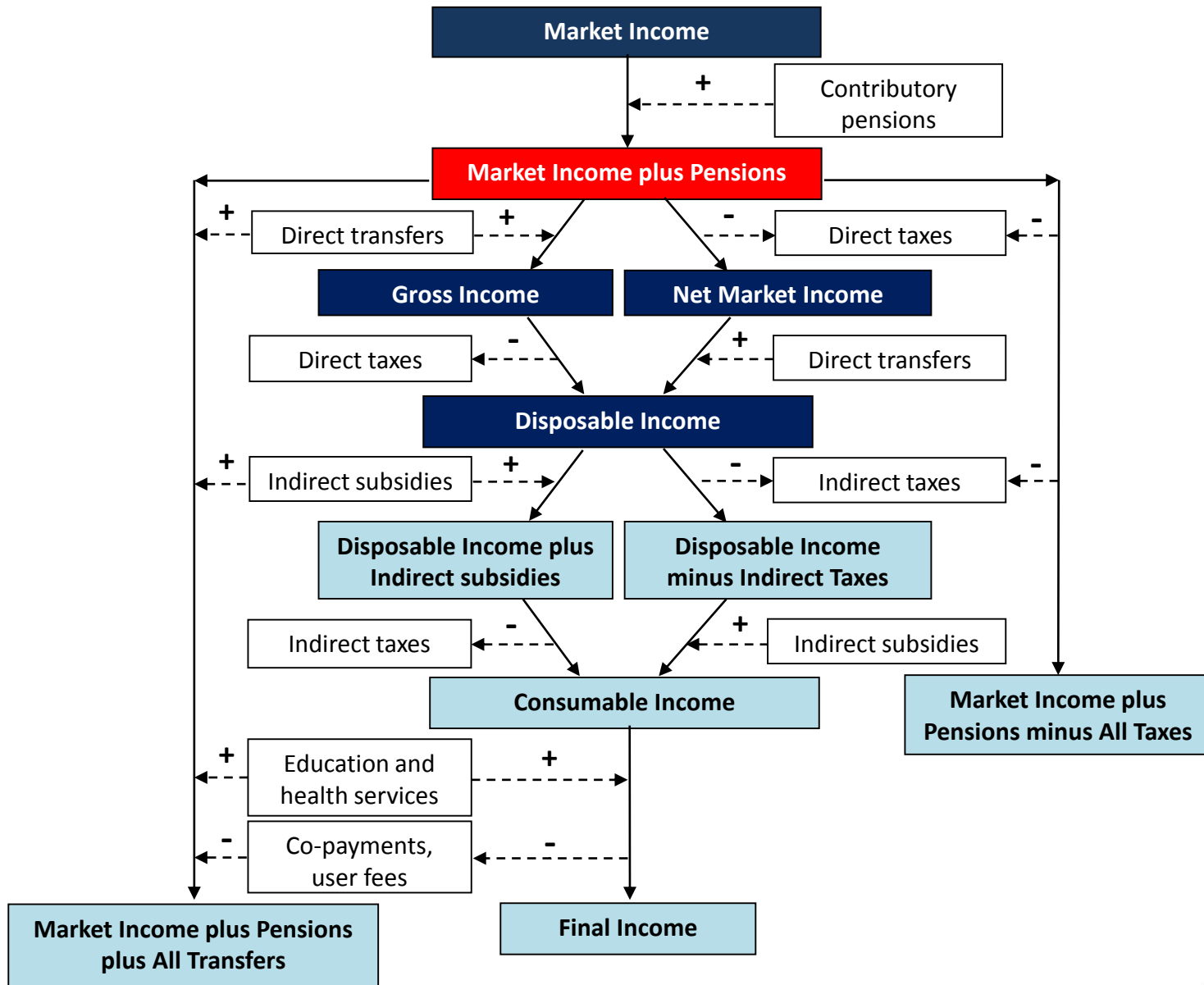
Market Income plus Pensions

- Market Income plus Pensions =
    Market Income + Contributory Pensions

$$m^{+P} = m + P$$
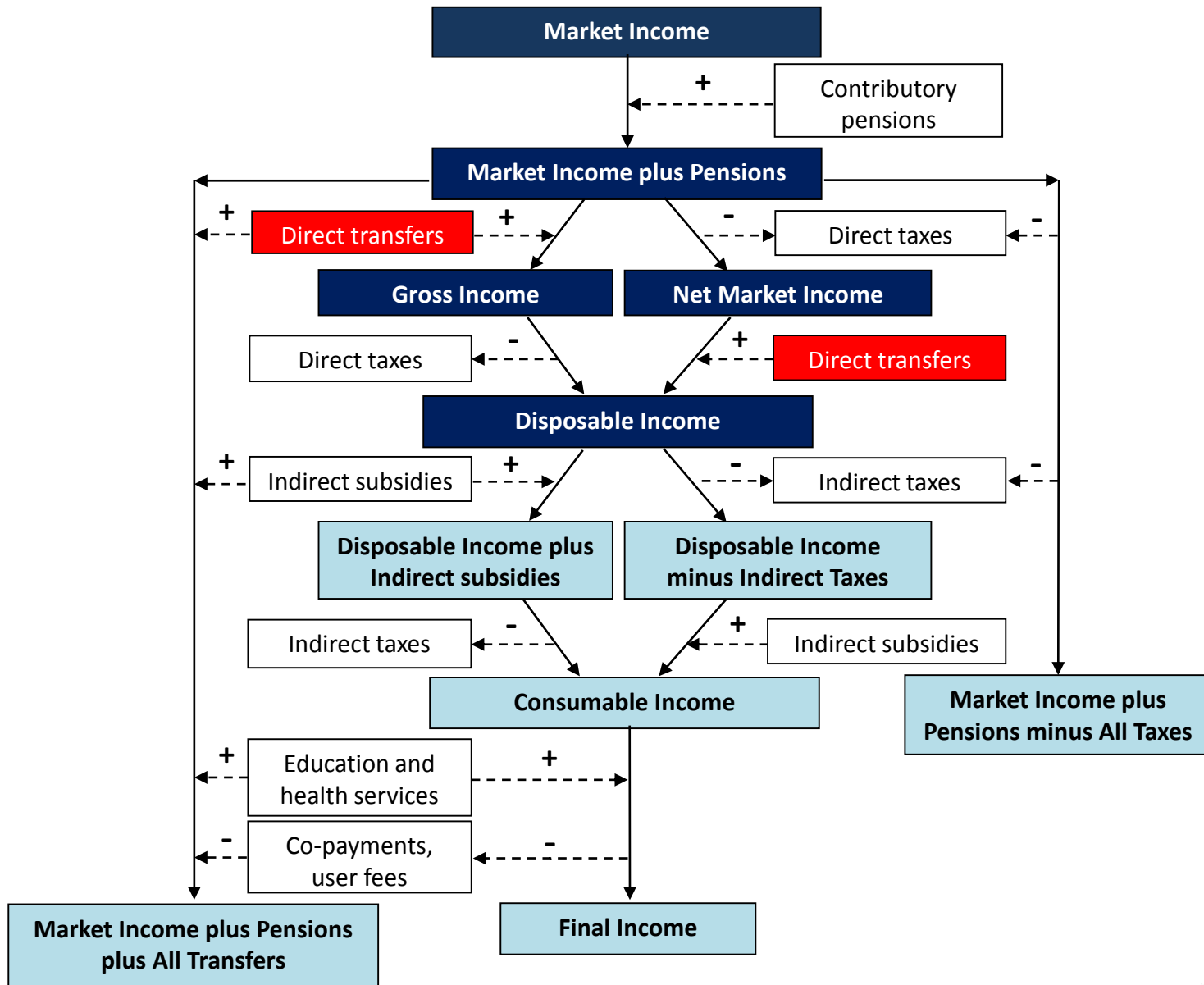
Direct Transfers: Components

