MACROECONOMIC FLOW: CIRCULAR OR LINEAR?

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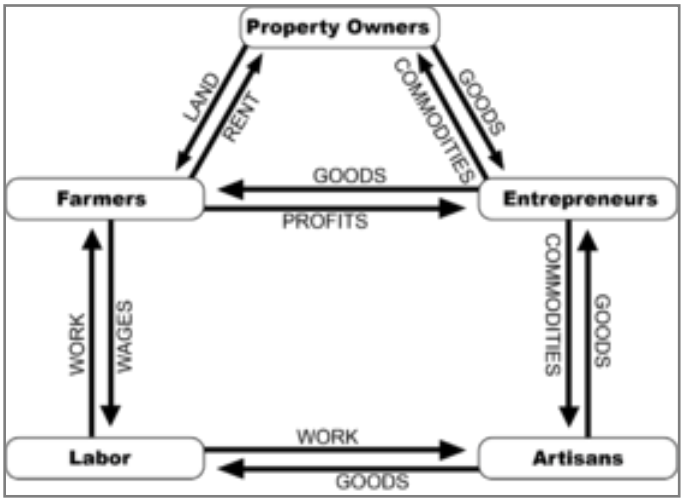
The macroeconomic circular-flow concept has been entrenched in economics for centuries. Haney (1949, p.126, 174 and 187f) traces the basic idea to John Law (1705), Richard Cantillon (1755) and Quesnay's *tableaux économique* (1753-1758). Sismondi addressed the same basic idea but Haney (p.393f) describes his efforts as pretentious as Quesnay's.[1]

Thornton constructed the following diagram from Cantillon's *An Essay on Economic Theory* (2010) on the basis of five economic agents: property owners, farmers, entrepreneurs, labor, and artisans.



Source: Cantillon 2010, p.66.

Fast forward to 1948 when Paul Samuelson published the first-edition of his *ECONOMICS* and captured the essence of the circular-flow as follows.

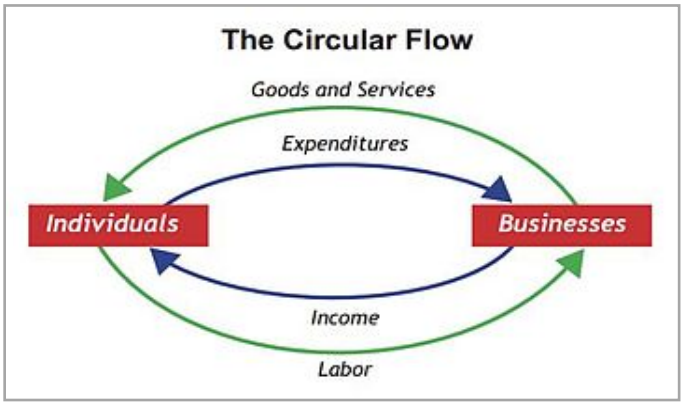
> In the simplest case, we can imagine a circular flow of dollars going from business to the public in return for productive services of labor and property; this is just matched by a flow of consumption dollars going from the public to business to pay for the purchase of real consumption goods and services (Samuelson 1948, p.226).

Notice the difference between Cantillon's thinking which centers on living, breathing economic agents whereas Samuelson's concentrates on inanimate objects.

[1] See also Backhouse and Giraud (2010) and Murphy (1993).

Source: Samuelson 1948, p. 226

We cite Samuelson on this matter for two reasons. First, he is a Nobel laureate. Second, the 19th and last edition of his principles text, with William Nordhaus as co-author, was published by McGraw-Hill in 2010, meaning that he has influenced countless numbers of students of economics to think about macroeconomic affairs in circular terms. Literally everyone, whether instructor or student, whether they use the Samuelson text or not, employs the macroeconomic circular flow diagram. The author himself was taught it in introductory economics with Samuelson's third edition.



Source: Wikipedia 2020

Today in its simplest form the macroeconomic flow diagram looks like this.

Samuelson's diagram and a very simplified version of the more current one do not look the same, principally due to design shape, use of color, and word selection. However, they are essentially the same. Businesses produce goods and services by employing the labor contributed by individuals. The income (wages) paid by businesses allows individuals to purchase those goods.

