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## **Economics Actually for Ecological Economics**

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### **Abstract**

The paper begins by briefly reviewing the widely recognized need for an alternative to current mainstream economics. It then provides a new introduction to the verifiable two-flow dynamics of economic process, which was originally discovered by Bernard Lonergan (1904–1984). The heuristics can be seen to play out in all sectors, from individual roadside businesses, through banking and finance, to vast aggregates of businesses contributing to global production chains. Two-flow heuristics provides a basis for identifying some errors in current mainstream modeling. The paper works out some initial aspects of the two-flow perspective, as it will be applicable in ecological economics. The final section points to the need and possibility of methodological progress.

**Key words:** ecological economics, sustainability, consumer production, capital production, supply chains, production chains, two-flow economics, basic production, surplus production, monetary functions, basic supply function, basic demand function, surplus supply function, surplus demand function,

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redistributive function, two types of firm, fundamental flaws, GDP, human wellbeing, global collaboration.

# 1. Introduction: The need to understand actual economic activity

## 1.1 *Initial contexts*

For more than a century, the application of mainstream economics has been responsible for countless problems in the world's economies. Among them are escalating debt crises, unrestrained consumerism, systematic decimation of ecologies and cultures, as well as economic and political damage caused by corporate and oligarchic enclaves.<sup>3</sup> These problems have prompted numerous challenges toward mainstream economics. Some go under the rubric of heterodox economics. But there are also well-known economists closely aligned with mainstream economics who nevertheless dispute aspects of current orthodoxy. For instance, in recent years, Jeffrey Sachs and his collaborators have been outspoken about problems with mainstream economics. Among other things, they have outlined six transformations for achieving the Sustainable Development Goals provided by the UN<sup>4</sup>. There is also the work of Stiglitz, Fitoussi and Durand, in support of the OECD's<sup>5</sup> efforts to “develop the means to describe progress and, in this way, to contribute to better policies” (“For Good Measure” 2018). The Institute for New Economics states that “[m]ainstream economics has demonstrated blind spots that have impaired its effectiveness and credibility—and failed society at large” (“Institute for New Economic Thinking. Our Purpose.” 2025). One of the purposes of the institute is to “repair our broken economy and create a more equal, prosperous, and just society” (“Institute for New Economic Thinking. Our Purpose.” 2025).

Prior to, and in many respects independent of, these and other similar efforts in both heterodox and mainstream economics, scholars in ecological economics, over the past sixty years and more have been developing models that, in principle, would be ecologically sustainable and would promote human wellbeing (Costanza 2023; Hoekstra 2019). Ecological economics is thought of as a “transdisciplinary” field that considers ecosystems, society and the economy. Topics of concern include, but are not limited to, ethics, poverty, inequity, social justice, law, business practice, social and ecological sustainability, human, non-human, philosophy, Indigenous peoples, and land management. Resulting economic models include circular, doughnut, steady-state, post-growth, no-growth, de-growth, beyond-growth, and post-consumption. In some instances, results have led to new metrics, policies, and

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<sup>3</sup> See (Benton and Quinn 2024b).

<sup>4</sup> United Nations.

<sup>5</sup> The Organisation for Economic Co-operation and Development.

actions.<sup>6</sup> And over the last ten years or so, there is also integral ecology, an area of scholarship that acknowledges the need to break from current “dubious economic reasoning” (Francis 2015, par. 127).<sup>7</sup>

Notwithstanding these efforts, little to no traction has been gained in having new models adopted in global economic practice. This includes governments, business, industry, and finance (Hoekstra 2019; Losa 2025; Fischer-Kowalski 2020). The ethos that emerged from neoclassical economics still dominates, along with “training within policymaking institutions, siloed and short-termist approaches to policymaking, [as well as] ... vested interests within policymaking” (Mason and Büchs 2023). And so, for instance (this is not the only problem), *GDPs* remain a primary source of data used by economists to analyze economic performance. Questions of ecological and social viability aside, sustained growth in *GDP* remains a standard measure of successful economic performance. Results about *GDPs* are thus shared with the public annually and quarterly, even though it is well known that patterns of increasing *GDPs* can be simultaneous with endemic poverty, worsening social crises, and ongoing destruction of ecologies.<sup>8</sup>

## 1.2 ***Two reasons for the lack of progress in implementing alternative economic models: assumptions and method***

Despite a widely acknowledged need for change, why has there been so little progress toward implementing alternative economic models? Whatever other reasons there might be,<sup>9</sup> two distinct and mutually dependent aspects of the problem are evident in the literature:

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<sup>6</sup> “Local and national governments are implementing measures of prosperity to inform budgetary decisions beyond their effect on economic growth. In 2019, New Zealand adopted such a Wellbeing Budget [sic]. Similarly, Scotland assesses national progress through a framework measuring outcomes in improving child wellbeing, sense of community, culture and education, environmental quality, quality of working conditions, health, human rights, and reducing poverty. The framework includes economic growth as one of the many deliverables of a national economy, assessing it, however, against carbon footprint and natural capital depletion” (Coscieme et al. 2019, Sec. 8.2). There are ninety-six case studies reported by the Wellbeing Economy Alliance (“Case Studies: Wellbeing Economy Alliance” 2022). Many of these are by way of formalizing agreements on the need of alternative approaches that promote not only care for ecologies and human wellbeing, but also include various practical initiatives. Some projects that cohere with the goals of integral ecology are reported in (Beltran 2020).

<sup>7</sup> Some compatibilities between the goals of integral economics and ecological economics are noted in (Fischer-Kowalski 2020). See also (Sachs et al. 2019).

<sup>8</sup> Data on this problem is available in the World Bank Data Base (“World Bank Open Data” 2025). See, for instance, results on Zambia.

<sup>9</sup> The possibility of effective identification of ranges of influence goes beyond the scope of this paper. See, however, Sec. 5.

- (i) the prevalence of assumptions that undermine the possibility of reaching an understanding of actual economic process, and
- (ii) current methods.

Let us briefly consider each of these, in turn.

- (iii) Whether explicit or implicit, some of the operative assumptions can be expressed as follows:

There is no fundamental problem with structures identified in current mainstream economic models. For the fact is, there are producers and homes; and there are more or less circular flows of money and goods between them, as detailed in the circular flow model. Specific structures such as government, stock markets and other sectors, as well as international trade, can be added to the circular flow model. This reveals, in particular, the appropriateness of accounting systems for goods, services, stocks and flows in terms of input and output (such as developed by Leontief). Since all of this occurs in the biosphere, it follows that if we can be successful in institutionalizing goals and policies of sustainable development, ecological sustainability, doughnut economics, circular economics, or whatever one's preferred model might be, and include appropriate metrics for human wellbeing, then the economics part of the problem can be sorted out as needed. *In other words, the main challenge is not a matter of reaching a new understanding of economic process. Rather, it is a matter of obtaining additional statistical indicators and metrics for ecological sustainability and human wellbeing and then institutionalizing appropriate policies and laws that regard ecology, business practice, and society.*

The views expressed in this summary are ubiquitous in the literature. A few examples follow. There are the works cited above, by Sachs, and Stiglitz et al. In ecological economics, see (Jackson and Jackson 2025), (Saunders 2014), as well as (Scherzinger et al. 2024) and (Fontana et al. 2013). Some of the reaching influence of neoclassical economics in ecological economics is discussed in (Pirgmaier 2017). With no reference to the underlying economic question, a focus on policies is explicit in (Coscieme et al. 2019):

Overall, to implement a wellbeing economy, we need a major transformation to

- (1) Live within planetary boundaries and achieve environmental sustainability;
- (2) Achieve and maintain an equitable distribution of wealth and opportunity, both within and between generations;
- (3) Efficiently allocate resources to provide high levels of human wellbeing (Coscieme et al. 2019, Sec. 8.2).

The concluding paragraph of the paper then introduces a general policy about general policies: “[p]olicy making cannot be solely informed by an elite of economists perpetuating a flawed vision of the world” (Coscieme et al. 2019, Sec. 9).

See also articles provided by MERGE, Horizon Europe; one of whose aims is to find “pathways towards inclusive and sustainable wellbeing” (“MERGE” 2025). The focus of one of its reports is on indicators, models, policies, and conceptual frameworks. Conclusions reached are as follows:

- The time is ripe for a new integrated system of societal wellbeing metrics, models, and policies to guide us to a sustainable and inclusive wellbeing future.
- We have highlighted the growing convergence among a broad range of groups on what these metrics and models need to contain, and the policies needed to achieve SIW [Sustainable and Inclusive Wellbeing].
- SIW metrics and models should address the nine domains of Financial Situation, Physical Health, Living Environment, Education, Social and Personal Wellbeing, Institutions (Social Capital), Human Capital, Natural Capital, and Physical Capital.
- So far, the Sustainable Development Index and the Ecological Macroeconomic models come closest to fulfilling these requirements, but there is still large room for improvement and the need to build broader consensus (Costanza et al. 2024, 39).

With regard to economic process itself, however, the authors of the report express no awareness of flaws in mainstream modelling and the fundamental scientific challenge this presents.

In integral ecology, source documents draw attention to three main components of the problem, ecology, society and economics. But discussion has centered only on the ecological and social dimensions: “We are faced not with two separate crises, one environmental and the other social, but rather with one complex crisis which is both social and environmental” (Francis 2015, par. 139). Or again, “a true ecological approach always becomes a social approach; it must integrate questions of justice in debates on the environment, so as to hear *both the cry of the earth and the cry of the poor*” [sic] (Francis 2015, par. 49).<sup>10</sup>

For another example, there is the Wellbeing Economy Alliance (“Wellbeing Economy Alliance” 2021). The Alliance has

brought together over 500 organisations and thousands of individuals who agree that our economic system is not working fairly for everyone and that we need to put people and planet in front of profit. Members come from different sectors, geographies and thematic areas within the Wellbeing Economy agenda. We value togetherness over agreement and believe that if we are going to create global system change, we need to be collaborative and action-oriented (“Members: Wellbeing Economy Alliance” 2022).

The group embraces a range of worthwhile doctrines, a central notion of which is that of a Wellbeing Economy [sic]:

[It is] an economy designed to serve people and the planet, not the other way around. Rather than treating economic growth as an end in and of itself and pursuing it at all costs, a Wellbeing Economy puts our human and planetary needs at the centre of its activities, ensuring that these needs are all equally met, by default (“What Is a Wellbeing Economy: Wellbeing Economy Alliance” 2022).

Or again:

A Wellbeing Economy [sic] delivers social justice on a healthy planet. It prioritises meeting our needs before our wants. And this includes human and planetary health: access to nature, true participation, connection within communities, fairness through out institutions and

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<sup>10</sup> The same oversight is evidenced in *Fratelli Tutti* (Francis 2020). See (Duffy 2021).

dignity for all people (“Key Concepts: Wellbeing Economy Alliance” 2022).

There is, however, a prior question:

What is the economy?

Simply put, it’s the way that we produce and provide for one another. We often think of the economy as something given, fixed and unchangeable – but it’s not. The rules, social norms and stories that underpin our current system were designed by people, and that means they can also be changed by people (“Wellbeing Economy Alliance” 2021).

The question “What is an economy?” is right on.<sup>11</sup> But how, in fact, do we produce and provide for one another? The rest of the quotation reveals a tacit assumption of the Wellbeing Economy Alliance that there is nothing fundamental to understand; and, moreover, that rules, social norms and stories will be sufficient to meet current crises that are tied to economic process.