- 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

Direct Transfers: Allocation

- Simulation
  - Targeted Transfers in Argentina and Bolivia
    - Simulated according to program rules and eligibility criteria (based on income, having children, etc.)
    - Assumed perfect targeting, full coverage and take-up of target population, and no leakages
  - 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

Direct Transfers: Allocation

- 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
  - Note: scale down totals from national accounts

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

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
- 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
  - Details on next slide

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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

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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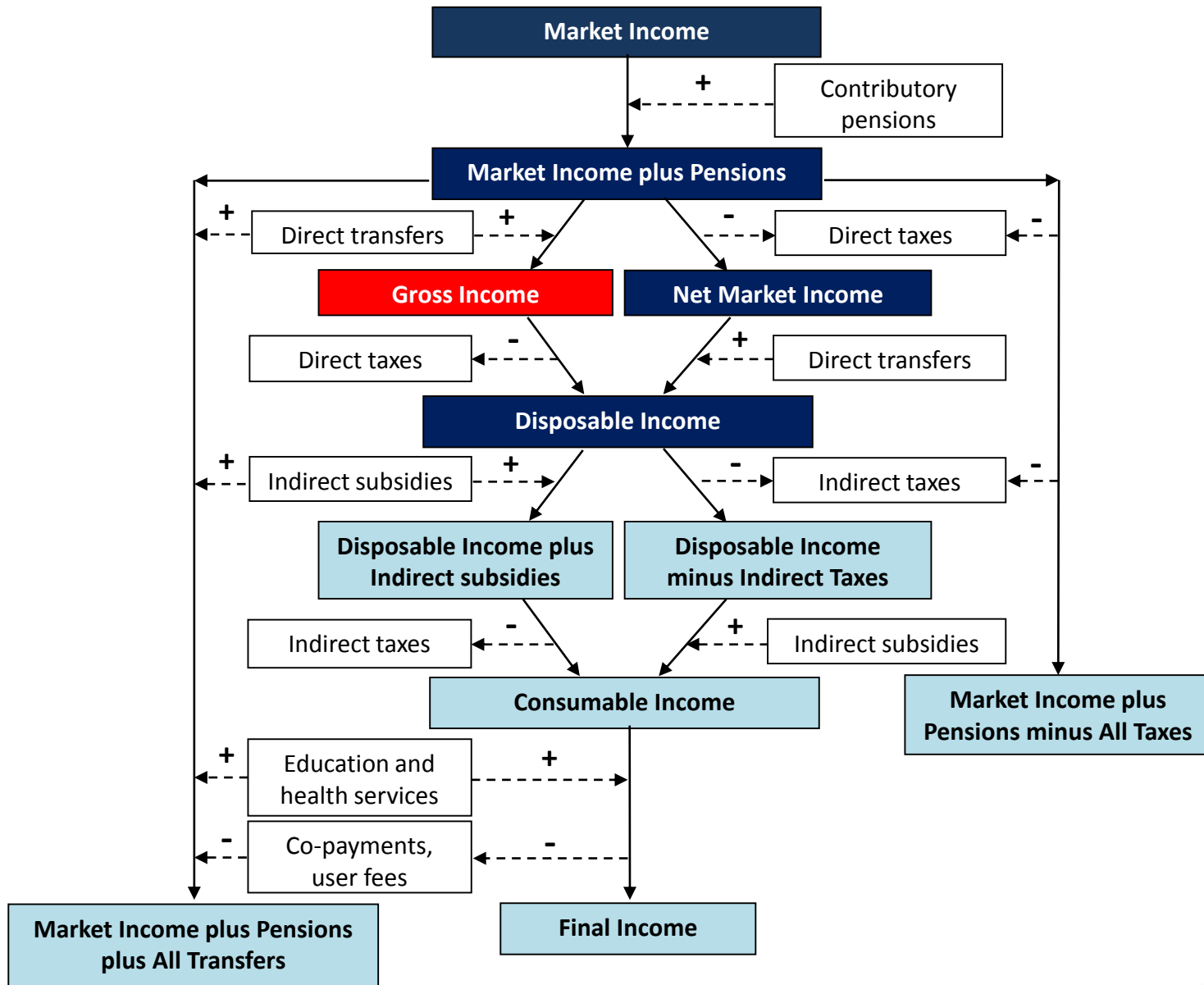
Gross Income

- Gross Income =
  Market Income plus Pensions + Direct Transfers

$$g = m^{+P} + B_d$$
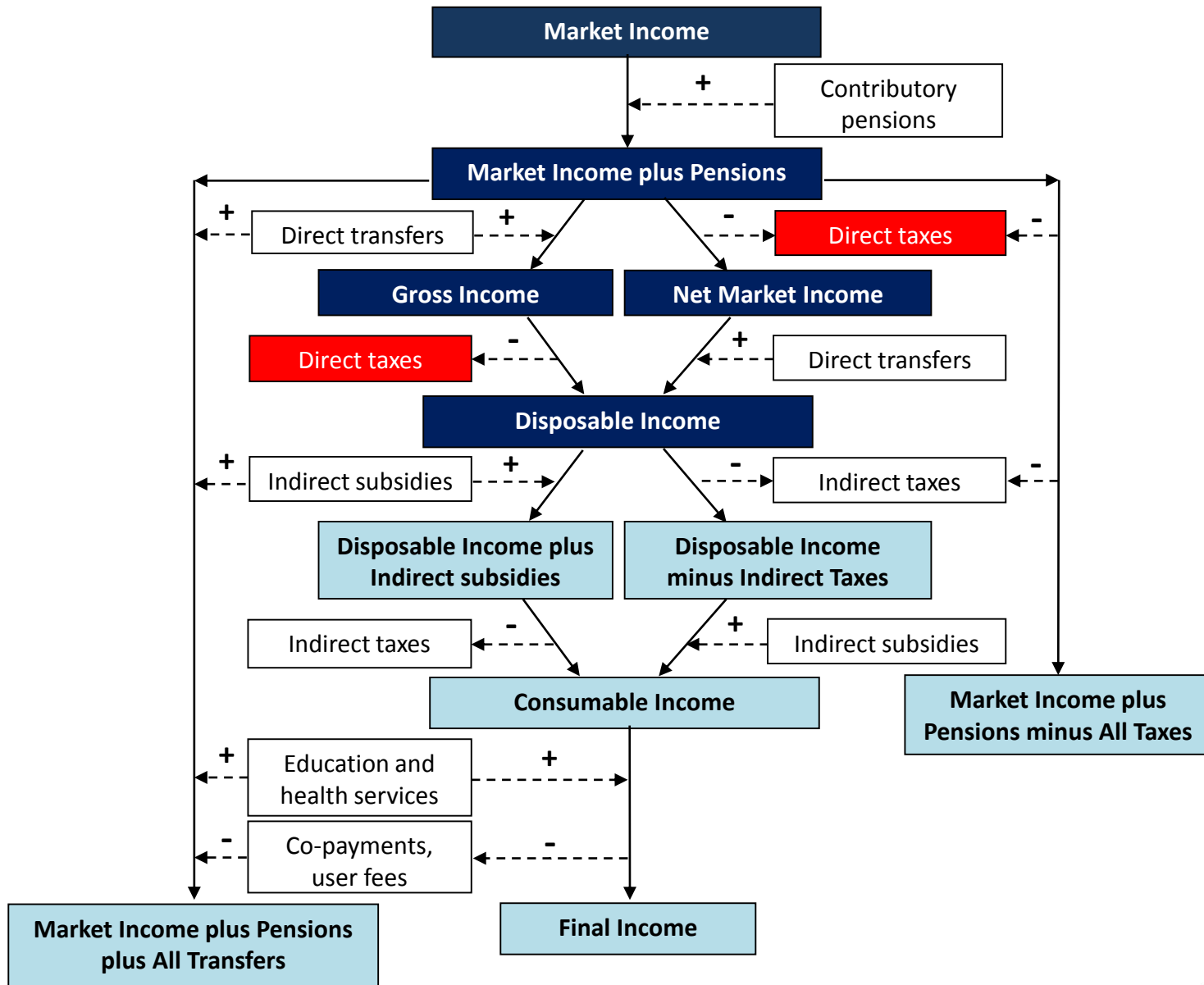
Direct Taxes: Components