CIRCULAR-FLOW DIAGRAM FROM A PERSONALIST ECONOMICS PERSPECTIVE

The author's original circular-flow diagram (see Exhibit 1) was designed primarily to de-emphasize the workplace, household, and government sectors and emphasize instead human beings as specific economic agents: the producer/entrepreneur, the consumer/worker, the creditor/banker, and the public official. Allowance is made for borrowing by householders. These changes are consistent with the emphasis that we have given to thinking about economic affairs from the very beginning of personalist economics, Economics most fundamentally is about human beings carrying out their routine, everyday activities in economic affairs. See O'Boyle 2020.

Following the long-standing practices of the macroeconomic flow diagram of conventional economics, the product market is represented by Flows 1-5-6-9-10. In like fashion, the resource market is represented by Flows 2-3a-3b-3c-3d-4, and the financial market by Flows 7-8a-8b-12-13. The diagram leaves out exporters and importers because otherwise it becomes so entangled that the student of introductory economics risks getting lost in the complexity.

Flow 14 has been added to represent wasted natural resources allowing us to see environmental degradation in terms of the circular flow. Discarded natural resources can be either recycled or reprocessed and used again in the production of goods and services. A reprocessed item is one that undergoes some change before it is used again. A recycled item is one that is returned to the production process without being reprocessed. Both are shown as being returned to the process of production through Flow 3d. Provision is made in Flow 14 for waste that is disposed of in landfills or other sites.

Carrying capacity is a concept that has emerged as a result of heightened awareness of the importance of the environment to the well-being of all earthly creatures, especially human beings. Carrying capacity refers to the limit on the capability of our planetary home to absorb environmental contamination of the air, soil, and water. There is in other words a limit to the amount of Flow 14 that can be tolerated without impairing the well-being of every earthly inhabitant. Where that limit lies is precisely the question at the heart of the public discourse

Flow 15 has been introduced to represent wasted human resources, so that we can visualize from a macroeconomic perspective job loss and subsequent unemployment. Flow 3c represents the unemployed after they have been are recalled or find a new job. Provision is made in Flow 15 for persons who withdraw from the labor force,

We have known since the Great Depression, and learned again during the Great Recession, that millions of workers can be jobless for a long period of time. In more nearly normal times, however, the average unemployed person remains jobless for only a short period of time. Indeed, during an economic boom when there are labor shortages, unemployment may run for just one or two weeks. Large proportions of the unemployed are on temporary layoff and subsequently are recalled by their employers. Others find new jobs. We represent both types through Flow 3c.

New labor resources are differentiated from new natural resources. Flow 3a represents new labor resources as including new entrants into the labor supply and reentrants. Flow 3b portrays new natural resources as the endowments of nature. We have included Flows 3a, 3b, 3c, and 3d in our macroeconomic representation of the resource market at the bottom of the diagram where we also take note of the flows specific to the product market and the financial market.

Though the lines in the diagram suggest linearity, the underlying concept is circular. Therein lies its principal flaw. The following argument on the difference between the cyclic way of thinking and the evolutionary way demonstrates why even Exhibit 1 is fundamentally flawed.

CYCLIC WAY OF THINKING[1]

As with other disciplines such as history which "repeats itself," economics is constructed on a cyclic model that applies circular descriptions and explanations to economic events. Consider the following examples from economics past and present: (1) characterizing the market as a system that clears shortages and surpluses, automatically returning to a state of microeconomic equilibrium; (2) employing automatic stabilizers to restore macroeconomic equilibrium; (3) describing macroeconomic affairs in terms of the business cycle with its repeating pattern of expansion, contraction, peak, and trough; (4) promoting the natural-rate hypothesis which claims that unemployment invariably returns to its normal or natural rate regardless of the rate of inflation.

In the cyclic model events are construed as identical and inevitable, and therefore predictable. Reality is closed in and brought under control. Though assertive, thinking remains in a primitive

[1] This section and the one that follows on the evolutionary way of thinking are much shorter versions of the author's own chapter in O'Boyle 2011.

mold (Ong 1967, pp. 87, 73, 95). Thus, the widespread use of econometrics in conventional economic analysis. Using cyclic reasoning, and given the data required to operationalize their econometric models, conventional economists are comfortable in asserting that changes in economic affairs can be predicted. What they do not fully appreciate is that one other requirement -- a central premise of their way of thinking about economic affairs -- must be firmly in place. Specifically and notwithstanding any changes taking place in economic affairs over time, *homo economicus* is an *utterly rational, never-changing human individual.* Without this rationality and constancy about human individuals as economic agents, and the automaticity which is characteristic of market economies, the cyclic model disintegrates for lack of predictability.