(i) Current methods

Whether we look at contemporary mainstream economics, ecological economics, or heterodox economics, we find similar flaws in method: the ongoing development of models is primarily based on merely imaginary and speculative hypotheses. For example, in a tradition that emerged from the work of Ludwig von Bertalanffy (1901–1971), modern systems theory heuristics, such as advocated by Costanza and his collaborators, are not verifiable in actual economic events. And while the Wellbeing Economy Alliance seeks to intervene in real world economic process, it attempts to do so not on the basis of understanding how economies work but rather on modeling that emerges from “pluralistic and heterodox curricula, dynamic macro modelling, [and a] systems perspective” (“What Is a Wellbeing Economy: Wellbeing Economy Alliance” 2022). There are also efforts to replace or go “beyond *GDP*.”<sup>12</sup> But so far, the approaches

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<sup>11</sup> The full answer will be an eightfold structuring of global collaboration. This is touched on in Sec. 5.

<sup>12</sup> See, for example, (Hoekstra 2019; Stiglitz, Fitoussi, and Durand 2018; Bleys 2012).



taken avoid the economic problem. Instead, they develop dashboards of indicators for growth, environmental sustainability, and other factors that would contribute to the success of individuals and countries.

These are just a few examples. Collaborative dialectic *is* needed. But that would go beyond the main focus of this paper.<sup>13</sup> In the meantime, even a cursory review of the literature reveals that currently available economic models (mainstream, alternative, heterodox, or otherwise) mainly are in “high level” and general terms that are remote to any actual ponds, lakes, streams, non-humans, humans, ecologies, homes, villages, communities, businesses, cities, and local and regional economies. Evidently, Syll’s observations about mainstream economics apply generally: the “model becomes the message” (Syll 2023, 63).

How might we make progress in getting past assumptions noted in (i) and in implementing methods that do not suffer from weaknesses noted in (ii)? If we directly attempt to develop still more alternative models, then the problem of method remains. If we attempt to discuss method in general terms, then results will be remote to particular economic situations.

There is another possibility. Here we come to an inflection point in moving toward the solution of the problem: preliminary observations of *actual* economic process<sup>14</sup> suggest the existence of intrinsic norms and criteria. The possibility of determining what they are is a main result of this paper. In the meantime, that there are such is partly evidenced when things go wrong. A central bank’s adjustment to interest rates can negatively impact economic activity. A government’s efforts to develop sound fiscal policies can inadvertently contribute to inflation, deflation and other monetary failures. Despite governmental efforts to establish acceptable trade agreements, international debt crises can and do worsen. Tariffs can induce damaging material and monetary instabilities in supply chains and financial markets. In the last century and more, there have been series of booms and slumps. Stock market activities can adversely affect production rates, prices and wages, and vice versa.<sup>15</sup>

The existence of norms and criteria is also suggested by how the nineteenth century Industrial Revolution emerged. Buildup in the production and provision of capital goods and services (for example, new factories and methods of

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<sup>13</sup> Effective dialectic is a distinct task that is preceded by functional research, functional interpretation and functional history. See Sec. 5.

<sup>14</sup> From this point forward, unless otherwise stated, words such as “economy,” “economic events” and “economic process” refer to the actual economy, actual economic events, actual economic process, irrespective of models.

<sup>15</sup> It is widely recognized that the “stock market is not the economy.” Descriptive statistics notwithstanding, the functional relationship between equity markets and the economy is obtained within the heuristics of two-flow economics. See par. 2.3.1 (e).

transportation in England) preceded long-term and large-scale buildup in the production and provision of consumer goods and services.<sup>16</sup>

But we need more than broad evidence for the *existence* of norms and criteria of economic process. What, precisely, are they? What is called for is a shift of attention that is unfamiliar to contemporary economics. If one’s model cannot account for *this* and *that* instance of production or provision, *this* and *that* transaction in *this* and *that* business, in *this* and *that* town, city and economy, then what is it about? To uncover norms and criteria, why not start by looking at particular businesses so that we might begin to see how they, in fact, participate in and contribute to the economy?<sup>17</sup>

### 1.3 *Outline of the paper*

Section 2 shows that starting with instances of economic activity can lead to a new understanding of economic process. It is an understanding that, by virtue of the approach, is verifiable at all levels and in all sectors, from individual roadside businesses, through banking and finance, to vast aggregates of businesses contributing to global production and provision chains. Initial observations lead to the familiar distinction between consumer and capital goods and services.<sup>18</sup> But this also reveals that there are two types of production that, relative to final usage, are not determined by materials and sectors, let alone ownership. Following up on these observations, we obtain a heuristics for two types of production in any economy.

This result—that, for the sake of brevity, and for reasons that will become clear, we call *two-flow economics*—was the original discovery of Bernard Lonergan (1904–1984).<sup>19</sup> The manuscripts that contain his work in economics (Lonergan 1998) are densely written. Lonergan wrote with a masterly control of meaning, was relentlessly concrete in his heuristics, and obtained results that

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<sup>16</sup> Currently, we may be in the beginnings of long-term build ups of capital production and provision made possible by new generations of large language models (LLM) and generative pre-trained transformer (GPT) computer technology. There are also signs of consequently possible long-term build ups in similarly based consumer production and provision.

<sup>17</sup> The possibility of initiating the shift in focus is an existential challenge. See (Benton and Quinn 2024a).

<sup>18</sup> *Capital goods* are “intended for use in production of other goods or services, rather than for final consumption” (Black, Hashimzade, and Myles 2009a). Consumer goods are “for use by final consumers” (Black, Hashimzade, and Myles 2009c). In terms of production, consumer goods enter into our day-to-day living, while capital goods are used to produce goods of all kinds.

<sup>19</sup> Lonergan devoted several decades to reflection on method in science and theology. The middle part of his career was bookended by a focus on economics. That work was done throughout much of the 1930’s and into the 1940’s and then, again, for more than ten years prior to his death in November of 1984.

are explanatory of any economy. So far, however, his discoveries remain largely unknown in economics (mainstream, heterodox, ecological, or otherwise).<sup>20</sup> Future applications of two-flow economics will be as sophisticated as any modern applied science. At the same time, we have found that key initial insights are generally accessible.

Section 2 of this paper, therefore, provides a new introduction to the two-flow structuring of economic process, in modern contexts.<sup>21</sup> While any economy includes production and provision of goods and services, to ease terminology, unless otherwise needed for clarification, we let “provision” be understood; it can be identified in particular cases. In other words, we follow tradition and look at “supply chains.” We then reformulate results in terms of “production chains.”<sup>22</sup>

Production chains yield two types of goods and the distinction between consumer and capital goods has long been taken for granted in mainstream economics. Adverting to such distinctions, Schumpeter wrote that “[i]t is good to classify goods in ‘orders,’ according to their distance from the final act of consumption. Consumption goods are of the first order, goods from combinations of which consumption goods originate are of the second order, and so on, in continually higher or more remote groups” (Schumpeter 2012, 16). Later, Kalecki suggested that we “subdivide the economy into two sectors providing investment goods and consumer goods, respectively. In each sector, we include the production of materials and fuel will be allocated between the sectors according to the uses that are made of them in production” (Kalecki 1990, 23). However, neither Schumpeter nor Kalecki worked out implications of “orders” and “sectors” to reach a verifiable two-flow dynamics of production. And ultimately, little significance has been attributed to the distinction between capital and consumer goods. But by focusing on production processes—from natural resources through to finished goods—it becomes clear that the distinction between consumer and capital goods and their production is fundamental to economic dynamics.

Key to this introduction to two-flow economics is the sequence of diagrams given by Figure 2.4, Figure 2.5 and Figure 2.6. In Section 2.1, we focus on consumer production. We develop an initial heuristics for all consumer production chains in any exchange economy. This yields Figure 2.4. Once again focusing on production, a distinct but completely similar heuristics is obtained for all capital production chains in any exchange economy. This yields Figure

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<sup>20</sup> See, however, (Oslington 2022; 2022; 2011; Burley and Csapo 1992; Burley 1989). See also (Quinn 2021).

<sup>21</sup> Other introductions to two-flow economics include: (Quinn 2018; 2021; Quinn and Benton 2023; Duffy 2018; McShane 2017; Anderson and McShane 1998). See also (Duffy 2021). Key insights are invited in (McShane 2007).

<sup>22</sup> For a comparison of *supply chains* and *production chains*, see note 27.

2.5. It is then a matter of appropriately linking these two heuristics. This yields Figure 2.6. Toward completing the shift to the new viewpoint, in Section 2.4, the descriptive terms “consumer” and “capital” are replaced by what ultimately are explanatory terms, namely, “basic” and “surplus,” respectively.

Some advantages of the approach are as follows: classes of payment come into view; the distinction between types of payment and classes of payment is brought into relief in modern contexts; it becomes evident that, in different ways, the two-flow heuristics pertains both to individual entrepreneurial units and to the entire aggregate that is an economy; the diagramming by which we introduce the two-flow heuristics complements what has been used elsewhere in the literature.<sup>23</sup>

Drawing on the results of Section 2, Section 3 identifies some obvious errors in current mainstream economics. It is only a sampling. But the discussion begins to reveal the explanatory power of the two-flow heuristics.

Section 4 describes some aspects of two-flow economic process and briefly anticipates how this will pertain to an implemented ecological economics.

For historical context, Section 5 points to the need of progress in methods, the adequate discussion of which exceeds the scope of this introduction.

Some final comments regard how to read the two-flow model. One might attempt to assess it based on the extent to which it coheres with current mainstream views.<sup>24</sup> Comparison between two-flow heuristics and contemporary mainstream models will eventually have a place. Such work, however, is a further task.<sup>25</sup> In the meantime, mainstream economics is already known to be fundamentally flawed and, by definition, is not verifiable in instances. On the other hand, the two-flow model is intended to replace mainstream economics and *is* verifiable in instances. In particular, it is concrete in its referents and so can be verified, or rejected, on the basis of actual economic activity. To determine the validity of the two-flow model, one needs to observe actual production and actual payments in an exchange economy. A fundamental question, then, is whether or not there really are two types of production, five monetary functions, and three classes of payment. After having worked through Section 2 of this

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<sup>23</sup> See note 21.

<sup>24</sup> For instance: “A test of whether Lonergan’s research has a contribution to make to contemporary economics would be the chances of acceptance in a highly ranked contemporary economics journal of a selective and generous interpretation of his model, suitably translated into contemporary mathematical style” (Oslington 2022, Sec. X). For a detailed analysis of Oslington’s paper, see (Quinn 2023d).

<sup>25</sup> A pedagogical dialectic between two-flow heuristics and modern mainstream economics is provided in (Anderson and McShane 1998). The textbook critiqued is still used globally and is now in a 12<sup>th</sup> edition (Mankiw 2025). In professional contexts, comparison becomes effective in functional dialectic. See Sec. 5.

paper, we expect that you will find it difficult to deny the validity of the two-flow model without contradicting the facts.

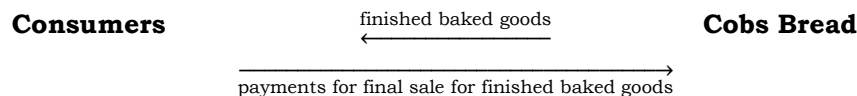
## 2. There are two types of production chain

The purpose of this section is to identify some key features of consumer and capital production. We begin by describing steps in consumer production with their corresponding payments, day by day, week by week, month by month, and interval by interval, using whichever time scales happen to be applicable.

### 2.1 Consumer production chains

#### 2.1.1 Final sale for a finished consumer good

In a neighborhood in Toronto, Canada, there is a bakery called Cobs Bread.<sup>26</sup> Despite the name, Cobs Bread makes and sells many types of baked goods. In other words, the franchise is a supplier of baked goods for consumers. A superficial sketch of the situation is given by Figure 2.1.



**Figure 2.1** Consumers buy finished baked goods from Cobs Bread.

#### 2.1.2 A consumer production chain

At Cobs Bread, food is baked fresh daily on the premises using traditional scratch baking methods and ingredients. On a regular basis, the bakery buys flour, sugar, seeds, nuts, dried fruit, olives, herbs, milk, chocolate, cheese, cooking oil, and countless other ingredients. And so, for each type of baked good made, Cobs Bread is at the final step in a production process. And until final sale, baked goods are still in production.