- 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
  - Included if possible

- Assumption: direct taxes fully shifted forward to labor in the form of lower wages

Grossing Up

- Suppose reported pre-tax wage is 10
- Reported direct taxes (paid by employee) are 2
- Employer pays 3 in payroll taxes
- The pre-tax wage of 10 is *net of* employer payroll taxes, so gross up pre-tax wage to 10+3 = 13
  - 13 is the pre-tax wage used when constructing market income
- Direct taxes (ignoring other categories) are 2+3 = 5
- Post-tax wage is 13-5 = 8

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Direct Taxes: Allocation

- Direct Identification
  - Individual income taxes in Brazil, Colombia, 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)
- 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 Brazil
  - Corporate income taxes in Brazil and US
    - Requires very broad assumptions about burden of corporate income tax

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Direct Taxes: Components

- 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
- Imputation
  - Agricultural income tax in Ethiopia
    - Distribute total collected from national accounts proportionally to land holdings
- 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
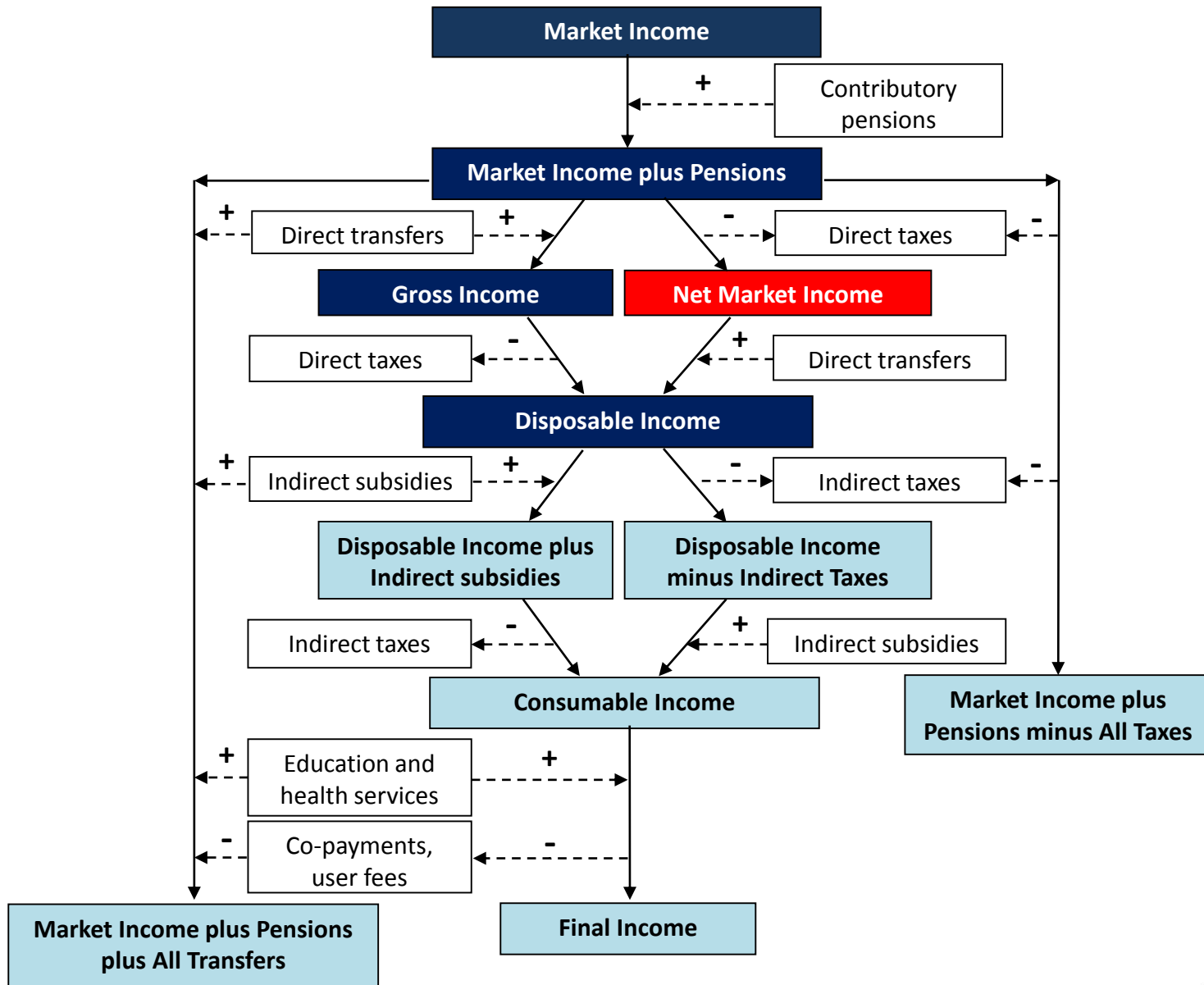
Net Market Income