Walter Ong (1967, p. 89) invites us to set aside cyclic thinking for evolutionary thinking because "one can make use of the circle model only as a result of a careful selection of details and the calculated elimination of others." Consider these five examples of "careful selection" and "calculated elimination": (1) imputing values for unobserved or unobservable variables; (2) assuming that dependent and independent variables are normally distributed in the population; (3) taking for granted that measurement error is randomly distributed; (4) presuming that in linear programming two of the lines bounding a region of basic feasible solutions do not intersect at the same corner point; (5) using budget constraints which ignore kinks, discontinuities, gaps, and nonconvexities (Berndt 1991, pp. 614-649).

EVOLUTIONARY WAY OF THINKING

Charles Darwin's theory of evolution with its twin emphasis on adaptation of living organisms to the environment and natural selection has had a powerful influence on modes of thought well beyond the precincts of biology. Ong proposes two arguments in support of the evolutionary model.

> … the discovery of evolution has undermined cyclic views even more than would appear at first blush. In the universe as we know it, there exists no real model or analogue for cyclicism -- that is the identical and inevitable repetition of an event or two (much less at an infinite number of) points in time (Ong 167, p. 73).

> … *the birth of man in the cosmos is striking evidence against cyclicism* if further evidence is really needed. For *here we have the cosmic processes terminating not in repetition but in its antithesis, the utterly unrepeatable and unique human person* (Ong 1967, p. 78; emphasis added).

By extension, Ong is arguing and we certainly concur that there is no way to posit a *never*-changing *homo economicus* without essentially casting aside "the central corporate discovery of all mankind" (1967, p. 61) and without effectively cloning all economic agents from a single cell

taken from a hyper-rational abstract human being. At the very heart of economic affairs is found the economic agent who is not cyclic but evolutionary, adapting in a Darwinian sense to the economic environment, and changing in a personalist sense simply by acting as an economic agent. In personalist economics, the *person of action.*[1]

There are several significant examples of evolutionary thinking *outside* conventional economics. The evolutionary thinking of Thorstein Veblen, John Commons, Wesley Mitchell, and Clarence Ayres formed the intellectual foundations of the Association for Evolutionary Economics. Other examples that demonstrate evolutionary thinking in economics are worthy of note. Deriving its inspiration from Joseph Schumpeter, the *Journal of Evolutionary Economics* also presents economic affairs in terms of an evolutionary process. Evolution is one of four ideas which are foundational to institutionalist theory. The other three are culture, cultural relativity, and instrumental valuing (Mayhew 1988, p. 23). Evolutionary economics replaces the maximization and equilibrium assumptions of mainstream economics with "uncertainty and imperfect information, routines, heuristic search processes and optimizing behavior, and nonequilibria" (Blauwhopf 1994, pp. 153-154).

Analogizing economics to biology, Herman Daly argued that matter-energy are *degraded* through the economic process in the same way that matter-energy are *degraded* through the metabolic process. In both the biological order and the economic order the purpose is the same: the maintenance and enjoyment of life. In his extended analogy, Daly examines the life process which he regards as the ultimate subject matter of economics and biology under two aspects: steady-state and evolutionary. Unlike cyclic thinking, Daly's thinking is linear. He visualizes the flow of matter-energy in economic affairs as "one-way, non-circular, and irreversible" (Daly 1968, pp. 392, 394-395).

In the early 1980s Kenneth Boulding (1981, p. 17) argued that Adam Smith, Thomas Malthus, and Alfred Marshall employed the evolutionary model and that it was Leon Walras and his followers who by grounding economics in mathematics subsequently steered it in the direction of the cyclic model. Economic science, in other words, was first a biological science before it was fashioned into a physical science. Several years later, Daly (1974, pp. 15-21) employed linear thinking to give expression to a steady-state economy based on the flow of matter-energy. Several years later, he voiced great concern for "an extreme overemphasis on the circular flow and a correlative under-emphasis on throughput" (Daly 1985, p. 296).