Consider, for instance, the production of raisin bread. For the moment, we focus on production itself and refrain from looking at payments involved. Because recipes are proprietary, without loss of essential features of the process,

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<sup>26</sup> From here on, unless otherwise indicated, the name Cobs Bread refers to this local franchise, not to the parent franchisor.

we suppose that ingredients of raisin bread made by Cobs Bread are those of a common recipe, with the list of ingredients given in Figure 2.2.

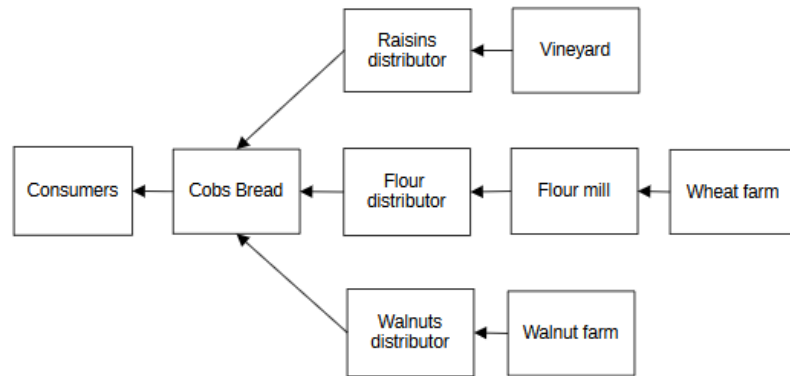
<b>Finished raisin bread for sale</b>	<b>Cobs Bread</b>	
	<b>Ingredi ents</b>	<b>Source</b>
raisin bread	raisins	vineyard
	wheat flour	wheat farm
	walnuts	walnut farm
	water	local water supply
	milk	dairy farm
	butter	dairy farm
	salt	salt mine
	sugar	sugar cane farm
	eggs	chicken egg farm
	yeast	yeast production company
	cinnamon	cinnamon tree farm

**Figure 2.2** Ingredients for raisin bread and their sources. For the example, these are supposed ingredients, obtained from a common recipe for raisin bread.

In the situation described, none of the ingredients are final goods. But each of them is produced and has its own source in natural resources. From each of those sources to the bakery there are what, in this paper, we call *production series*. The terminology refers to the sum effect of any sequence of contributions toward the production and sale of a finished good. This name is appropriate partly because the meaning of the word “series” includes “sum”; and even in the case of a single entrepreneurial unit, a contribution to production is a sum effect of all that goes into that step in production.

Figure 2.3 is a flow chart that represents production series for three of the eleven ingredients of raisin bread (namely, wheat flour, raisins, and walnuts)

that ultimately converge on Cobs Bread. It is, therefore, not complete. But the flow chart is indicative of how the various production series, each with its own steps in production, converge on the bakery. The arrows represent steps in production. With combinations of rates so that, normally, ingredients arrive at the bakery when needed, the various production series determine a *production chain*<sup>27</sup> for raisin bread. Observe that its structure is not obtained from a speculative model but from how the production of raisin bread happens to occur.<sup>28</sup>



**Figure 2.3** Part of the production chain for getting wheat-based raisin bread made by Cobs Bread to consumers.

### 2.1.3 *Payments involved in a consumer production series*

Let us look at one of the production series indicated in Figure 2.3. We consider the production of wheat flour that goes on to become an ingredient in the final good, namely, raisin bread that Cobs Bread makes and sells to consumers. Now we also track payments involved.

<sup>27</sup> Traditionally such a combination is called a “supply chain,” a typical description of which is a “series of linked stages in a supply network along which a particular set of goods or services flows; it usually consists of: suppliers, vendors of the suppliers, producers, distribution partners, and customers” (Law 2016). However, as will become clear, the descriptive name “supply chain” is not sufficient for present purposes. Also, supply chains are sometimes classified according to conceptual models (for example, continuous flow, agile, fast, efficient, custom). The name “production chain,” by contrast, is always concrete. And it draws attention to the fact that getting from natural resources to finished goods is a production process.

<sup>28</sup> Abstractly, a production chain can be represented by a directed graph or network. In relation to both domestic and international trade, there is an extensive literature on such structures.



Starting at the final step, where bread is removed from production, consumers, C say, pay Cobs Bread, CB, for raisin bread. We can allow for the possibility that, as is often the case, a local delivery service is involved. To effect both the sale and delivery of finished raisin bread to a consumer, the total amount  $d_0(C)$ (raisin bread) that the consumer pays is a sum.<sup>29</sup> One part,  $d_t(C: CB)$  say, is the final payment from the consumer C to Cobs Bread CB. Another part,  $d_t(C: LD)$  say, goes from the consumer C to the local delivery service, LD say. (As will be explained below, the subscript 't' is for “transitional.”) The total amount  $d_0(C)$ (raisin bread), say, paid by the consumer to acquire the raisin bread is, then, a sum of the form

$$d_0(C)(\text{raisin bread}) = d_t(C: CB) + d_t(C: LD). \quad (2.1)$$

The payment  $d_t(C: CB)$  is the final payment for bread while  $d_t(C: LD)$  is paid to a local delivery service. Observe further that each of the summands are fractions of the total payment  $d_0(C)$ (raisin bread). We will discuss this issue below. For now, let us continue to gather data on the production series; and take it one step in production at a time.

As you might expect, for Cobs Bread, there are many payments to consider. There are wages of salesclerks, bakers, managers, and other staff; there is an annual income for the franchisee that is paid out monthly; and (in accordance with particulars of the franchise contract) some money goes to the owners of the Cobs Bread franchise. However, our present interest is neither in who receives the money nor how often money changes hands. Our goal is to understand what these payments are doing in the production process. Whether it is an hourly wage of a salesclerk, an annual income of the franchisee that is averaged to provide monthly payments, or something in between, personal income allows consumers to buy consumer goods.<sup>30</sup> We therefore denote outlay of the bakery that is directed to such income by  $i_1(CB)$ . (The subscript '1' is to indicate that Cobs Bread produces consumer goods.)

Some of the bakery's income is directed to pay for maintenance of the premises, ovens, and other capital goods. Capital goods are replaced when

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<sup>29</sup> The symbolism here is convenient for this introduction. Note also that, in the interim, we ignore taxes. See par. 2.3.1 (f).

<sup>30</sup> In fact, not all personal income is necessarily used to pay for consumer goods and services. For example, individuals might save part of their income for some as yet unknown future usage. Without changing the range of possible types of payment, a more general account would allow for fractioning.

repairs are no longer feasible.<sup>31</sup> The bakery makes payments to Hydro One (Ontario's electricity provider). Electricity is used (consumed) when running ovens and other machines in the bakery. It is thus a capital good that is both used and replaced more or less continuously. Whatever averaging methods for electricity bills might be in place, part of those payments are determined by production rates in the bakery. When business is slow, electricity consumption goes down, and vice versa during, for example, a holiday season. There is, however, usage of electricity which is relatively independent of fluctuations in short-term production rates. We are referring to the consumption and replacement of electricity needed for heating, air conditioning and lighting. Without that usage of electricity, the business would be hard pressed to get customers into the store and, in any event, in the Canadian climate, the premises would eventually fall into disrepair. While there are significant differences in the examples mentioned in this paragraph (which would show up in accounting ledgers), in terms of production they all have something in common. In one way or another, they are all payments for maintenance and replacement (and in some cases, more<sup>32</sup>) of capital goods used or consumed by the bakery in its work of producing baked goods, day by day, week by week, and month by month. Let us denote all such payments by  $m_1(\text{CB})$ .

The franchisee for Cobs Bread does not own the premises of the bakery. The bakery operates out of a small unit in an outdoor Toronto shopping mall. Month by month, then, part of the bakery's income goes to rent or lease payments for usage of the premises. But someone, or perhaps some real estate investment group, does own the property. And so those payments also provide income. This alerts us to the fact that, since our inquiry is about the process rather than proprietary boundaries, the meaning of  $i_1(\text{CB})$  is not restricted to income paid to employees of the bakery.

A baker's oven is a capital good that costs tens of thousands of dollars. Suppose that (perhaps in collaboration with the Cobs Bread franchisor), the bakery purchased an oven with a loan. Typically, each installment on a loan is partly principal and partly interest. It is also evident that the parts of the installments that go toward paying off principal *are not* intrinsic to production, interval by interval. Why not? Over the term of the loan, the repayment of principal merely repays money borrowed. However, the interest payments on the loan go to financial firms and pay for services rendered, interval by interval.

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<sup>31</sup> For example, pastry brushes can last a few months before needing to be replaced. Depending on usage and materials of construction, professional bread slicers need to be replaced every five to ten years. Bakers' ovens need to be replaced every ten to fifteen years.

<sup>32</sup> The "more" can include, for example, payment for a new type of oven not previously available or, more generally, innovation. This topic goes beyond the immediate focus of this introductory paper. But see Sec. 4.1.2.

The following turns out to be highly significant: the repayment of principal reveals that there is a non-empty remainder class of payments in the exchange economy. We are referring to all payments that are not intrinsic to production or provision, interval by interval. Let us call such payments *redistributive*. For any payments either from, or to, Cobs Bread that are redistributive, let us write  $r_1(\text{CB})$  (where  $r$  is for “redistributive”). By contrast, payments such as  $i_1(\text{CB})$  and  $m_1(\text{CB})$  that, interval by interval, *are* intrinsic to production or provision will be called *operative*. With that terminology, redistributive payments are *non-operative*. In general, if some part of some series of payments is intrinsic to some instance of production or provision, then it is *operative*. If there is no such correspondence, then it is non-operative and redistributive.

As indicated by Figure 2.3, interval by interval, the outlay of Cobs Bread, CB, includes payments to a wholesale wheat distributor,  $W$  say. Where the bakery is a supplier of baked goods to consumers, the wholesale wheat distributor  $W$  is a supplier of flour to the bakery. However, similar to payments made by consumers to bring flour one step closer to final production and final sale of raisin bread, payments made by Cobs Bread typically are also a sum. For instance, in addition to paying for wheat, there are payments for transportation. In some cases, there might also be administration fees, legal fees, import tariffs, and so on. Altogether, then, to pay for the transition of flour from the mill to the bakery, *transitional payments*  $d_t(\text{CB})(\text{wheat})$  are of the form

$$\begin{aligned} d_t(\text{CB})(\text{wheat}) &= d_t(\text{CB}: W, \text{transportation}, \dots) & (2.2) \\ &= d_t(\text{CB}: W) + d_t(\text{CB}: \text{transportation}) + \dots, \end{aligned}$$

where  $d_t(\text{CB}: W)$  pays for the flour provided by  $W$  and  $d_t(\text{CB}: \text{transportation}) + \dots$  represents payments for transportation and whatever else is needed to get flour from the wholesale distributor  $W$  to the bakery. Notice that, again, one or more of the transitional payments is income to businesses for services provided in the production step. Typically, these payments center (statistically) on fractions of final payments  $d_0(\text{C})(\text{raisin bread})$ . More precisely, because these payments are two steps away from final sale, they center on fractions of fractions of final payments made by consumers to acquire the finished goods.

Similar observations apply to the flour mill, and the wheat farm, entrepreneurial units contributing to the other eight production series that are implicit in Figure 2.2, and to any entrepreneurial units contributing to any consumer production chain.