- Net Market Income =
  Market Income plus Pensions - Direct Taxes

$$n = m^{+P} - T_d$$

Disposable Income

- Disposable income
  = Net Market Income + Direct Transfers

$$d = n + B_d$$

= Gross Income - Direct Taxes

$$d = g - T_d$$
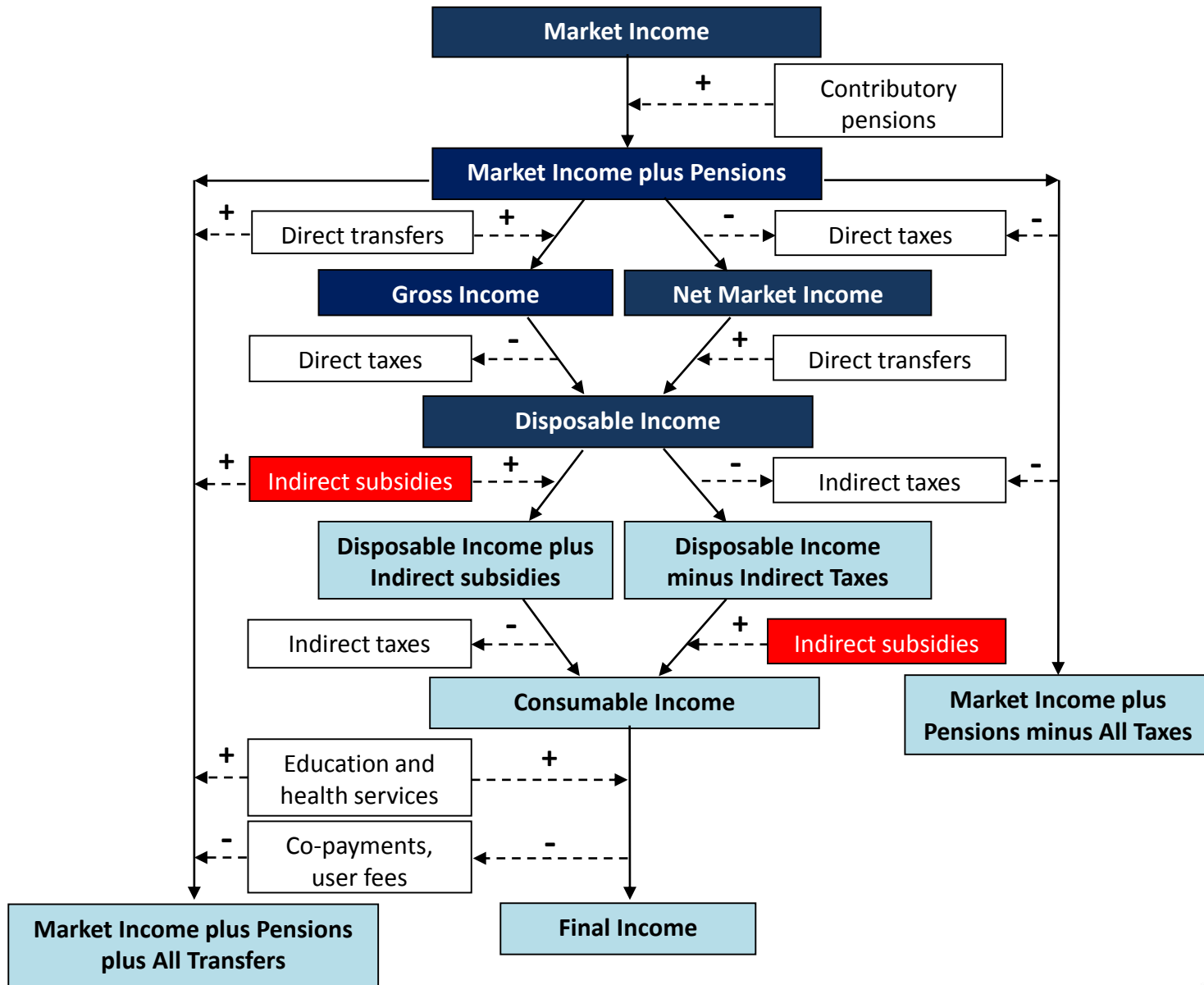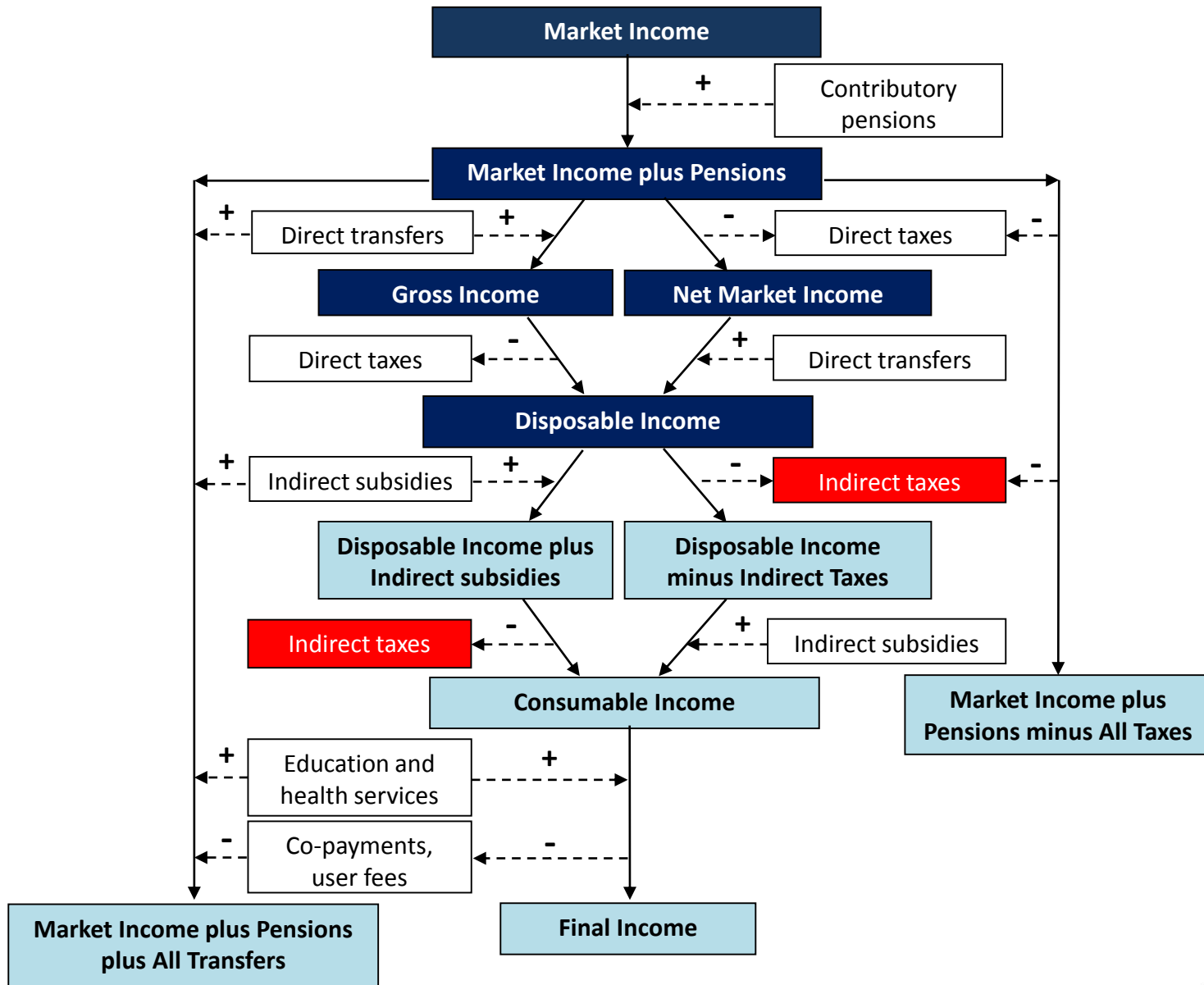
Indirect Subsidies and Indirect Taxes