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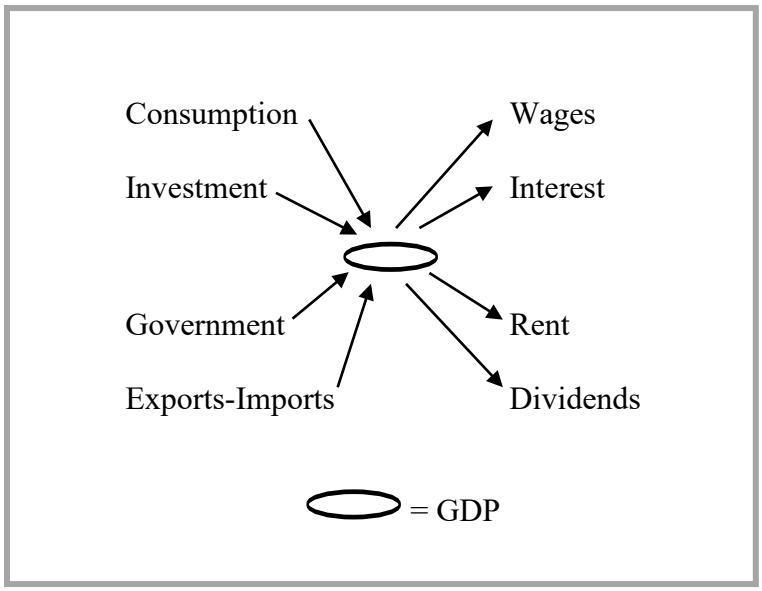
[1] We have just become aware of research indicating that in his 1911 edition of *The Theory of Economic Development* Schumpeter used "man of action" (mann der tat) to characterize the economic leader, the entrepreneur but abandoned that language in later editions. Our extended comments are available at our paper "Schumpeter's Man of Action: Precursor of Person of Action" which is accessible at ResearchGate.

The conventional macroeconomic circular flow diagram is a product of thinking from a cyclic perspective. Even our own diagram (Exhibit 1), which makes the role of the economic agent more explicit, is defective for that very reason. It is time to re-think how the economy operates from an evolutionary or linear perspective. Our proposition is not a radical departure from the past. It returns economics to its biological roots. Recall that in Thornton's rendering of the circular flow according to Cantillon (2010, p.66) where attention is focused primarily on five classes of economic agents: property owners, farmers, entrepreneurs, labors, and artisans.

A SIMPLIFIED MACROECONOMIC *LINEAR* FLOW DIAGRAM

Constructing a macroeconomic flow diagram with a distinctive linear dimension to replace the conventional circular dimension begins with the familiar terminology of national income accounting. The expenditure side in our diagram includes consumption, investment, government, and exports minus imports. The income side includes wages, interest, rent, and dividends. The expenditure side provides an estimate of gross domestic product that logically matches the estimate from the income side. Aligning our diagram with national income accounting grounds the new diagram in both the familiar and the relevant, thereby enhancing its validity.

Constructed Around Inanimate Objects

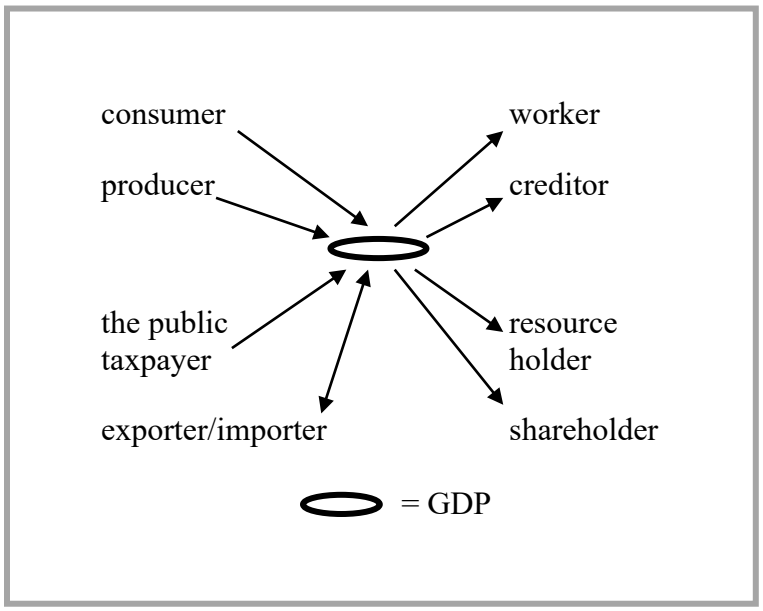


Throughout his *Theory of Economic Development* Schumpeter represents the economic system