At this point in the (concretive) narrative, then, there are various payments to consider. For each entrepreneurial unit contributing to any consumer production series, interval by interval, operative payments pertain to and support the production and final sale of a consumer good. In each entrepreneurial unit contributing to each step in production, some operative payments are for *maintenance and replacement* of capital goods used in production; some pay *income*; while some are fractions of consumer demand paid to suppliers at a prior step in production. Again, non-operative payments are redistributive. What we get, then, is that, in every entrepreneurial unit contributing to any step of consumer production, there can be four *types* of payment: income  $i_1$ , fractions of consumer demand  $d_1$  that are paid to entrepreneurial units that are immediately prior in a production series, maintenance and replacement  $m_1$ , and redistributive  $r_1$ .

A consumer production chain, then, consists of one or more entrepreneurial units, each of which makes its proper contribution to one or more production series in the consumer production chain. This means that while there can be four types of payment, there can be three *classes of payment*, namely, initial, transitional, and final.

Payments are *initial* when, interval by interval, they are made to factors of production within an entrepreneurial unit in a production chain. Payments are *transitional* when, in a production chain, interval by interval, they provide income to an entrepreneurial unit immediately prior in a production series. Payments are *final* when, interval by interval, they are for finished goods. In other words “[t]hey are the last payments that are operative with respect to that product” (Lonergan 1998, 249) and thus remove them from production. There are, for example, final payments for bread, homes, and other consumer goods.

As we have already observed, entrepreneurial units contributing to consumer production buy and use capital goods. The purchase of a finished capital good also is a final payment. Final payments for capital goods will be discussed below, in Section 2.2.

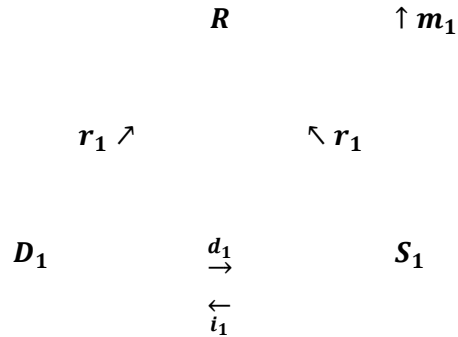
Every consumer production series begins with natural resources. At that point, there are no transitional payments. But transitional payments are received from subsequent steps in production.

In any consumer production chain, then, the classes of payment correspond to the layout of entrepreneurial units. Transitional payments provide whatever income is needed by each to make its proper contribution to production.

Classes of payment are descriptive, for they are determined by the linkages of a particular production chain. On the other hand, types of payment are explanatory; they are mutually defined and can, potentially, be found in all entrepreneurial units in all consumer production chains.

In practice, classes of payment can be of significance to businesses and their accountants. With that said, recall that classes of payment are not defined in terms of proprietary boundaries. One person, or a single investment group, might own more than one entrepreneurial unit in a production series, or even own an entire production chain. Or again, a consumer production chain that starts with natural resources and eventually goes into the making of raisin bread, for example, might involve collaboration internationally and also cross numerous proprietary boundaries. In that case, there are many transitional payments. In another case, however, there might be merely one group of persons using only ingredients grown on one farm. In that case, there are no transitional payments. But in all cases, there is only one production chain. And in each entrepreneurial unit contributing to a production chain we can, potentially, find all types of payment, namely, income, maintenance and replacement, some fraction of consumer demand, and redistributive. This brings us to Figure 2.4, a preliminary heuristics for all types of payment involved in all steps and aggregates of steps in consumer production.

Money for maintenance  
and replacement of  
capital goods used in  
consumer production



**Figure 2.4** General heuristics for monetary payments for consumer production in an exchange economy. The symbols  $d_1$ ,  $i_1$ ,  $m_1$  and  $r_1$  represent payments that mediate consumer demand for consumer goods, income paid by suppliers contributing to consumer production, maintenance and replacement (and more) of capital goods used in consumer production, and payments that are redistributive. The symbols  $D_1$ ,  $S_1$  and  $R$  represent (the monetary functions called) consumer demand, consumer supply, and redistributive. Boldface draws attention to the fact that elements have dimensions determined by circumstances in the aggregate.

It is essential to keep in mind that Figure 2.4 *is not mathematical*. At the same time, it does anticipate the need and possibility of mathematics, in applications. For part of the meaning of the general heuristics is that particulars such as quantities, frequencies and trends are determined in instances. The heuristics applies variously both to individual entrepreneurial units as well as to aggregates of entrepreneurial units that contribute to consumer production chains, step by step, with sets of time intervals as appropriate.

What are the three symbols  $D_1$ ,  $S_1$ , and  $R$ ? For  $D_1$ : Think of money poised (and eventually directed) to pay for a final consumer good. That money mediates consumer demand, as will any fraction of that money that eventually pays for some prior step in a consumer production chain. For  $S_1$ : As already described, money can be poised (and eventually directed) to meet any one of several needs, among which there are income, and maintenance and replacement (and more). For  $R$ : This stands for redistributive. Money can be poised (and eventually

directed) not to serve any instance of production but to be held in reserve or to be directed to some other non-operative purpose. Altogether, then, there are three mutually related *monetary functions*: there is a *consumer demand function*  $D_1$ , a *consumer supply function*  $S_1$ , and a *redistributive function*  $R$ . In this context, observe that the meaning of monetary function is not in the mathematical sense of function. It is in a heuristic sense that allows for whatever the specifics might be in particular cases, mathematical, multi-valued, or otherwise.<sup>33</sup>

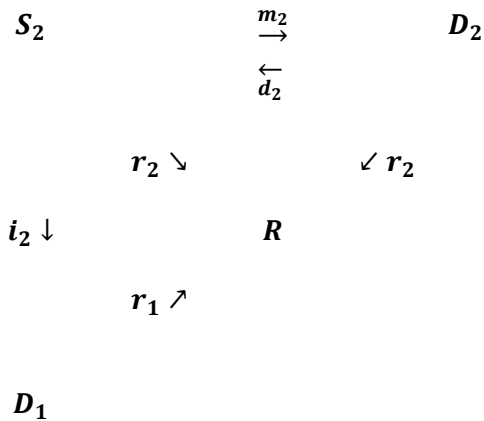
## 2.2 **Capital production chains**

As is clear from the results in Section 2.1, and as Figure 2.4 suggests, the heuristics are not yet complete. For example, part of the operative outlay from Cobs Bread is  $m_1(\text{CB})$ , for maintenance and replacement, neither of which are consumer goods. And when a finished oven is purchased for usage in a bakery, say, it is removed from a capital production chain that, just like consumer production chains, reaches back to natural resources. Furthermore, businesses that contribute to any step in the production of ovens each have their own tools, trucks, buildings, and so forth. Relative to the production of ovens, these are produced at still further “levels” of production.

In other words, in capital production, there are vast ranges of “levels” of production. But in any entrepreneurial unit, at any level contributing to any step in the production of any capital goods, there can be payments  $i_2$  that are income paid by suppliers of capital goods, fractions of capital demand payments  $d_2$  to suppliers to a prior step in production;  $m_2$  for maintenance and replacement of capital goods; and redistributive payments  $r_2$ . (The subscript ‘2’ is for capital production and provision.) Toward completing the heuristics, then, we need to include two additional monetary functions, namely, capital demand  $D_2$  and capital supply  $S_2$ . All types of payment involved in capital production can then be represented by a figure that is completely similar to Figure 2.4.

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<sup>33</sup> More refined analysis needs to also include production intervals and rates. See (Lonergan 1998, 21:141–42; McShane 2017, 143–44), (McShane 2017, 143–4) and (Quinn 2023a, 105–40).



**Figure 2.5** General heuristics for monetary payments for capital production in an exchange economy. The symbols  $d_2$ ,  $i_2$ ,  $m_2$  represent payments that mediate demand for capital goods, income paid by suppliers contributing to capital production, maintenance and replacement (and more) of capital goods used in consumer production, and payments that are redistributive, respectively. The symbols  $D_2$ ,  $S_2$  and  $R$  represent (the monetary functions<sup>34</sup> called) capital demand, capital supply, and redistributive. Boldface draws attention to the fact that elements have dimensions determined by circumstances in the aggregate.

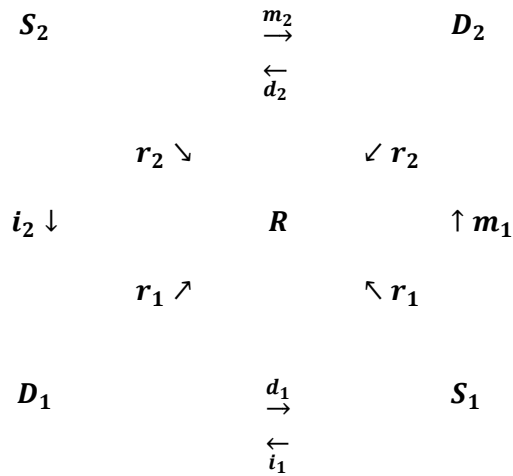
**2.3            A complete heuristics for types of payment in capital and consumer production**

To obtain a heuristics for all types of payment in both capital and consumer production, we can join Figure 2.4 and Figure 2.5. This yields Figure 2.6. Joining the two figures is valid not on the basis of diagrams but because, as examples help reveal, in any exchange economy, there are precisely five mutually related monetary functions, namely, the consumer and capital supply and demand functions  $S_1$ ,  $D_1$ ,  $S_2$ ,  $D_2$ , and the redistributive function  $R$ .

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<sup>34</sup> See the concluding par. of Sec. 2.1.3.





**Figure 2.6** General heuristics for monetary payments operative in consumer and capital production in an exchange economy. The symbols  $d_j$ ,  $i_j$ ,  $m_j$  and  $r_j$ ,  $j = 1, 2$ , are payments that mediate consumer and capital demand, income paid by suppliers, maintenance and replacement (and more), and payments that are redistributive, respectively. The symbols  $D_j$ ,  $S_j$ ,  $i = 1, 2$  and  $R$  represent (the monetary functions called) consumer and capital supply and demand, respectively, and redistributive. Particulars such as quantities, frequencies and trends are determined in instances. Boldface in the figure draws attention to the fact that elements have dimensions determined by circumstances in the aggregate.<sup>35</sup>

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<sup>35</sup> This is a simplified rendering of Lonergan’s diagram of transfers between monetary functions (Lonergan 1998, 21:258).

### 2.3.1 Regarding Figure 2.6

- (a) Payments  $i_2$  and  $m_1$  are called *crossover payments*. This is because payments  $m_1$  are shifted from the consumer supply function  $S_1$  to the capital demand function  $D_2$ . Payments  $i_2$  are shifted from the capital supply function  $S_2$  to the consumer demand function  $D_1$ . We will say more about crossover payments in sections 3 and 4.
- (b) As examples discussed in Section 2.5 indicate, all types of payment and both types of production can occur in a single business.
- (c) Monetary function of a payment is not defined in terms of money changing hands or accounts but rather in terms of production.
- (d) Most of the time money is quiescent. When payment occurs, it can happen instantaneously. Money is *totally quiescent* if it is not yet intended for any particular purpose. (For example, money can be set aside for some unknown future need. As explained above, this would be redistributive.) Money is *dynamically quiescent* if it is poised to pay for something. Aggregates of actual payments (money directed to some purpose in the economy) over time intervals determine time series and other statistical dynamics of the monetary circuits.
- (e) The redistributive function plays a major role in modern economies. However, because it has not been identified in current modeling, a few observations might be helpful. In the present context, the meaning of “redistributive” is functional and relative to production. Its meaning is not to be confused with descriptive uses of the word “redistribution” such as in the distribution and redistribution of wealth (for example, as in Piketty’s work (Piketty 2014), or in the GINI index<sup>36</sup>). These and other descriptive usages of the words “distribution” and “redistribution” ignore the two-flow structuring of real economies which includes five monetary functions and four functionally distinct types of payment. For example, transactions in equity markets change ownership. They are second-hand trade, therefore

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<sup>36</sup> “The Gini index measures the extent to which the distribution of income (or, in some cases, consumption expenditure) among individuals or households within an economy deviates from a perfectly equal distribution. A Lorenz curve plots the cumulative percentages of total income received against the cumulative number of recipients, starting with the poorest individual or household. The Gini index measures the area between the Lorenz curve and a hypothetical line of absolute equality, expressed as a percentage of the maximum area under the line. Thus a Gini index of 0 represents perfect equality, while an index of 100 implies perfect inequality” (“Gini Index” 2025).

not intrinsic to production, and hence are redistributive. Payments for land and natural resources that were never produced by anyone are redistributive. Historically, techniques for the remainder class of payments have been evolving.

