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The Accounting-Existence Paradigm of GDP Accounting: Theoretical Foundations, Model Construction, and Application Paths

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Date: 2026-03-07T11:11:31+00:00

Abstract

As the core indicator of macroeconomics, GDP has faced three fundamental challenges since its inception: the paradox of government output accounting, the controversy over the treatment of fixed asset depreciation, and the lack of rigorous proof for the triple-equivalence principle. Based on the "Accounting Reality Paradigm," this paper proposes a reform scheme that establishes GDP accounting directly upon corporate financial statements. Starting from Smith's coat production chain and incorporating Marx's two-sector model, the article establishes a consolidated accounting identity for the whole society through layer-by-layer expansion: $\sum Va = \sum Oi_{final\ consumption} + \sum(Oi_{new\ investment} - BI) + \sum(Oi_{exports} - IV)$.

On this basis, this paper redefines the micro-foundation of GDP accounting—the boundary of the "production unit" (using "operating revenue" as the sole criterion, similar to the concept of "business" in accounting), demonstrates that fixed asset depreciation cannot be treated as net value in income-approach accounting, and provides the first accounting-level proof of the triple-equivalence principle. The contributions of this paper are: (1) providing an accounting foundation for GDP accounting that precedes the SNA; (2) resolving long-standing controversies such as the government output accounting paradox and imputed rent; (3) proposing an operational path for generating GDP data directly from corporate financial statements. With the implementation of the Golden Tax Phase IV project, the comprehensive implementation of audit-based taxation for individual industrial and commercial households, and the popularization of electronic payments, China already possesses the objective conditions to take the lead in realizing this reform.

Full Text

Preamble

The Accounting Reality Paradigm of GDP Accounting: Theoretical Foundations, Model Construction, and Application Pathways

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Abstract: As the core indicator of macroeconomics, GDP has faced three fundamental challenges since its inception: the paradox of government output accounting, controversies regarding the treatment of fixed asset depreciation, and the lack of rigorous proof for the triple-equivalence principle. Based on the "Accounting Reality Paradigm," this paper proposes a reform scheme to establish GDP accounting directly upon corporate financial statements. Starting from Smith' s coat production chain and incorporating Marx' s two-sector model, the paper establishes a consolidated accounting identity for the whole society through layer-by-layer expansion: $\sum Va = \sum Oi_{\text{final consumption}} + \sum(Oi_{\text{new investment}} - BI) + \sum(Oi_{\text{export}} - IV)$.

On this basis, the paper redefines the micro-foundation of GDP accounting—the boundary of the "production unit"—using "operating income"as the sole criterion (similar to the concept of "business"in accounting). It argues that fixed asset depreciation should not be treated as net value in income-approach accounting and provides, for the first time, an accounting-level proof of the triple-equivalence principle. The contributions of this paper include: (1) providing an accounting foundation for GDP accounting that precedes the System of National Accounts (SNA); (2) resolving long-standing controversies such as the government output paradox and imputed rent; and (3) proposing an operable path to generate GDP data directly from corporate financial statements. With the implementation of the Golden Tax Phase IV project, the comprehensive adoption of audit-based taxation for individual businesses, and the popularization of electronic payments, China possesses the objective conditions to lead this reform.

Keywords: GDP accounting; Accounting Reality Paradigm; Triple-equivalence principle; Production unit; Fixed asset depreciation; National economy

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1.1 Introduction

Since Simon Kuznets first proposed the concept of GDP in his 1934 "National Income Report"to the U.S. Congress, controversies surrounding GDP accounting have never ceased. Kuznets himself warned that "the welfare of a nation can scarcely be inferred from a measurement of national income." Despite multiple revisions to the System of National Accounts (SNA), several fundamental flaws persist.

First is the paradox of government output accounting. Scholars such as Jiang Ping have pointed out that under the current SNA framework, the output of non-market service sectors, such as the government, is calculated using the cost method—where output equals the sum of input costs. This implies that "the more the government spends, the higher the GDP."This paradox severely distorts the measurement of the government' s true contribution to the economy and renders international comparisons meaningless.