in circular-flow terms.[1] Even so, our diagram aligns well with his argument in chapter one to the effect that it is individuals contributing to a social product and receiving from that "heap" (Schumpeter's word) the things that are used to satisfy their wants. Notice the difference between Samuelson (and virtually all contemporary economists) and Schumpeter on the circular flow. Samuelson thinks largely in terms of inanimate objects, Schumpeter in terms of living, breathing human beings.

> … each individual throws a contribution into this great social reservoir, and later receives something from it. To each contribution there corresponds somewhere in the system a claim of another individual; the share of everyone lies ready somewhere (Schumpeter 1949, p. 9).

Constructed Around Living, Breathing Human Beings



The author's initial effort to convert the conventional macroeconomic flow diagram from the circular to the linear is displayed below in Exhibit 2. It is based on the foundation of a steady state economy as defined in the following.

> A steady state economy is an economy of stable or mildly fluctuating size. The term typically refers to a national economy, but it can be applied to a local, regional, or global economy. An economy can reach a steady state after a period of growth or after a period

[1] The title of the first chapter of *The Theory of Economic Development,* 1934 edition, is "The Circular Flow of Economic Life As Conditioned By Given Circumstances."

> of downsizing or degrowth. To be sustainable, a steady state economy may not exceed ecological limits.
>
> A steady state economy entails stabilized population and per capita consumption. Birth rates equal death rates, and production rates equal depreciation rates. Minimizing waste allows for a steady state economy at higher levels of production and consumption.
>
> All else equal, the steady state economy is indicated by stabilized (or mildly fluctuating) gross domestic product. GDP is not a good indicator of well-being, but it is a solid indicator of economic activity and environmental impact (CASSE 2020, definition).[1]

The linear nature of macroeconomic events in Exhibit 2 is displayed in terms of four distinct periods to indicate that what takes place in Period 1 is transmitted to Period 2 and then to Periods 3 and 4 with the proviso that decision-making is not *necessarily* dependent on decisions made in the previous period. Implicit in Exhibit 2 is the realization that economic decision makers are *persons of action* and what they do is not pre-determined in a market system. An economic agent is subject to changing circumstances and conditions in her life -- perhaps a new, better paying job, a drop in the valuation of her 401k retirement portfolio, a young adult family member setting out on his own -- and consequently her decisions change over time.

Notice, however, that Exhibit 2 maintains the conventions of the circular-flow diagram: the four kinds of expenditure (consumption, investment, government, and exports/imports) along with the four types of income (wages, interest, rent, and dividends). By holding on to those conventions, Exhibit 2 leaves out the *persons of action* who drive macroeconomic events.

Exhibit 3 corrects that flaw by (1) inserting consumer, producer/entrepreneur, taxpayer/public, and exporters/importers who drive expenditures and (2) workers, creditors, share holders, and resource holders who share in the income generated by economic activity. Entrepreneurs are highlighted because, following Schumpeter, they are the principal agents of change. To complete the personalization of Exhibit 3 the author replaced “savings” with “wealth holder” and “credit” with “banker.”

Exhibit 4 incorporates the linear thinking which for years the Bureau of Labor Statistics has used to show what happens in the labor market from one period to the next with its gross-flows data series (see BLS 2020). The author includes that thinking here for two reasons. It is the natural but vastly underutilized companion to the monthly labor force data that derive from the very same source -- the *Current Population Survey*. Second, in combination with Exhibit 3 it shows

[1] The author does not intend to imply that his use of the steady state in Exhibits 2, 3, and 4 is to be taken as his support for or advocacy of a steady-state economy.

how to present events in the labor market in linear terms and provides added support for re-thinking all macroeconomic events in linear form.