While not intrinsic to production, it turns out that the redistributive function *is* intrinsic to international trade. Detailed discussion of the “functional journey of money” in international trade is treated elsewhere.<sup>37</sup> Nevertheless, results along these lines can be anticipated. Observe that, interval by interval, production of goods (finished or otherwise) for exporting is above and beyond patterns of domestic production and consumption. Some of the corresponding payments, therefore, are not intrinsic to domestic production and consumption. Hence, in ways that are yet to be determined, payments received factor through the remainder class. Similarly, but inversely, for the importing of finished goods (finished or otherwise), production occurs in another economy and so, again, some of the corresponding payments (in the form of a debt of some kind) are not intrinsic to production in the domestic economy and therefore also factor through the remainder class. The type of production also needs to be determined. Importing tractors, for example, supplements surplus production in the domestic economy while importing wheat, say, supplements basic production. By the same token, exporting tractors draws on surplus production capacities of an economy, while exporting wheat draws on basic production capacities of a domestic economy.

- (f) In Section 2.1, the question of taxes came up. (See note 29.) Paying taxes is redistributive. A further question is how tax revenue is spent by the government. Some payments contribute to consumer production chains. (These might include, for example, payments toward the development of parkland, community recreation centers, medical treatment, food and shelter, public education and subsidies for public transportation). Some payments go into capital production chains. (These might include, for example, payments for the maintenance and replacement of vehicles used for parkland services, the construction, maintenance and replacement of community recreation centers, hospitals, kitchens and shelters, and public schools, and for the maintenance and replacement of public transportation infrastructure). But a government might also purchase or sell old buildings, buy and sell used vehicles, obtain and pay off mortgages, make and repay principal on loans both domestic and foreign, and so on. In other words, government spending can also be redistributive. In broad

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<sup>37</sup> See (Lonergan 1998 chs. 13, 19; McShane 2017 ch. 4; T. Quinn and Benton 2023 part I, sec. 3.3.8; part II, ch. 9; Anderson 2001).

terms, then, the spending of government money  $G$  partitions three ways:  $G = G_1 + G_2 + G_r$ , where  $G_1$  contributes to consumer production,  $G_2$  contributes to capital production, and  $G_r$  contributes to or draws from the redistributive function.

## 2.4 ***Completing the transition to the new heuristics***

There are consumer goods and capital goods.<sup>38</sup> Consumers buy and use consumer goods, but consumers also buy and use capital goods. In the second case, the consumers referred to are in some way involved in production (or redistribution). Hence, in terms of production, there are two types of consuming. There are also producer goods. A *producer good* is “intended for use as a capital good or intermediate product by producers, rather than for direct use by consumers. Some goods are both consumer and producer goods: cars, for example, are bought by individuals as well as firms, and fuel is used both privately and commercially” (Black, Hashimzade, and Myles 2009b). But notice that the meaning of “use” in the sense of “use as a capital good” is different from the meaning of “use” in the sense of “intermediate product.” To say, “use as a capital good” is both consistent with dictionary definitions of the verb “to use” and the nature of production.<sup>39</sup> However, to say “use” in reference to raw materials or intermediate goods, speaks of goods that are produced in production series and that become part of finished goods. For example, in the first sense of use, an oven (capital good) can be used to make raisin bread out of ingredients (raw materials and intermediate goods) such as wheat, water, packaged raisins, and yeast. In production, an oven is consumed through its use as a capital good. In making a batch of loaves of bread one might “use up” all available ingredients; and one consumes the ingredients of bread through eating bread. The difference is that we do not eat ovens. Notice also that intermediate goods and finished goods are all produced using capital goods. And since there are two types of final goods, in terms of production, there are also two types of raw materials and two types of intermediate goods.

It would be helpful to have terminology that frees us from this imbroglio and that precisely reflects the structurings of production. We can start by replacing the terms “consumer” and “capital” with “basic” and “surplus,” respectively.

Etymology of “basic” includes “pertaining to basic material needs” in living, including food, clothing and housing. We can extend that to include, for example,

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<sup>38</sup> See note 18.

<sup>39</sup> For example, from the *Oxford English Dictionary*, the first meaning of the verb “use” is: “take, hold, or deploy as a means of achieving something” (Soanes and Stevenson 2008).

dosages of medication, musical instruments, artistic performances, economics textbooks, and so forth. In other words, *basic goods and services* enter into our day-to-day living. But we are looking at the whole production process which includes production chains. For example, in any instance, some number of kilograms of wheat yields some number of loaves of bread. In general, contributions to the production of basic goods and services are in a *one-to-one relation* with final basic (consumer) goods and services.<sup>40</sup>

Etymology of “surplus” includes “that which remains above what is used or needed.” For example, think of an oven in a bakery. Metaphorically speaking, it is “above” loaves of bread that are sold in batches from day to day, and week to week. In this case, there is no typical ratio. As long as the oven is maintained, it is used to produce an indeterminate number of loaves of bread. For another example, as long as it is maintained, a hospital is used to care for an indeterminate number of patients. At least in some cases, then, the relation between contributions to production of surplus goods and services and goods and services that enter into our day-to-day living is *one-to-many*.

Now, as long as it is in use, an oven factory produces an indeterminate number of ovens. And so, as long as the oven factory is in use, and ovens produced are being used to produce loaves of bread, the number of oven factories produced compared to the number of loaves of bread produced is in a “*one-to-many-to-many*,” relation. This is a special case of one-to-many. In all such cases, then, contributions to surplus production are in a one-to-many relation with the final production of basic goods. And this generalizes.<sup>41</sup>

The new terminology is precise. It eliminates the need to add qualifiers to statements about consumption and producer goods. The new terminology accommodates the fact that there are two types of intermediate goods. It also allows for a convenient shorthand: *there are two types of firm*, namely, basic and surplus. A *basic firm* contributes to basic production, while a *surplus firm* contributes to surplus production. In the present context, the meaning of “firm” is not the familiar and descriptive sense of the word, namely, a business with proprietary boundaries. In the present context, “firm” is meant relative to production. Whether or not a contribution to production is basic or surplus is determined by *usage of finished goods after final sale*.

In brief, then, any economy has two types of production, namely, basic and surplus. In an exchange economy, there are five monetary functions, that is,

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<sup>40</sup> With that in mind, we can seek to obtain statistical results such as typical ratios.

<sup>41</sup> Special cases of these relations can be classified as “point-to-point,” “point-to-line,” “point-to-surface,” “point-to-volume,” and so on, as we look to production that is increasingly remote from the production of basic goods and services. See, for example, the quotation at the end of Sec. 3.4, and “point-to-point, etc.” in the Index of (Lonergan 1998).

basic and surplus supply and demand, respectively, and a redistributive function. Because there are two types of production, there are two types of firm. We do not extend that terminology to entrepreneurial units in the economy whose role, monetarily, is redistributive. For redistributive is not defined in a positive sense. Rather, payments are redistributive if and only if they are not operative. Specifics of payments in the remainder class can be determined in instances. For example, recall that the principal parts of loan installments change ownership of money, the capital parts of mortgage payments mediate a change in ownership of property, while currency exchange is preparatory to the possibility of there being operative or non-operative payments in another economy.

As shown in Section 2.5 below, it is often the case that individual businesses contribute to both basic and surplus production. A business, then, can be working partly as a basic firm and partly as a surplus firm and, in some cases, also be serving the redistributive function.

## **2.5      *Examples of firms***

A bakery, of course, is a basic firm, as is any business *exclusively* contributing to any step in production along a production series that leads to food made by a bakery. A business that only makes ovens for bakeries is a surplus firm, as is any business that *exclusively* contributes to any step in production that leads to the manufacturing and, eventually, final sale of ovens for usage by bakeries.

But now consider an iron mine. Shipments of ore that are later smelted might eventually go into the production of ovens used by bakeries. Other shipments of the same type of ore from the same iron mine might eventually go into steel framing in the construction of homes. In this realistic scenario, the iron mine contributes partly to basic production and partly to surplus production.

Similar partitioning can also be found closer to final steps in production. Consider a retail store that sells building materials. After being sold, some prefabricated lighting systems, say, might go into the construction of homes. In such cases, the sale of the lighting systems are mediated by transitional payments; and lighting systems would be products of a production series contributing to the basic production of homes. The purchase of the homes would be mediated by final payments. But the same type of lighting systems sold by the same retail store might also be sold to contractors building offices. In that case, sale of the lighting systems through transitional payments would

contribute to the surplus production of offices which, in turn, would become available for final sale.

Partitioning of production into basic and surplus can also be found after final sale. Suppose that a pickup truck is used at a local wood mill, but that the same vehicle is also used at home, on days off from the mill. During part of the week, then, the truck is used as a product of surplus production while, on days off, it is used as a product of basic production.

Let us not forget the redistributive function. Some retail businesses provide their own financial services including, for example, credit, mortgages and loans. In as much as such a business loans and then manages the return of principal, it would be both making and receiving redistributive payments. Payments for a foreign currency are partly redistributive and partly for services rendered. And if a business is involved in either export or import then it, too, could be managing redistributive payments.<sup>42</sup>

In brief, the type of production and type of firm are defined neither in terms of materials, nor proprietary boundaries, but rather with respect to production and final usage. And there are countless examples where payments made by, and received by, individual businesses can be basic, surplus or redistributive, as the case may be.

## **2.6      *On the possibility of applying two-flow heuristics***

In order to apply two-flow heuristics, economists will need appropriate data from businesses participating in, and contributing to, the two-flow exchange economy, locally and more broadly. How might we distinguish, let alone measure operations of particular businesses that typically are identified by proprietary boundaries rather than by types of production?

An example in Section 2.5 provides a clue. The usage of the pickup truck is partly as a product of surplus production and partly as a product of basic production. Partitioning in usage is already familiar to accountants and revenue agencies. But at this time, differences between basic and surplus are neither precisely identified nor, generally, reported. Still, they could be. In the example with the pickup truck, at the end of a tax year, the owner would report percentages for each type of usage. And, eventually, time series of such would reveal trends.

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<sup>42</sup> See par. 2.3.1 (e).

However, let us now return to the example of the iron mine. Might we somehow determine the extent to which the mine contributes to basic or surplus production? Part of the difficulty is that, typically, at the point of sale of iron ore in a production series, finished goods, final sale and usage are at a considerable remove. The type of production to which a particular shipment of iron ore is intended to eventually contribute, let alone eventually *does* contribute, need not be known to an iron mine's accountants. In any case, at the time of sale to a next step in a production series, final sale and usage are not yet determinate. To add to the challenge, there is randomness within and between production chains which themselves emerge, survive for a time, and cease to function.

The solution to the problem has three main parts. First, there is the question of method. As in any process involving randomness, method will need to be partly statistical. Second, in the future application of two-flow heuristics, we can assume that production chains will not be less known than they are at present. In particular, contributions to production chains will therefore be trackable. This brings us to the third part of the solution.

Tracking of production and payments will need to be extended through production chains to also identify usage of finished goods after final sale. This will reveal whether or not contributions to earlier steps in production *were* basic or surplus.