- Presented by Gabriela Inchauste
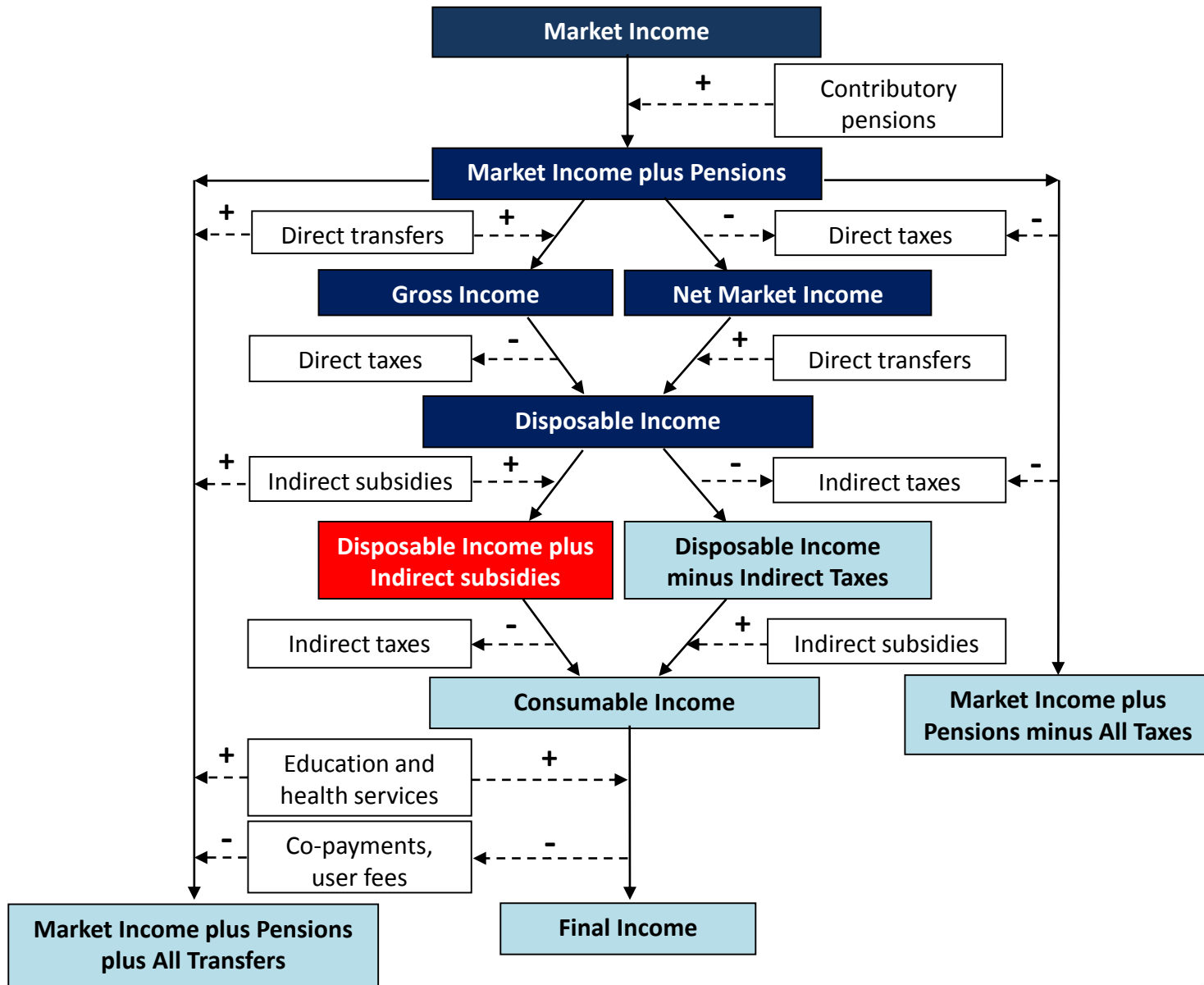
- Disposable Income plus Indirect Subsidies
  = Disposable Income + Indirect Subsidies

$$d^{+B_i} = d + B_i$$

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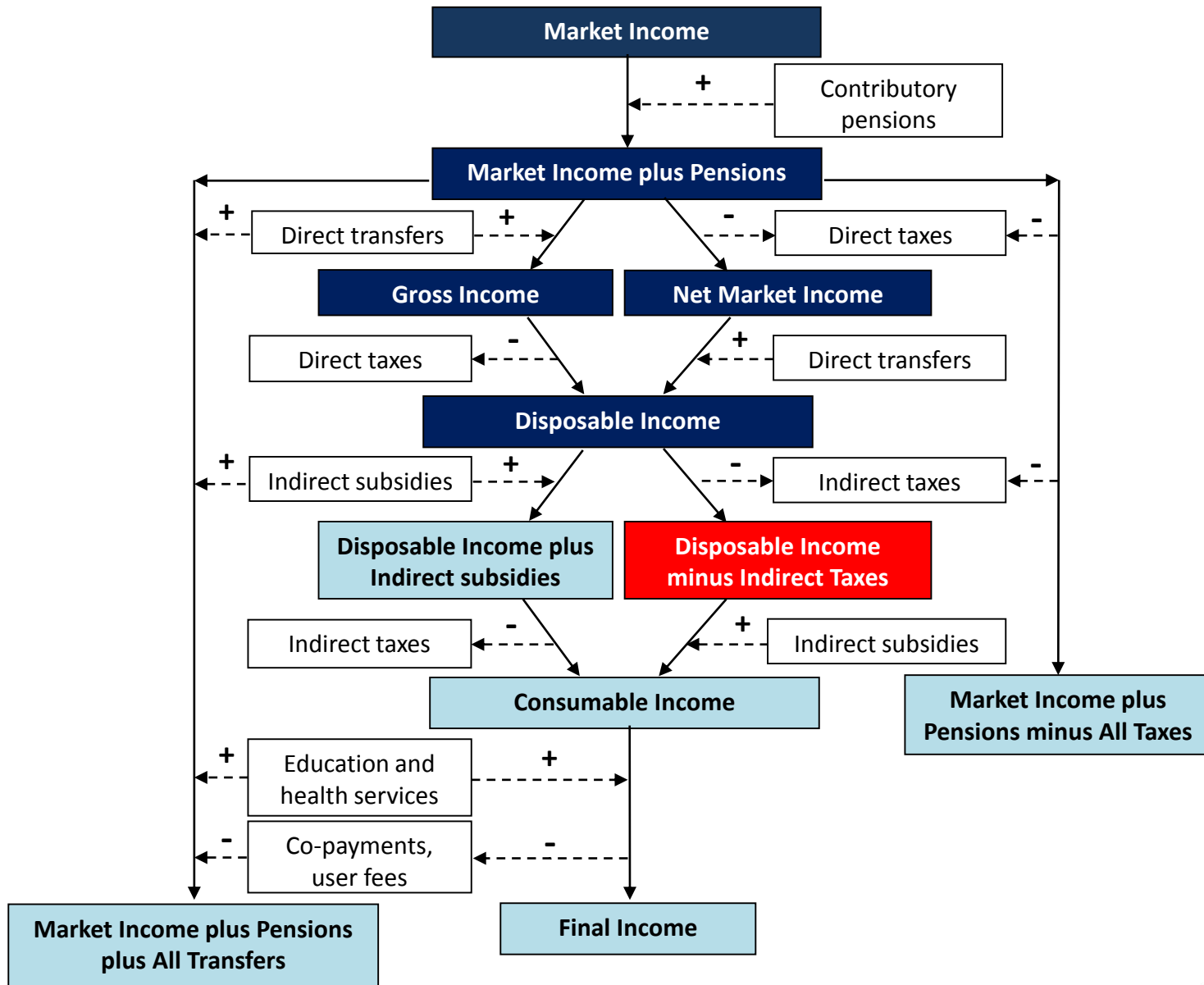
Disposable Income minus Indirect Taxes