Exhibit 5 takes our macroeconomic linear flow diagram one step further by including the expansion and contraction phases of the business cycle. The National Bureau of Economic Research measures both phases in terms of months. The historical record indicates that since the end of WWII, when monetary and fiscal policy first began to be used aggressively to stimulate/dampen the national economy, the expansion phase lasts much longer than the contraction phase. Specifically, the average expansion phase (trough to peak) lasts 60.2 months; the average contraction phase (peak to trough) lasts 10.2 months (NBER 2020). Exhibit 5 includes that difference (not-to-scale) by making the linear dimension for an expanding economy longer than for a contracting economy.

A FINAL WORD

The key to re-thinking macroeconomic affairs and re-constructing the circular flow diagram is not so much replacing the circular with the linear as it is in acknowledging that all economic activity at the micro level and the macro level is driven by living, breathing human beings and for that reason economists ought not to model economics after the physical sciences that focus on inanimate objects which are incapable of actuating themselves. Rather they should model it after the biological sciences that centers attention on living organisms subject to evolutionary change.

Homo economicus is simply too passive a construction of the economic agent. What is needed instead is an economic agent that actively engages in economic affairs. What is needed is the *person of action.* Change the agent and macroeconomics no longer can be represented in circular terms and diagrams. Linearity will follow.

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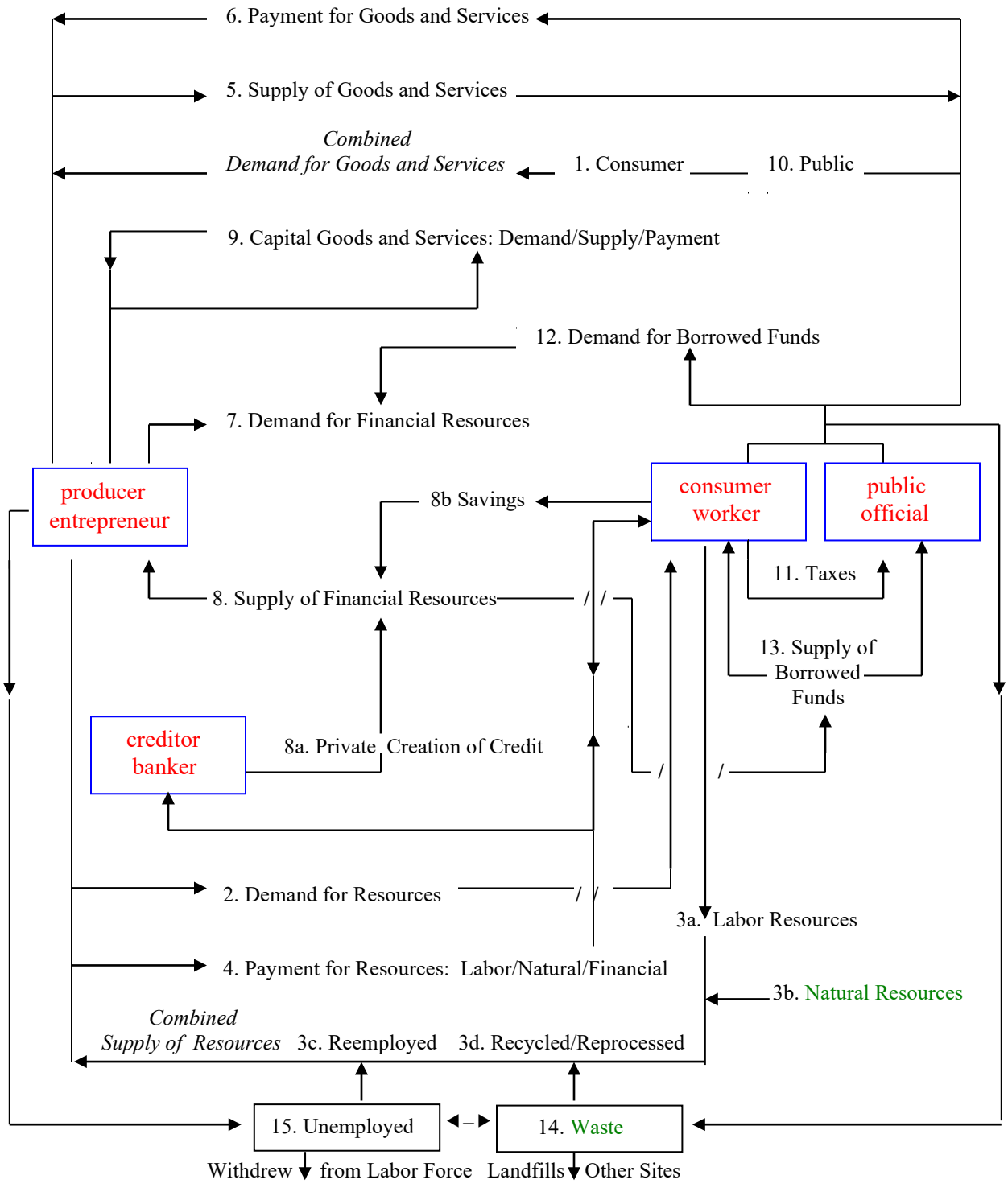
EXHIBIT 1.
CIRCULAR FLOW: PERSONALIST ECONOMICS CONTEXT
United States Domestic Economy