Yet to be developed, new (two-flow) accounting protocols will reveal partitioning, as well as mixing of basic and surplus production in businesses. Dynamics will be determined statistically and will include, for instance, time series. An admittedly simplistic but nevertheless illustrative example is as follows: Suppose that over a period of twenty years, with random variation and modest dispersion, approximately twenty percent of the output of an iron mine ended up as material in surplus goods. This would provide an estimate for the mine's accountants, and then also economists with whom such data would be shared. On that basis, statistically speaking, approximately eighty percent of the mine was for basic production. In other words, eighty percent of the iron mine's operations were as a basic firm, and twenty percent were as a surplus firm.

The new accounting protocols will need to be applied throughout the economy, in as much detail as needed. Such data will be shared among economists, to aid in analyses of time-dependent (statistical) trends, states, and substates of the two-flow exchange economy, locally and more broadly. Not unlike modern meteorology and environmental science, we can expect that, over time, there will be cumulative data bases. Appealing to such data, economists



will be able to study time series of aggregates of concomitant payments thus revealing the interplay between basic and surplus production, redistributive activity, and basic and surplus usage, locally, regionally and internationally. Such results will also contribute to information needed in planning future production. For it is often the case that statistical results can be used as a basis for “reasonable betting.”<sup>43</sup>

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<sup>43</sup> See (McShane 2021, 45–54).

### 3. Some obvious errors in current mainstream economics

#### 3.1 *Circular flow*

Examples in this paper show that the circular flow model does not reflect what actually happens in an exchange economy, increment by increment.<sup>44</sup> For instance, to cover maintenance and replacement, firms do not pay households but surplus firms. With that said, the expression “circular flow” is valid in a qualified sense, for each of basic production and surplus production, respectively.

Let us begin with surplus production. Throughout the aggregate of surplus production, the surplus demand function directs payments that flow into surplus production chains. In entrepreneurial units contributing to surplus production, fractions of total payments provide income  $i_2$  that, in traditional terms, is said to be money that goes to “homes.” Fractions of that money are taken up by the basic demand function and result in monetary flow into basic production chains. Through payments for maintenance and replacement, fractions of those fractions of money are directed toward maintenance and replacement and thus can be taken by the surplus demand function. Hence, abstracting from crossover sources<sup>45</sup> and non-operative payments, net monetary flows and monetary functions actuated in surplus production can be said to be “circular.”

A similar analysis applies to payments in basic production.<sup>46</sup>

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<sup>44</sup> See Fig. 2.6. See also (Benton and Quinn 2024c; McShane 2017, 60–62).

<sup>45</sup> See par. 2.3.1 (a).

<sup>46</sup> Or, regarding the entire exchange economy, as Lonergan observed, “a circulation of money is not a rotational movement of money. Rather it is a circular series of relationships of dependence of one rate of payment on another. Money moves only at the instant of a payment or transfer” (Lonergan 1998, 21:254). Regarding the movement of money, see par. 2.3.1 (d).

### 3.2 *Net export*

To measure the impact of foreign trade, current practice looks at

Net export := value of exports – value of imports.

This formula cannot detect functionally distinct quantities. For example, both imported and exported goods can be basic, surplus, finished and intermediate. Abstracting from redistributive payments involved, net export  $NX$  is

$$\begin{aligned} NX &= (X_1 + X_2) - (M_1 + M_2) \\ &= (X_1 - M_1) + (X_2 - M_2). \end{aligned} \tag{3.1}$$

This reveals that, with regard to the impact of trade on the domestic economy,  $NX$  is fundamentally ambiguous. For example, a large positive net export  $NX$  can be due to a large net basic export  $(X_1 - M_1)$  together with a modest deficit in net surplus export  $(X_2 - M_2)$ ; but it could be also be due to a large net surplus export  $(X_2 - M_2)$  together with a modest deficit in net basic export  $(X_1 - M_1)$ ; or both net basic and net surplus export approximately equal and positive; and so on. And each of these cases corresponds to distinct situations in the economy.

### 3.3 *Gross domestic product*

In his 1934 report to the US Congress (Kuznets 2008), Simon Kuznets defined National Income as a makeshift quantity.<sup>47</sup> It was the precursor to *GDP*. To his credit, Kuznets also warned that “[t]he welfare of a nation can ... scarcely be inferred from a measurement of national income as defined above” (Kuznets 2008, 7). The fact that total expenditures might be useful in some applications is not in question. See, for example, Section 4.1.2. What is in question is the plausibility of the modern assumption that the total volume element called *GDP* is a valid measurement of an economy’s performance. As defined, the quantity is a vast sum of expenditures; and in applications, only approximations are

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<sup>47</sup> “Dr. Kuznets, who was in full charge of the work, was responsible for the preparation of the final estimates, as well as the organization and the text of the report” (Kuznets 2008, XI, Acknowledgment).

obtained. In other words, *GDP* is an answer to a question: How many? This begs the question: How many of what? In other words, what are expenditures?

In contemporary views (mainstream and otherwise), an expenditure is merely an amount of money paid for goods or services. Further inquiry is thus effectively blocked. At the same time, there are numerous counterexamples to the assumption that if *GDPs* are increasing over time then the economy is performing well. As briefly discussed in Section 1.2 (ii), we are encountering the problem of method. It need not be surprising, then, that despite a growing consensus that *GDP* is not an appropriate economic metric, it remains a staple in contemporary economic analysis, globally. Admittedly, there are attempts to go “beyond *GDP*.”<sup>48</sup> But so far, these have been by way of avoiding the scientific problem; and generally, *GDP* is retained as a complementary quantity.

With the advantage of having made progress in two-flow heuristics, what is *GDP*? If it is not a valid metric for economic performance, can we identify some of its shortcomings?

To begin, recall that *GDP* in a given time interval is the total market value of all goods and services provided by the domestic economy. Some goods might be exported, while others might be imported. Exported intermediate goods go on to become parts in finished goods that might be sold in another economy or ultimately be imported back into the domestic economy. Similar observations apply to importing intermediate goods. In the context of global trade, and with the understanding that value is added in increments along supply chains, one computes the blanket quantity called net export. The formula for *GDP* is, therefore:

$$GDP = C + G + I + NX \quad (3.2)$$

where  $C$ ,  $G$ ,  $I$  and  $NX = X - M$  represent, respectively, consumer spending on finished goods (available in the domestic economy), government spending, investment in capital goods (available in the domestic economy), and (with export  $X$  and import  $M$ ) net export.

In fact, without having to appeal to two-flow heuristics, there are some obvious problems with using *GDP* as a measurement of economic performance. Consider the case where a sequence of increasing *GDPs* results from all four of it

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<sup>48</sup> As is well known, these include attempts to measure environmental costs, distribution of wealth, quality of life, well-being, employment levels, ecological sustainability, and so on. See, e.g., (Costanza et al. 2024; Stiglitz 2020; Hoekstra 2019; Stiglitz, Fitoussi, and Durand 2018). Some of these are briefly discussed in Sec. 3.5, below.

terms increasing. This might be due, for example, to a prolonged period of major economic expansion. But a completely similar sequence of increasing *GDPs* can result from a failing domestic economy, a failing domestic government, and endemic poverty. For all of these can occur together with increasingly large export of, for example, an internationally-valued natural resource. The results of such could leave ecological devastation while the massive income received through those exports might not be directed back into the domestic economy.<sup>49</sup>

By appealing to two-flow heuristics, further problems are exposed. Recall that, as seen in Section 2.3.1(f), net government expenditures partition along functional lines, that is,  $G = G_1 + G_2 + G_r$ . Combining this with the results of Section 3.2, we get that

$$GDP = C + (G_1 + G_2 + G_r) + I + ((X_1 + X_2) - (M_1 + M_2)). \quad (3.3)$$

The quantity  $C$  is basic and  $I$  is surplus. Grouping terms functionally, we get that

$$GDP = (C + G_1 + (X_1 - M_1)) + (I + G_2 + (X_2 - M_2)) + G_r, \quad (3.4)$$

where the terms in the first parentheses represent basic expenditures; those in the second, surplus; and the final term represents net redistributive expenditures of a government.

Again, because *GDP* is defined as a sum, a sequence of increasing values can result equally from different situations. Such a sequence could be found in an economy that is thriving but also in an economy in decline. From Equation (3.4), it is evident that a still wider range of problematic situations can occur under the guise of increasing *GDPs*.

It is already known that large expenditures for net export can hide what is happening in the domestic economy. And so, for the moment, suppose that net export of both basic goods and surplus goods is approximately zero. Suppose further that all three types of government expenditures are approximately constant. Consider the case, now, where surplus production is in a state of contraction (and so, in particular, maintenance and replacement are increasingly less available), while basic production is in a state of expansion. In this case, we

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<sup>49</sup> We can think of, say, foreign investors whose concerns do not include the domestic economy. But that is not our topic here. See, however, note 8 regarding Zambia, and (Benton and Quinn 2024b; Quinn 2023b, 62–63).

could have a sequence of increasing *GDPs* while domestic basic production is approaching a crisis.

A sequence of increasing *GDPs* can also be due to an overexpansion of surplus production compared to current needs of basic production. Because of crossover payments, before long, this will lead to financial difficulties in basic production. And so on. In other words, by looking at all terms in Equation (3.4) (including, in particular, the fact that  $G = G_1 + G_2 + G_r$ ), and considering all realistic combinations, it becomes clear that the range of possible situations is extensive, wherein *GDPs* are increasing but an economy is in, or is heading for a crisis in production.

In the same way, it can be shown that a sequence of decreasing *GDPs* can be due to problems in economic performance; but that such a sequence can also result from a well-functioning domestic economy, wherein surplus and basic production are meeting the needs of society.

Clearly, part of the problem is the oversight that a single quantity (*GDP*) might be used to measure a vast, and what turns out to be a multi-function process. Furthermore, problematic outcomes can be anticipated if—as in current mainstream economics—non-differentiated growth (increasing *GDP*) is selected as the goal. For it is to be expected that when basic and surplus production are not distinguished, when the redistributive function remains unknown, and growth is indiscriminately pushed on potentially all fronts, the two types of production and their respective monetary flows can easily lose coherence; and a crisis (such as a slump of some kind) will follow. For another example, consider a not uncommon strategy: In the effort to stimulate an economy, a government might initiate major capital production projects such as building new roads and highways. That can increase  $G_2$ , and therefore increase *GDP*. But if that is done at a time when it is, rather, basic production that needs support (for example, in the housing and medical sectors), such expansion can fail to meet the needs of both economic process and society.

With two-flow heuristics it is also becoming more than plausible that, instead of being an economic necessity, the business cycle is actually a pathology. For on present showing, it would seem to be the result of ignorance of, and not adapting to, intrinsic norms and criteria of the economy. However, analysis needed, as well as identification of strategies to avoid the business cycle, would require future global collaboration.<sup>50</sup>

In light of these various observations, it is not surprising that we often hear economists and finance ministers report that, as shown by growth in *GDP*, the

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<sup>50</sup> See (Lonergan 1998, 21:275–76).

economy is “doing well” when, in fact, actual circumstances can be in a state of economic crisis.

### **3.4 *Input-output analysis***

Advances in input-output analysis were obtained by Wassily Leontief (1906–1999). With as much detail as circumstances require, one identifies the various sectors involved, including the financial sector. Each sector requires input from other sectors and likewise contributes to other sectors. Tracking inputs and outputs over a time interval, one thus obtain an “input-output” matrix. Notice, however, that operative throughout are the same hypotheses that mistakenly justify appealing to *GDP* for analysis of economic performance. Among other things, the two types of production are not distinguished; and redistributive payments also are not identified. While input-output analysis yields more refined results than time series of *GDPs*, results again are merely descriptive. Over time, the method tracks volumes in, and between, sectors as described in current mainstream economics. But recall that, as indicated in Section 2.4, rhythms observed in, and between, basic and surplus production are

not ... based upon properties of things: the same raw materials may be made into consumer goods or capital goods; and the capital goods may be point-to-line, point-to-surface or a higher correspondence; they may have one correspondence at one time and another at another. Similarly, general services such as light, heat, power, transportation may be employed in any correspondence, and in different proportions in several correspondences at different times. The division [between basic and surplus] is neither proprietary nor technical. It is a functional division of the structure of the productive process; it reveals the possibilities of the process as a dynamic system (Lonergan 1998, 237).