- Disposable Income minus Indirect Taxes
  = Disposable Income - Indirect Taxes

$$d^{-T_i} = d - T_i$$
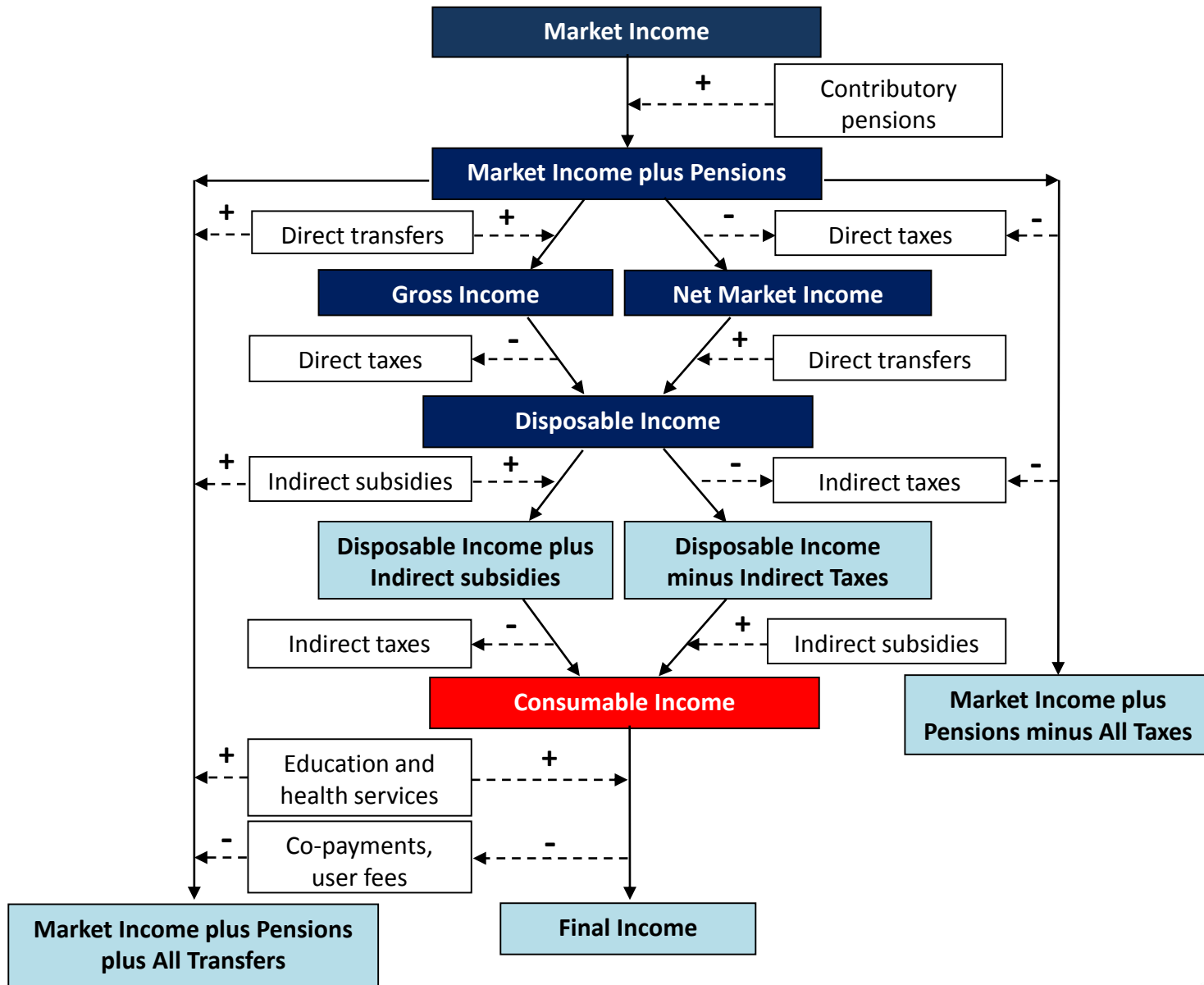
Consumable Income

- Consumable Income
  = Disposable Income minus Indirect Taxes
    + Indirect Subsidies

$$c = d^{-T_i} + B_i$$

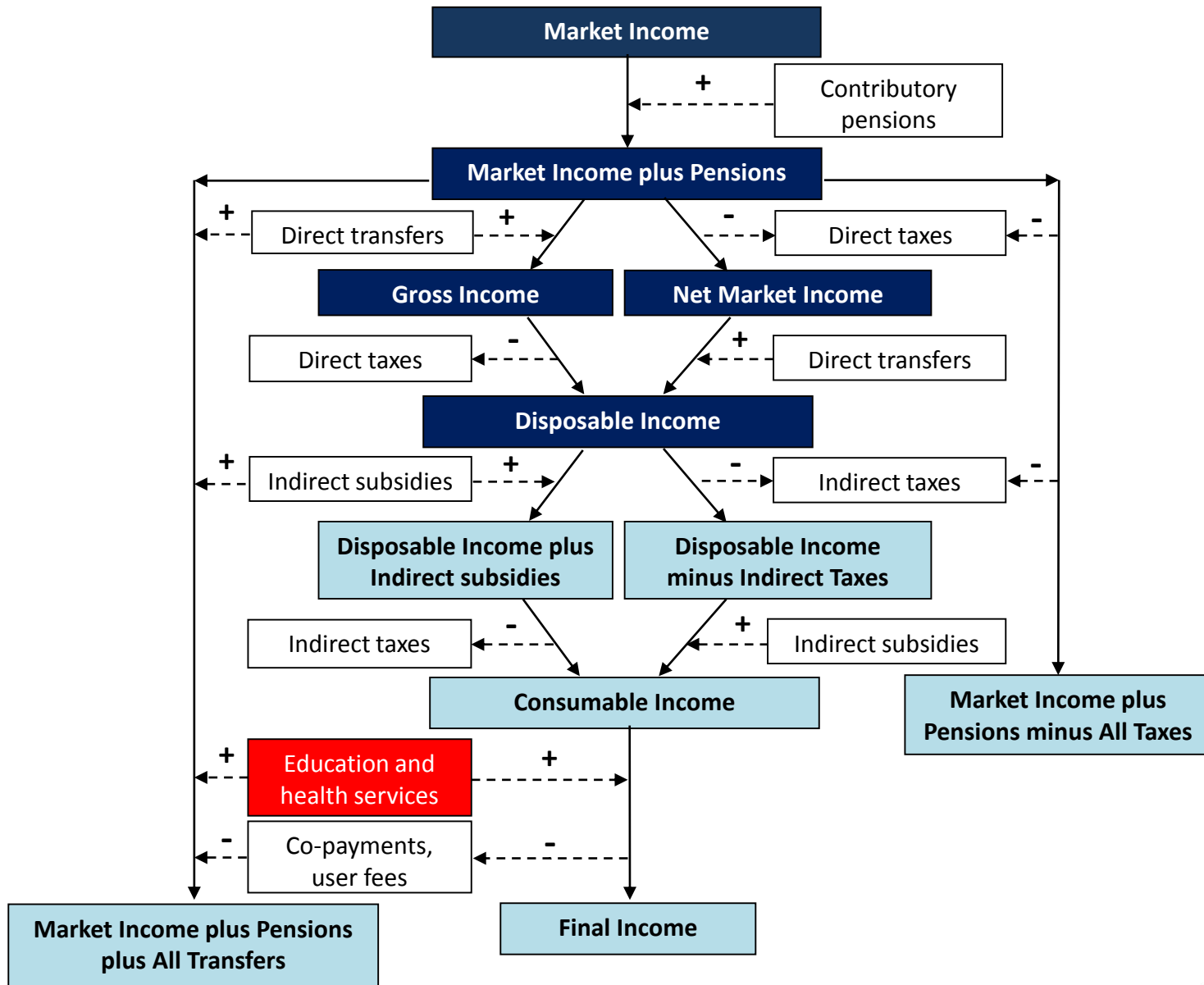 = Disposable Income plus Indiret Subsidies
    - Indirect Taxes