Source: O'Boyle 2020.

EXHIBIT 2.
SIMPLIFIED MACROECONOMIC LINEAR-FLOW DIAGRAM:
A STEADY-STATE ECONOMY

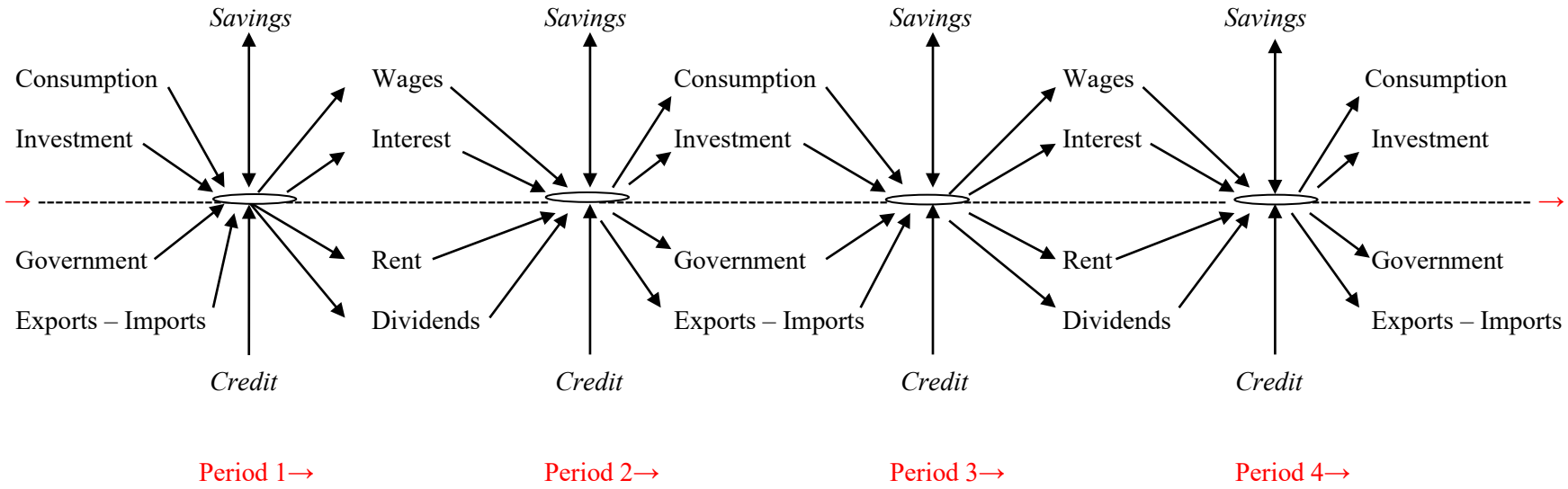
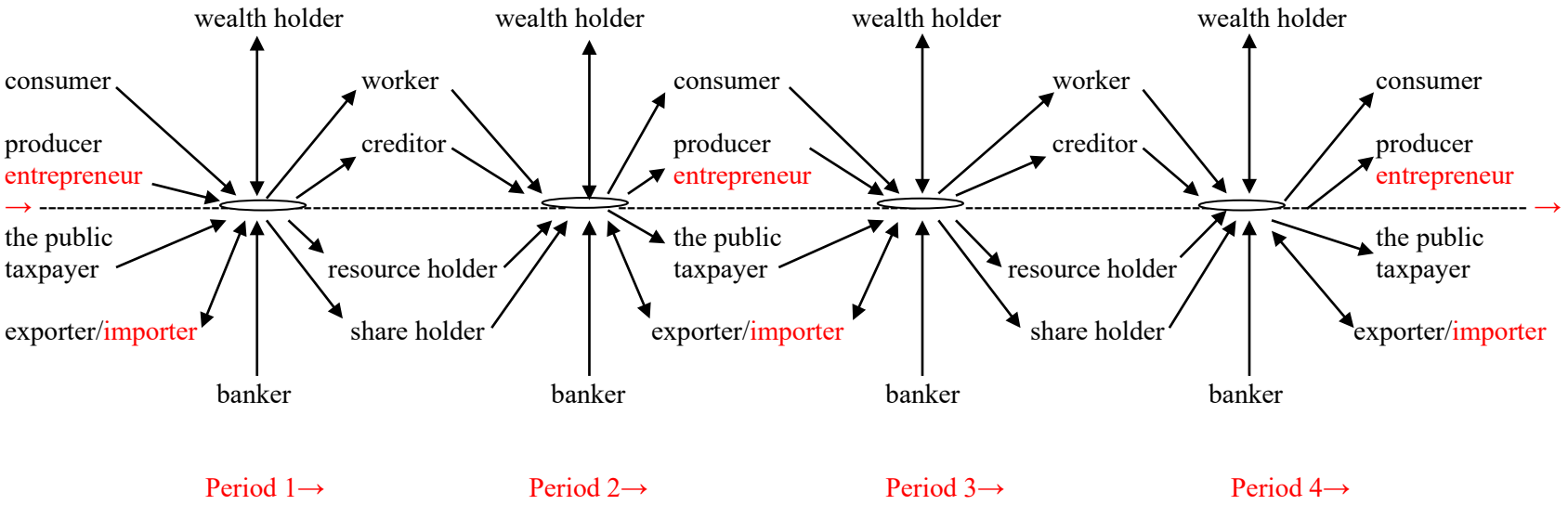
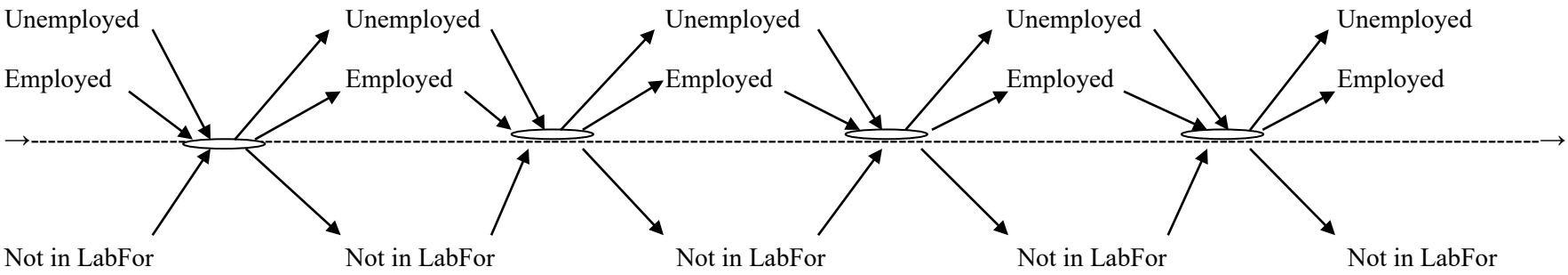


EXHIBIT 3.
SIMPLIFIED MACROECONOMIC LINEAR-FLOW DIAGRAM:
A PERSONALIZED STEADY-STATE ECONOMY



Wealth holder includes venture capitalist.

EXHIBIT 4.
SIMPLIED MACROECONOMIC LINEAR-FLOW DIAGRAM:
A STEADY-STATE LABOR MARKET



Period 1→ Period 2→ Period 3→ Period 4→

EXHIBIT 5.
SIMPLIFIED MACROECONOMIC LINEAR-FLOW DIAGRAM:
EXPANDING/CONTRACTING ECONOMY