Second is the controversy over the treatment of fixed asset depreciation. Income-approach GDP accounting includes fixed asset depreciation, yet depreciation is not newly created income but rather compensation for past investment. From an accounting perspective, depreciation is the amortization of costs, not a component of profit. The late economist Professor Qian Beihai strongly opposed including depreciation in value added, but within the SNA framework, this criticism failed to trigger substantive reform.

Third, the triple-equivalence principle lacks rigorous proof. Although it serves as the theoretical cornerstone of GDP accounting, the SNA has never provided a rigorous mathematical proof for it, leading to significant subjectivity in specific national accounting practices. Without a unified theoretical constraint, results calculated by different methods inevitably vary, undermining the comparability of international GDP data.

Fourth is the long-standing disconnect between statistics and accounting. Current GDP accounting relies excessively on statistical sampling, economic censuses, and extrapolated data, failing to fully utilize corporate financial statements—the most reliable data source. This disconnect not only causes a massive waste of resources but also prevents national economic accounting from achieving real-time dynamic monitoring of economic operations.

1.2 Literature Review

Criticism of GDP accounting defects has a long history, and related research can be categorized into three levels. The first level involves criticisms of specific SNA rules. Gao Mixue (2020) has long focused on the integration of statistics and accounting, finding inconsistencies between China' s monthly, quarterly, and annual GDP data rooted in non-unified accounting methods. Qian Beihai (1998) questioned the rationality of including fixed asset depreciation from the perspective of the income approach, arguing it compromises the purity of the value-added concept.

The second level reflects on the overall SNA framework. Dong Shoukun and Huang Xinmin (2015), in their analysis of Marx' s reproduction schemes, indirectly touched upon logical flaws in total social product accounting, suggesting fundamental issues within the GDP framework itself.

The third level explores alternative indicators to GDP. In recent years, indicators such as Green GDP, the Gross National Happiness index, and the Inclusive

Wealth Index have emerged to compensate for GDP' s shortcomings. However, these efforts are mostly "patchwork" criticisms—identifying problems without providing an alternative theoretical framework. This paper attempts to fill this gap by elevating GDP accounting from a "statistical tool" to the level of "accounting reality," using double-entry bookkeeping as the foundation to provide a more robust underlying logic for the national accounting system.

1.3 Core Proposition and Structure

The core proposition of this paper is that establishing GDP accounting directly upon the financial statements of production units can systematically resolve the inherent defects of the SNA and provide an operable, auditable, and traceable methodological basis for national economic accounting. This proposition is based on the following judgments: double-entry bookkeeping is the universal language of the business world, and its rule that "debits must equal credits" is an accounting reality that precedes any value theory; the consolidated income statement and balance sheet of an entire society are logically mere extensions of individual corporate financial statements; and if corporate financial statements can be converted into GDP data according to unified rules, the disconnect between statistics and accounting can be eliminated.

The structure of the paper is as follows: Section 2 constructs an economic model based on the "Accounting Reality Paradigm,"starting from Smith's coat chain to establish a social consolidated accounting identity. Section 3 proposes a revised GDP accounting scheme, including the redefinition of production units and the proof of the triple-equivalence principle. Section 4 discusses the conversion path from financial statements to GDP data, followed by conclusions in Section 5.

2.1 Methodological Stance: From the Specific to the General

Ricardo pioneered a research paradigm that abstracts complex economic phenomena into a few variables to explain the entire economy. Schumpeter called this the "Ricardian Vice" —the more abstract the model, the further it drifts from reality, yet its conclusions are applied directly to a complex world. Marx, conversely, proposed a dialectical path of "specific → general → specific." This paper strictly follows Marx' s methodology: starting from the highly specific case of Smith' s coat production chain and gradually adding conditions to bring the model closer to reality and universal applicability.