### **3.5 *Other indicators***

We can now look at other indicators including, for example, those provided by the OECD and the World Bank. The “economic indicators” provided by the OECD include: tourism GDP, value added by activity, housing prices, nominal GDP forecast, interest rates, and price level indices (“OECD. Economic Indicators” 2025). It is true that these indicators are developed from data obtained from economic activity. However, they are amalgams of functionally distinct quantities and thus reveal little about the functioning of an economy, either locally,

regionally, or more broadly. In addition to indicators identified to be “economic,” the OECD also provides data on society, employment, finance and investment, health, education and skills. To be sure, all of these are relevant to human living. However, in what respects they pertain to the functioning of a two-flow economy will need to be the fruit of future inquiry. For then data will be sifted and analyzed relative to the two-flow structuring of the economy. Similar problems are evident with indicators provided by the World Bank (“World Bank Data Bank” 2025) which include GDP growth rates, inflation, consumer price indices, poverty, population, education, and so on.<sup>51</sup>

### **3.6        *Competition and profit maximization***

#### *3.6.1        Introduction*

In current mainstream economics, competition and profit maximization are assumed to be foundational principles. Their nature and origin, as well as their various, and mutually dependent application, have a history of influence on economic thought and practice that goes back centuries.<sup>52</sup> Why that influence is a problem is more subtle than the errors discussed in the previous sections. Adequate identification of the two supposed principles, not to mention collaborative results needed for their future rectification, will not fit into a subsection of an article.<sup>53</sup> However, a few observations can provide points of entry for some key issues. First, we draw attention to their presence in the ethos of mainstream economics. Then we comment on their significance.

#### *3.6.2        An historical sequencing of the ethos of mainstream economics*

The ethos of mainstream economics can be traced back, in part, to the philosophy of Niccolò Machiavelli (1469–1527), a sampling of which is as follows:

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<sup>51</sup> As pointed to in Sec. 5, a more complete sifting along with practical strategizing will be “eightfold.”

<sup>52</sup> See, for example, (Mokyr 2005).

<sup>53</sup> Eventually, collaboratively, four cumulative past-oriented tasks will take up these issues; and four cumulative future-oriented tasks will work toward identifying implementable possibilities. See Sec. 5.



[F]or it is so far from how one lives to how one should live that he who lets go of what is done for what should be done learns his ruin rather than his preservation. For a man who wants to make a profession of good in all regards must come to ruin among so many who are not good. Hence it is necessary to a prince, if he wants to maintain himself, to learn to be able not to be good, and to use this and not use it according to necessity (Machiavelli 1998, 61).

As is well known, it was by way of Thomas Hobbes (1588–1679), and then John Locke (1632–1704), that Machiavelli’s influence eventually found its way into the thought of Adam Smith (1723–1790).

Machiavelli’s heir was Adam Smith. The invisible hand governs our lives. We look to create wealth, and that wealth can only be made by adhering to reality. ... Smith was as interested in the prince as Machiavelli was. Smith’s prince was the businessman, deemed as ruthless and cunning as Medici, but whose cunning was based on allowing himself to take advantage of the moment and the battle of the marketplace. ... But the real thing both cared for was the nation. They were not as interested in princes as they were in the competition in which princes were trapped, and how that competition influenced the power of nations. ...

Adam Smith is seen today as the hero of the free market, of men freed to live as they wish. Machiavelli is seen as the dark brooding side of humanity, of battles in the darkness of the political. But both were saying the same thing, that life is the recognition of what is necessary and what is impossible, and that wealth and power come from submitting to those fundamental moral principles. Adam Smith’s notion of laissez-faire economics is about aligning with the market. Machiavelli’s prince is about aligning with the state. Free will is knowing what must be and embracing it.

Neither thought ruthlessness was an end in itself. Both believed that ruthlessness was a myth, and that aligning with the market or war, submitting to the power of reality, was the path to the most important things: the wealth of nations and the power of cities. Both were saying that all the cunning in the world is of no value if it challenges the reality around you (Friedman 2020).

Adam Smith’s legacy “that wealth can only be made by adhering to reality” became an established practical framework for success in modern capitalism. It consists of a demonstratively pragmatic approach that is adversarial and can resort to cunning and ruthlessness with which to win the day. Moreover, his view

“that wealth and power come from submitting to those fundamental moral principles,” give birth and legitimacy to a mainstream economic custom far more honored in the observance than in the breach. Accordingly, in the nineteenth century, industrialist Andrew Carnegie (1835–1919) proclaimed

[o]ur duty is with what is practicable now ... the Law of Accumulation of Wealth, and the Law of Competition; for these are the highest results of human experience, the soil in which society so far has produced the best fruit. Unequally or unjustly, perhaps, as these laws sometimes operate, and imperfect as they appear to the Idealist, they are, nevertheless, like the highest type of man, the best and most valuable of all that humanity has yet accomplished (Carnegie 1889, 3).

In the twentieth century, the influential economist Milton Friedman (1912–2006) echoed Carnegie’s commitment to “what is practicable.”

The view has been gaining widespread acceptance that corporate officials and labor leaders have a “social responsibility” that goes beyond serving the interest of their stockholders or their members. This view shows a fundamental misconception of the character and nature of a free economy. In such an economy, there is one and only one social responsibility of business — to use its resources and engage in activities designed to increase its profits so long as it stays within the rules of the game, which is to say, engages in open and free competition, without deception or fraud. Similarly, the “social responsibility” of labor leaders is to serve the interests of the members of their unions. It is the responsibility of the rest of us to establish a framework of law such that an individual in pursuing his own interest is, to quote Adam Smith again, “led by an invisible hand to promote an end which was no part of his intention. Nor is it always the worse for the society that it was no part of it. By pursuing his own interest, he frequently promotes that of the society more effectually than when he really intends to promote it. I have never known much good done by those who affected to trade for the public good”<sup>54</sup> (M. Friedman 1962, 133).

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<sup>54</sup> Quoted from (Smith 1930, 421, Bk. IV, chap. ii).

### 3.6.3 *Methodological errors*

This brief historical sequence provides data on both economic thought and economic practice. It reveals, first, two strands of thought in the tradition: what human nature is, and how economies work, and secondly, the fact that both have influenced economic practice. Appeals for their justification are commensurate with that historical succession of prior views and examples of their application.

There are obvious methodological problems. For instance, whether ostensibly about human nature or allegedly about how economies operate, the views in question were developed in general terms, remote to actual people and actual economic events. As the samples from the literature also show, there is an inadvertent mixing of the two strands of thought. The narrative thus provides data on methodological problems already indicated in Section 1.2. A further problem in method is evident in advancing views by appealing to examples that meet pre-established criteria. The problem is compounded by assuming a limited view of human nature.

### 3.6.4 *Economic models that incorporate competition and maximization of profit*

From Richard Cantillon (1680–1734) onward, competition and a concern for profit have been assumed in, and reinforced by a tradition of speculative and, eventually, mathematical modelling. In recent times there is, for example, “equilibrium analysis,” a tradition of economic modeling originated by Léon Walras (1834–1910) and advanced by his followers. Its models are worked out in high-dimensional mathematical spaces that hypothesize limit states (for prices, quantities of goods and services, supply, demand, and maximizing utility) when time is allowed to increase toward infinity. But the models’ terms have no referents in instances of actual production, provision and exchange, and the limit states are merely conceptual entities. They also do not distinguish between the two types of production, let alone the monetary functions and the various types and classes of payment. And even when, in special circumstances, there are evident trends in an economy, the question remains: What are the events that, in the economy, are trending? As Walras himself said, the “whole theory is mathematical” (Walras 2014, xi).

Consequent to not recognizing that there are two types of production, equilibrium analysis also

[does] not take into account the phases of the production rhythms. As [can be]<sup>55</sup> shown, economic activity moves through a series of transformations and exploitations, and this series generates the succession of [two-flow] capitalist, materialist, cultural, and static phases. Now [whether locally or on a larger scale] each phase in an exchange economy will have its exchange equilibrium, but the equilibria of the different phases differ radically from one another (Lonergan 1998, 21:52).

### 3.6.5 *Subsequent technical errors*

In current mainstream economic thought and practice, whether implicitly or explicitly, deference is still routinely given to competition and maximization of profit, despite them being regularly detrimental to society and the public good. Taking advantage of the two-flow heuristics, part of the problem can be seen when, for example,

[a basic expansion] ought to be directed to raising the standard of living of the whole society. It does not. And the reason it does not is not the reason on which simple-minded moralists insist. They blame greed. But the prime cause is ignorance. The dynamics of surplus and basic production, surplus and basic expansions, surplus and basic incomes are not understood, not formulated, not taught. When people do not understand what is happening and why, they cannot be expected to act intelligently. When intelligence is a blank, the first law of nature takes over: self-preservation. It is not primarily greed but frantic efforts at self-preservation that turn the recession into a depression, and the depression into a crash (Lonergan 1999, 15:82).

In particular, there is no understanding of how “finance transfers money from inoperative to dynamic positions in the [two-flow] exchange system” (Lonergan 1998, 21:41); and there is also no understanding of how finance transfers money from dynamic positions to inoperative positions.<sup>56</sup> And so it happens that

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<sup>55</sup> Original text: “has been.” The possibility is intimated in Sec. 4.1.4.

<sup>56</sup> Transfers are to and from the redistributive function. See discussion prior to Eq. (2.2).

[c]apitalism as an economic system ‘is defined by the fact that it makes structurally central and primary the endless accumulation of capital.’ ... The process of capital accumulation is premised on the ability of capitalists [toward] ... producing and selling goods and services with a profit (Wigger and Buch-Hansen 2012, 25).

Among defects in the view that profit is a normative criterion of satisfactory enterprise is that

[p]rofit merely demonstrates the profit-maker’s ability to get a lion’s share out of aggregate income. Tell [people] to seek profit and tell them that profit is the result of intelligence, enterprise, and risk. Things will go well for awhile. But sooner or later even the stupidest will realize that the maximum return for their money is through monopoly prices and inelastic demand. This maximum return coincides with the minimum welfare of the community. It tends to yield a perpetual and artificial scarcity (Lonergan 1998, 21:92).

In further deference to competition,

its proponents are generally much more inclined to cite competition as a desirable organizing principle of capitalist economies and beyond. Positive connotations of competition are dominant in contemporary economic thought, if not in Western societies more broadly. The desirability of competition, provided it is ‘fair competition,’ seems to have slipped beyond the purview of normative critique (Ergen and Kohl 2022, 938).

Granted, competition can be valid when, for example, the purpose is to improve production and provision, often through innovation. This might be seen, for instance, when business is conducted in the spirit of “doing things better or at any rate more successfully than the fellow next door” (Schumpeter 1954, 974). However, as the historical sequence shows, competition as both conceived and implemented in mainstream economics is radically different. And a critique of that difference, in normative terms, reveals “a deeper malady” (Lonergan 1998, 21:36):

[People] are unequal in ability and in opportunity. Accordingly, if the productive processes are to yield their maximum of human satisfactions, then it is necessary that the less fortunate be able to demand more than they can supply, while the more fortunate supply more than they demand. ... But the delicate balancing of supply and demand necessarily limits each successive group of less fortunate [people] to the lower standard of living that their abilities and opportunities can command in the market.