$$c = d^{+B_i} - T_i$$
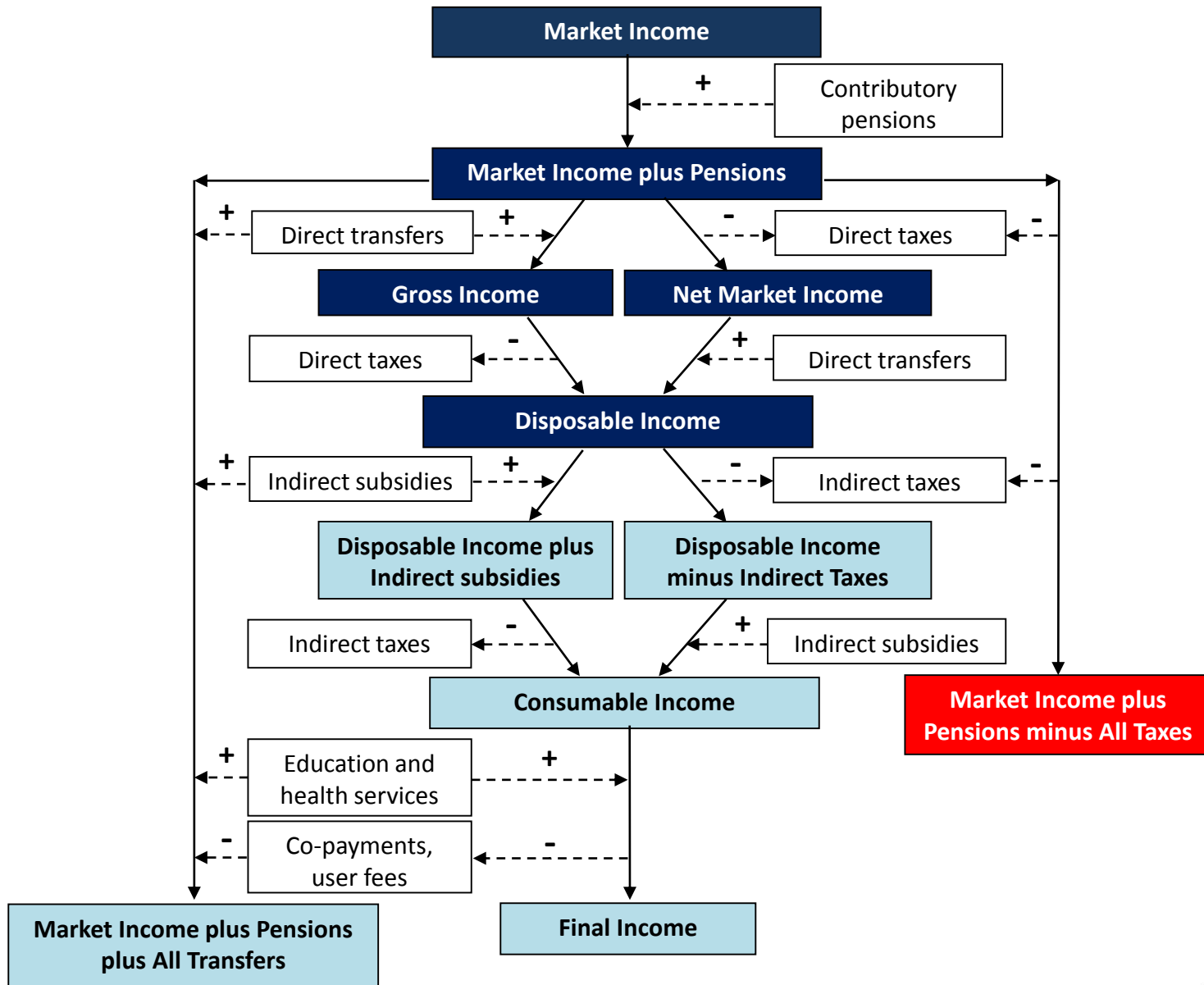
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Market Income plus Pensions minus All Taxes

- Market Income plus Pensions minus All Taxes
  = Market Income plus Pensions - Direct Taxes
    - Indirect Taxes

$$m^{+P-T} = m^{+P} - T_d - T_i$$

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
- 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
    - See next slide

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Education

- 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
  - 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

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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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
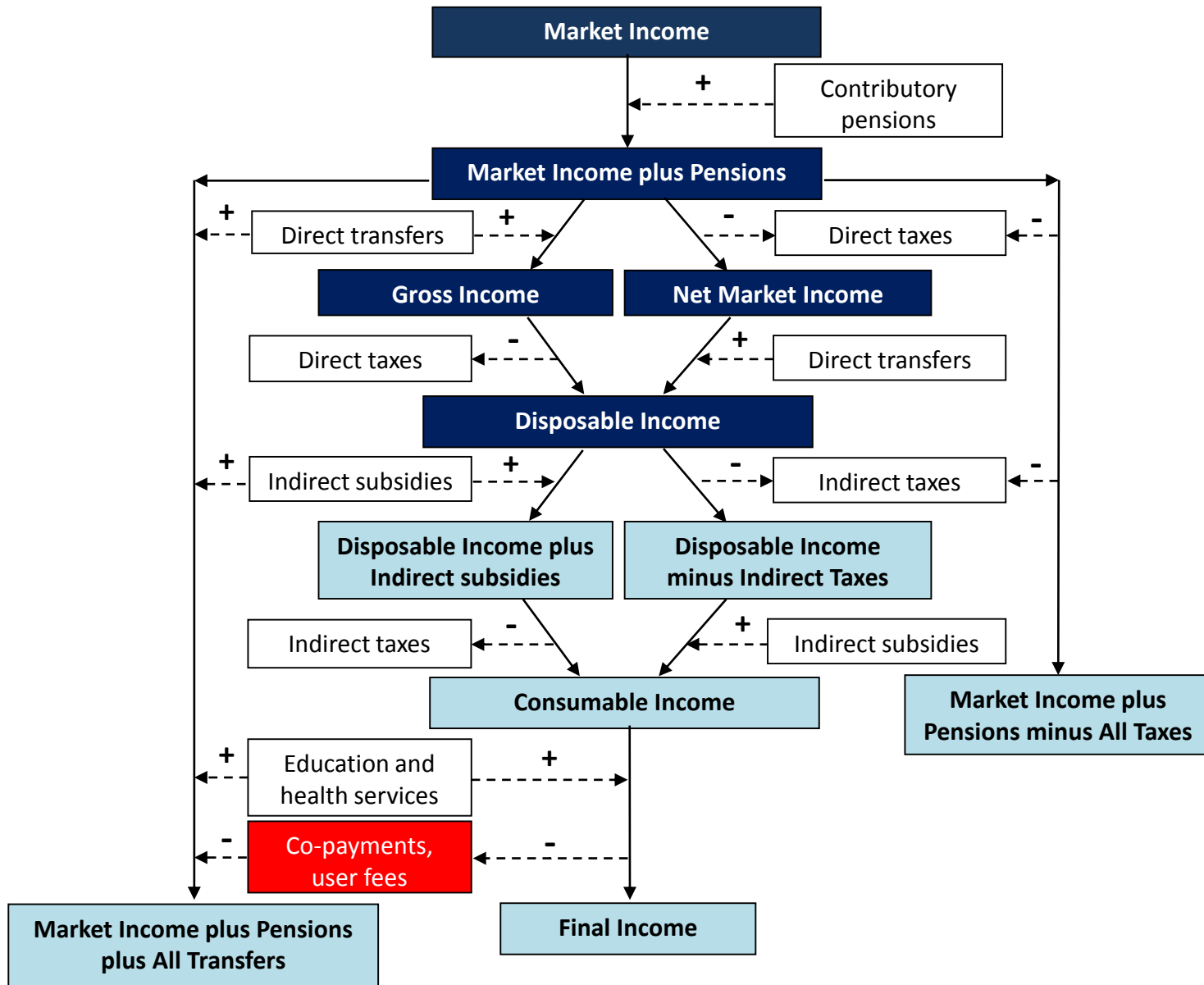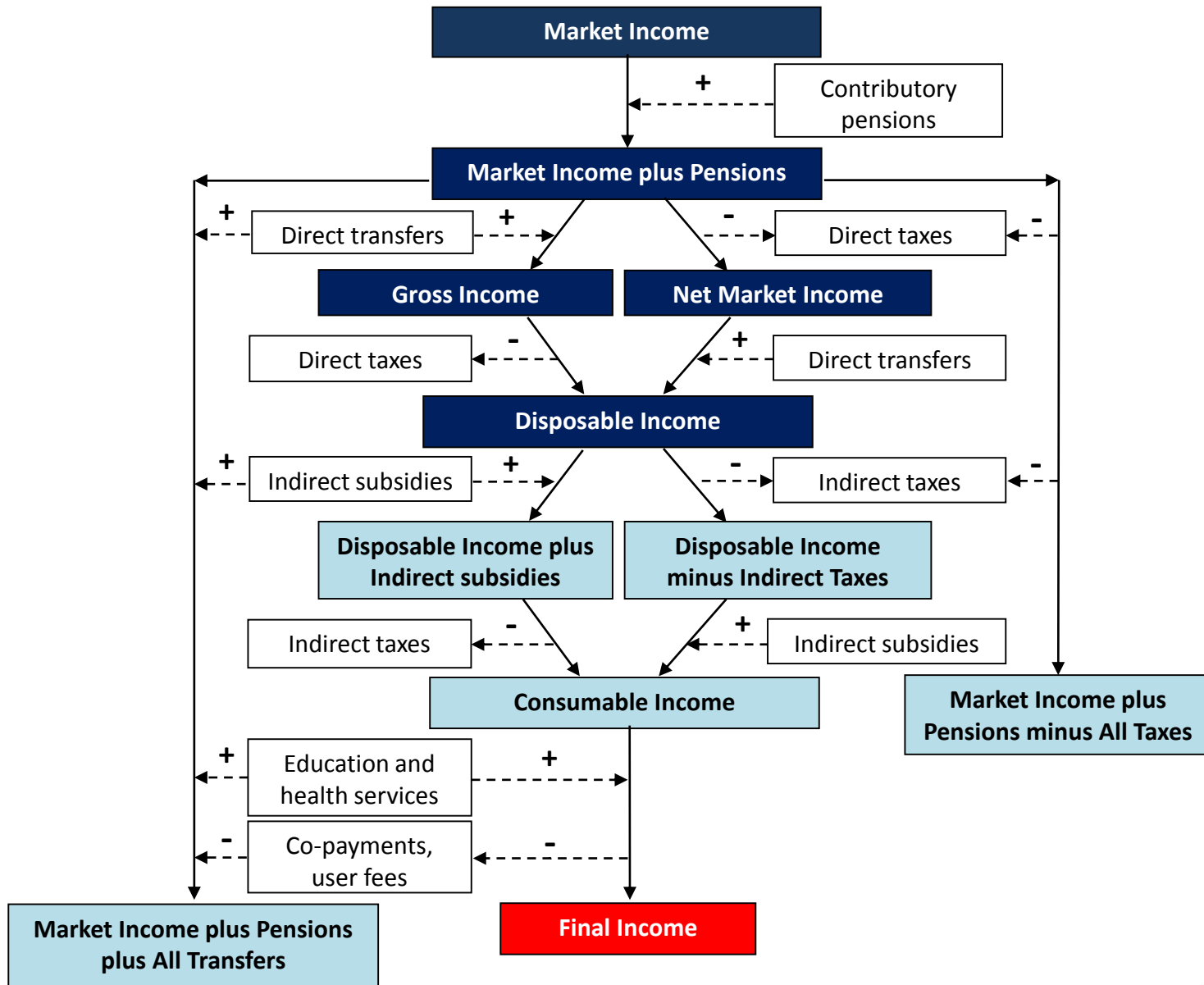
User Fees