2.2 Basic Concepts and Operating Income Decomposition

The core unit of analysis is the "Production Unit," defined as an independent accounting entity engaged in material production aimed at creating use-value and obtaining monetary income through market transactions or internal settlements. This definition includes three elements: material production (encompass-

ing both tangible goods and intangible services), operating income (measured in currency, distinguishing it from government or household activities), and independent accounting (the ability to provide financial statements).

Under this definition, government agencies, the military, and household activities are not production units. However, semi-public schools and hospitals with revenue, or corporatized gray industries, are included. To facilitate accounting, the model is limited to a specific "Economic Territory." From the financial statements, the operating income (Oi) of a production unit is decomposed as:

$$Oi = Tv + Va$$

Where Oi is the total sales (excluding non-operating gains), Tv (Transferred Value) represents intermediate products consumed, and Va (Value Added) is the newly created value. Tv is further decomposed into:

$$Oi = Cca + D\&A + BI + IV + Va$$

Here, Cca denotes consumable current assets, $D\&A$ denotes depreciation and amortization, BI is beginning inventory, and IV is import value. This decomposition makes the internal structure of double-entry bookkeeping explicit, allowing for the cancellation of internal transactions when aggregated across society.

2.3 The Original Smith Model and Its Limitations

Adam Smith' s "coat production model" assumes five stages: cotton farmer, spinning mill, weaving mill, dyeing factory, and garment factory. Smith proved that any commodity price can be decomposed into wages, rent, and profit.

As shown in , the value of the garment factory' s output (30) equals the sum of the value added at all stages because the initial stage (cotton farmer) has zero transferred value. [Figure 1: see original paper] However, Smith' s "layer-by-layer reduction method" only holds if a stage with zero transferred value exists. Marx criticized this "Smithian Dogma" for ignoring the value of the means of production. This paper argues that Smith' s model is a special case of a linear chain without fixed capital or industrial cycles. Once these are introduced, the reduction method fails and must be replaced by a framework that accommodates fixed capital and circular inputs.

2.4 First Extension: Introducing Energy Cycles

Modern production requires energy, creating complex circular relationships between sectors. By adding oil wells, refineries, and power plants to the model [Figure 2: see original paper], we break the linear assumption. Through mathematical derivation, we find that even with circular inputs:

$$Oi_{\text{garment factory}} = \sum Va$$

This result is significant: even when the system moves from a linear chain to a network structure with energy cycles, the aggregate identity holds.

2.5 Second Extension: Transformation Between Final and Intermediate Products

In reality, a commodity like a coat can be a final product (sold to a consumer) or an intermediate product (sold as a uniform to a factory). By introducing these paths [Figure 3: see original paper], we derive:

$$\sum Va = Oi_{\text{garment factory}} - Oi_{\text{garment}\to\text{dyeing}}$$

This demonstrates that the sum of value added equals the total output minus the portion that re-enters the production cycle.

2.6 Third Extension: Explicit Fixed Capital

To handle fixed assets, we split transferred value into depreciation (Dfa) and consumable current assets (Cca) [Figure 4: see original paper]. The identity becomes:

$$Oi_{\text{garment factory}} = \sum (Dfa + Va)$$

This seems to validate Marx' s critique of Smith, as depreciation appears as an additional component. However, the next extension resolves this.

2.7 Fourth Extension: The Compensation Loop of Fixed Capital

By adding a machinery sector [Figure 5: see original paper] and assuming "simple reproduction" (where machinery output exactly compensates for total social depreciation), we find that $Oi_{\text{machinery}} = \sum Dfa$. Substituting this back, we return to:

$$Oi_{\text{garment factory}} = \sum Va$$

When the machinery sector is included, depreciation is offset in the social aggregate, saving Smith' s "trinity" of value components, though the components are redefined as wages, taxes, and capital returns.

2.8 Fifth Extension: Commerce, Inventory, and Imports

Introducing shopping malls, beginning inventory (BI), and imports (IV) [Figure 6: see original paper] leads to the identity:

$$\sum Va = Oi_{\text{mall}} - IV - BI$$

This means the sum of value added equals the final products produced in the current period, excluding results of past labor (inventory) or foreign labor (imports).