- 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
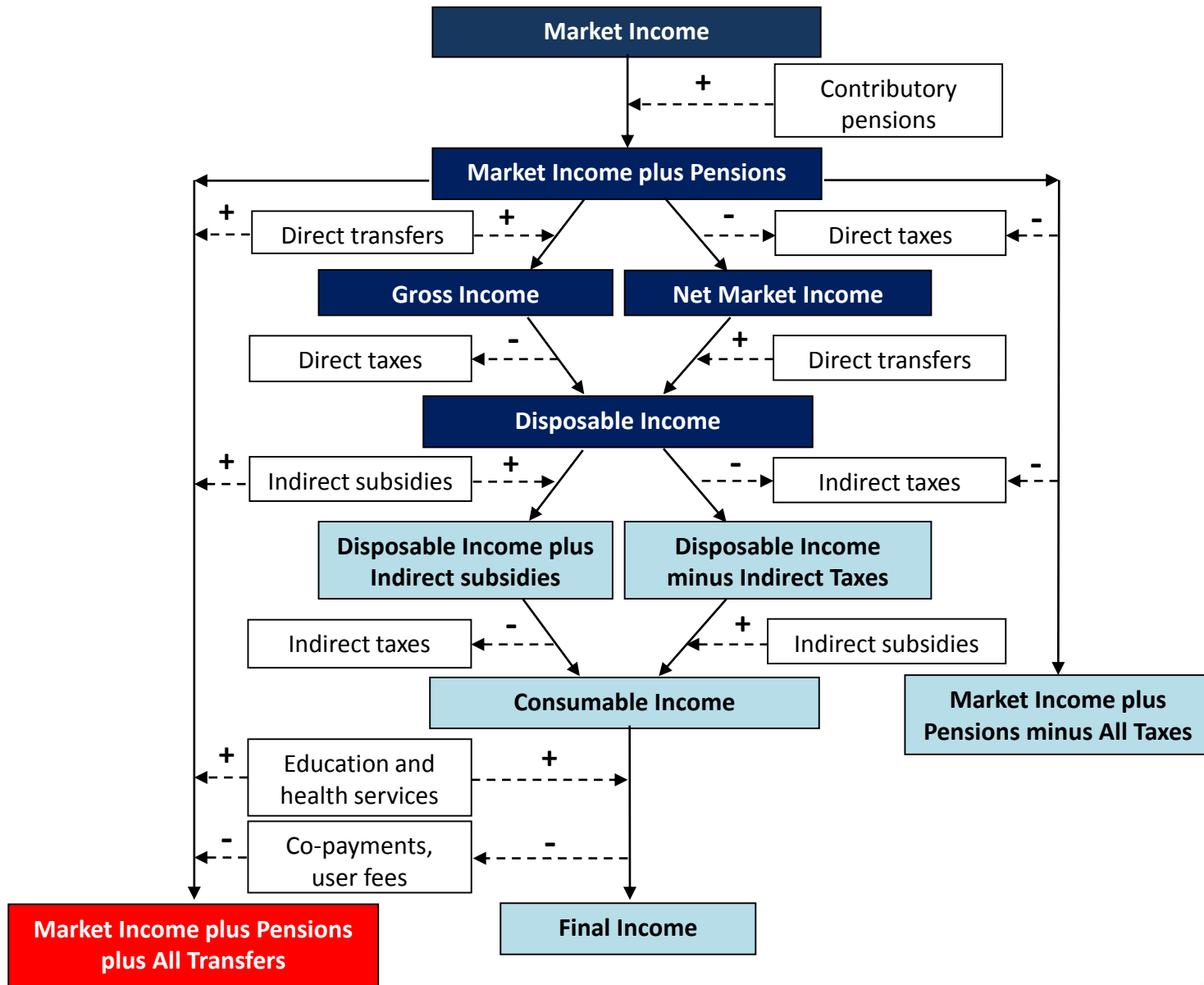
Market Income plus Pensions plus All Transfers

- Market Income plus Pensions plus All Transfers
  = Market Income plus Pensions + Direct Transfers
  + Direct Subsidies + (Education and Health Benefits -
  Co-payments and User Fees)

$$m^{+P+B} = m^{+P} + B_d + B_i + B_k - F$$

Final Income

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

$$f = c + B_k - F$$