2.9 Sixth Extension: Inclusion of Intangible Assets

Replacing the machinery sector with a "Machinery & Patents" sector [Figure 7: see original paper] allows the model to handle the amortization of intangible assets. This does not change the form of the identity but expands its applicability to the modern economy where R&D and software are crucial.

2.10 Model Simplification and Alignment with Marx' s Two Sectors

The complex network can be simplified into two sectors [Figure 8: see original paper]: Sector I (Production of intermediate goods, including machinery and patents) and Sector II (Final product sector). This structure mirrors Marx' s reproduction schemes [Figure 9: see original paper], but while Marx starts from value categories (c, v, m), this model starts from price categories $(D\&A, Cca, Va)$ directly linked to financial statements.

2.11 Seventh Extension: Removing the Simple Reproduction Assumption

To move beyond simple reproduction, we adopt an accounting stock-flow perspective. By examining financial data over any period, we can determine the type of reproduction based on changes in asset stocks: - $Stock_{t1} > Stock_{t0}$: Expanded reproduction - $Stock_{t1} = Stock_{t0}$: Simple reproduction - $Stock_{t1} < Stock_{t0}$: Economic contraction

The final form of the core identity is:

$$\sum Va = Oi_{\text{final consumption}} + (Oi_{\text{new investment}} - BI) + (Oi_{\text{export}} - IV)$$

This identity provides a rigorous proof of the triple-equivalence principle: the production, expenditure, and income approaches must yield the same GDP under this constraint.

2.12 The Integrated Stock-Flow Framework

By introducing the social consolidated balance sheet [Figure 11: see original paper]:

$$\sum At_1 = \sum At_0 + I(t_0, t_1) - D(t_0, t_1) + R(t_0, t_1)$$

The model evolves into a complete framework where the income statement reflects flows (newly created value) and the balance sheet reflects stocks.

3.1 Redefining Production

The SNA definition of production is overly broad, leading to the government output paradox and the controversy of imputed rent. This paper proposes "operating income" as the sole criterion for a production unit. This ensures that only

activities recognized by the market as creating value are counted. Consequently, government agencies and household activities are excluded from GDP creation, though they participate in the distribution of value added through taxes.

3.2 Net Value Treatment of Fixed Asset Depreciation

In the proposed framework, investment in the expenditure approach is treated as a net value (total investment minus total social $D\&A$). This ensures GDP reflects only "newly created wealth" and avoids the logical error of treating depreciation as both a cost and a component of income.

3.3 Proof of the Triple-Equivalence Principle

Using the identity in Eq. (13), we can see that the production approach ($\sum Va$) and the expenditure approach (final consumption + net investment + net exports) are strictly equal. The income approach (wages + net taxes + capital gains) is simply the decomposition of Va at the production unit level. Thus, the principle is proven as an accounting identity.

4.1 Accounting Alignment

Corporate income statement items can be reclassified to align with the $Oi = D\&A + Cca + Va + BI + IV$ decomposition. For example, Va is derived by summing wages, taxes, interest, rent, and net profit extracted from the costs and expenses.

4.3 Technical Feasibility

The objective conditions for this reform are mature in China due to the universal adoption of corporate accounting, the Golden Tax Phase IV project (which allows real-time data monitoring), the implementation of audit-based taxation for small businesses, and the high penetration of mobile payments (86% in 2025).

5.1 Main Contributions

This paper provides an accounting foundation for GDP that precedes statistics, resolves the government output paradox, and constructs a complete model from Smith' s coat chain to social consolidated statements. It demonstrates the feasibility of real-time monthly GDP accounting using current technology.

5.3 Conclusion

GDP is the yardstick of a nation' s economy, but its calibration has been neglected for a century. By using double-entry bookkeeping as the benchmark, we can ensure that GDP truly reflects the "ledger" of the national economy—a ledger that is already written in the books of every enterprise. Economics simply needs to learn how to read it.

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