Against this artificial nemesis humanity's idealism revolts. A rigidly egalitarian system belongs to a perfectly egalitarian world; a world in which [the vast majority of people who] are, in fact, unequal must find a different system. What system? (Loneragan 1998, 21:36)

### 3.6.6 *Observations*

Despite their presumed status as principles of economic practice, competition and maximization of profit have no basis in how an economy works. In fact, they do not even regard economic process per se but consist, rather, in advisories for how to conduct business and finance. Furthermore, they ignore, among other things, the fact that an economy has two types of production and intrinsic norms and criteria; and that if they are not met, then economic problems follow. Collectively, the two principles owe their currency to philosophical reflections originated by Machiavelli and adopted by the tradition.

As a consequence, their normalization in the traditions of both economic thought and practice has exposed economic process to predatory behaviour.<sup>57</sup> In particular, they have directly contributed to the historical dominance of corporate and oligarchic culture in the world's economies. With no regard for their intrinsic norms and criteria, let alone the welfare of communities, the corporate and oligarchic ethos is massively destructive of the proper functioning of the world's exchange economies (Benton and Quinn 2024a).<sup>58</sup>

As Loneragan states, we “must find a different system. What system?” (Loneragan 1998, 21:36). The “system” needed, of course, is not a system such as defined in contemporary systems theories. It will be, rather, a matter of working out

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<sup>57</sup> For details on some of the abusive practice see, for example, (Benton and Quinn 2024b).

<sup>58</sup> In fact, “unlike private property, exchange relations and social inequalities, economic competition has rarely been the explicit core of moral debates over capitalism” (Ergen and Kohl 2022, 937).

*[w]ho* among millions of persons, does *what*, among millions of tasks, in return for *which*, among millions of rewards” (Loneragan 1998, 21:35),<sup>59</sup>

effectively guided by a two-flow heuristics of economic process.

A central task, then, is to secure an adequate understanding of the two-flow productive process in modern contexts. But that is only part of the problem. Pointings toward additional heuristics needed to collaboratively manage these complex issues are briefly indicated in sections 4 and 5.

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<sup>59</sup> Italics are in source text.

## 4. The mechanics of the economics of ecological economics

### 4.1 *Anticipating some aspects of two-flow economics*

#### 4.1.1 *The primary and secondary economy*

With two-flow heuristics, we can see that any economy  $E$  is of the form  $E = E_1 + E_2$ , where  $E_1$  and  $E_2$  are basic and surplus production, respectively. The plus sign refers, concretely, to their combination which thus includes crossover and redistributive payments. Without implying a rigid structure, as instances reveal, surplus production has what we might call “levels.” In the aggregate, however, production in  $E_2$  is not for its own sake but ultimately is of whatever is needed for production in  $E_1$ ; whereas that which is produced by  $E_1$  is for our day-to-day living. Without getting sidetracked by attempting to develop a theory of “subeconomies,” we can introduce names for what has already been established: let us say that basic production is the *primary economy* while surplus production is the *secondary economy*. Also, in an exchange economy, monetary flows of the primary and secondary economy are the *primary circuit* and *secondary circuit*, respectively. The primary and secondary economies thus are linked both materially and monetarily.

Both  $E_1$  and  $E_2$  are engines of production. The whole economy that is their combination has the “mechanical structuring” of a vast “two-engine machine.” Not only does the output of the secondary engine provide what the primary engine uses, but there are also relations among their production rates. If we compare the production rates of the secondary and primary economies then (by aggregating results from sections 2.4 and 2.5), the relation between them is, in broad terms, *one-to-many*. For what is produced in  $E_2$  typically is used repeatedly for producing an indeterminate number of goods in  $E_1$  over subsequent production intervals.<sup>60</sup> We can therefore expect that, in order for an economy to be functioning in a way that is mechanically sustainable, surplus and basic production rates need to be appropriately, albeit loosely, synchronized.

In terms that can be made precise, the secondary economy works as an “accelerator” (or “decelerator,” if acceleration is negative) for the primary economy. We are touching on advanced issues. But an example can intimate something of the phenomenon that shows up in the aggregate that is the whole economy. Suppose that a professional baker’s oven can be used to produce

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<sup>60</sup> This is not without exception. For instance, to transport and sell milk to grocery stores, packaging is used only once. There is recycling of packaging. But in such cases, used packaging becomes raw material for new production chains.



approximately 1,400 loaves of bread each month, and approximately 16,800 loaves per year. Suppose also that, across a large region, and over an extended period of time, the population is increasing, new neighborhoods are being established, and new bakeries are gradually being introduced. Starting from a reference year  $t_0$ , suppose that, above and beyond the needs of maintenance and replacement, statistically, two new commercial ovens are being produced and sold each year, and subsequently going into use.

In this scenario, ovens previously sold and used are staying in use or, when necessary, are being replaced. Beyond year  $t_0$ , then, the total number of ovens being used is increasing year by year. Statistically, the number of ovens in use after  $\Delta t$  years is therefore the number  $N_0$  that were in use at the beginning of year  $t_0$  plus 2 additional ovens, for every additional year. The total number in use after  $\Delta t$  years is, then,  $N = N_0 + 2\Delta t$ . But each oven in use produces approximately 16,800 loaves of bread per year. It follows that the rate at which loaves of bread are produced is accelerating at a rate of  $2(16,800) = 33,600$  loaves *per year, per year*. On the other hand, if there were some kind of ongoing contraction of the population and the economy, and if ovens were going out of usage at similar rates, then there would be a negative acceleration of loaves of bread being produced, sold and consumed.

Admittedly, this is a simplistic example. Nevertheless, it points to a general result. If surplus production rates consistently exceed the needs of maintenance and replacement, and all surplus goods produced are sold and used, then there are accelerations at lower levels of production. If the pattern is sustained, eventually there will be accelerations in basic production with consequent effects in our day-to-day living (Lonergan 1998, 244–245).

#### 4.1.2 *Primary and secondary gross products, locally and more broadly, and new metrics*

With the two-flow heuristics, we can begin to see the need and possibility of new and mechanically significant metrics. In contrast to efforts so far to get “beyond *GDP*” by introducing speculative indicators, metrics, and policies for conceptual systems,<sup>61</sup> the development of mechanically significant metrics will be based on how economies function.

For example, we can start by observing that, while *GDP* as defined in current mainstream economics is a non-starter as a metric of economic performance, it would seem that certain gross production rates will not be without their

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<sup>61</sup> See note 12.

significance. However, unlike *GDPs* (that are undifferentiated total volumes), *gross expenditures*, *GP* say, can be partitioned according to whether or not they are for basic or surplus goods. It will make sense, then, to investigate time series of concurrent pairs  $GP_1$  and  $GP_2$  (gross expenditures for basic production and for surplus production, respectively). For a time interval, a sum of the form  $GP = GP_1 + GP_2$  might seem to be reminiscent of *GDP*. But, using accounting methods such as indicated in Section 2.6, to some approximation, series of each of the two summands would be known and would represent the results of two types of production, namely, basic and surplus, respectively, over a time period.

Notice also that *D* for “domestic” is not included in this symbolism. This is because in two-flow analysis, there would not be merely one pair of quantities  $GP_1$  and  $GP_2$  for an entire economy, over a time period. For regions in the economy, time series of concurrent pairs  $GP_1$  and  $GP_2$  would be needed.<sup>62</sup> Results from sets of regions could be obtained and combined along two-flow structurings. All of this would be in relation to local circumstances, regions in the domestic economy, the entire domestic economy, as well as in relation to similar sets of analyses in foreign economies, and in international trade.

The importance of having data of the form  $GP_1$  and  $GP_2$  can be suggested with an example of an individual business. To successfully run a bakery, one does not indiscriminately spend money on the production of baked goods (ultimately contributing to  $GP_1$ ) and on maintenance and replacement (ultimately contributing to  $GP_2$ ). Successfully running a bakery and managing payments depends on being familiar with circumstances and includes, for example, as much as possible knowing current demand, reasonable wages, the general state of repair or disrepair of ovens and premises and their expected lifespans, financial resources, the possibility of present and future credit, the availability of food ingredients from wholesale sources and their production series, and so on and so forth.

Similar observations apply to most businesses. But then they also apply to the aggregate that is the whole economy. Badly timed efforts to accelerate large subsets of basic production (and thus significantly increase  $GP_1$ ) could exceed current capacities both in basic production and in monetary resources available

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<sup>62</sup> In an economy, what is a “region” and what is “local”? Geography is a factor. For in the first and last analysis, we all live and work at places and in time. In international trade, there are empirical results supportive of the well known “gravity equations.” These state that by restricting focus to certain factors, statistically speaking, trade frequencies between two economics are proportional to an increasing function of their *GDPs* divided by a power of the geographic distance between them (Chaney 2018). The gravity equations do not distinguish basic and surplus production, nor do they identify the functional journey of money which, in international trade, factors through the redistributive function. Concretely and explanatorily, the meaning of “economic proximity” will be in terms of two-flow structurings. This points to the fact that the topologies of exchange economies, both individually and collectively, are highly non-trivial.

to basic production, not to mention surplus capacities for maintenance and replacement. On the other hand, blind efforts to accelerate large subsets of surplus production (and thus significantly increase  $GP_2$ ) could lead to build ups of unusable inventory, as well as wasted labor, materials and financial resources.

However, by gathering data on the two-flow structuring of the economy, working collaboratively, economists will be able to investigate needs, emergent trends and vulnerabilities in both basic and surplus production, and their monetary circuits, locally and globally. Attending to local needs and circumstances, and being apprised of economic activity locally, regionally and beyond, economists will be able to make recommendations for types and timings of production, provision and monetary flows, locally, regionally and more broadly. Not interfering with local creativity, it will be more a matter of “coaching and coaxing” (Loneragan 1998, xxvii). What is being envisaged will require not-yet-developed methods of collaboration in accounting,<sup>63</sup> in economics broadly, and with other fields.<sup>64</sup> Once two-flow economics is established as the standard model, practical economists will be “as familiar a professional figure as the doctor, the lawyer, or the engineer” (Loneragan 1998, 21:37), giving hope and vigor to local life.

As pointed out in the Introduction (Section 1), evidence of the interdependence of the primary and secondary economies is also evident in historical events. For instance, the Industrial Revolution in the nineteenth century started with a gradual buildup in the production of new machines, and factories, as well as aggregate wages for industrialists and those working to support the expansion. Eventually, this led to buildups in population, along with the production of food, homes and other basic goods. In other words, initially,  $GP_2$  was increasing; and after a time,  $GP_1$  also started increasing. In the long run, production rates of  $GP_2$  eventually levelled off with a concentration on maintenance and replacement; following which production rates of  $GP_1$  also eventually levelled off.

The discussion in this sub-section reveals the relevance of at least one new set of metrics: time series of locally, regionally and globally determined ratios of random variables of the form  $X = GP_2/GP_1$ . Among other things, statistical analysis of time series of such ratios will shed light on whether or not changes in production are indicative of problems in the “two-engine” economy; or are merely random variations with trends that are otherwise more or less coherent with intrinsic norms and criteria of its two-flow dynamics.

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<sup>63</sup> See Sec. 2.6.

<sup>64</sup> See Sec. 5.

### 4.1.3 *Two-flow wave mechanics*

The random variable  $X = GP_2/GP_1$  defined in Section 4.1.2 is merely preliminary. It will be the work of future economists working within the two-flow heuristics to develop metrics that are relevant to concrete economic circumstances. Figure 2.6 points to the need and possibility of ranges of metrics that will be mutually defined in terms of monetary functions, types of payment, and classes of payment. For the aggregate, statistical potential functions of some kind might be useful, together with their rates of change relative to functionally defined variables. To analyze particular economies, combinations, layerings and concretizations will be needed. Eventually, economists will work with something like a (two-flow and five-function) statistical economic wave mechanics.

### 4.1.4 *Two-flow equilibria and changes of state*

A type of *two-flow equilibrium* (a statistical state) will be when, for a particular region in the economy and for an extended period of time, the random variable  $X = GP_2/GP_1$  centers on a particular ratio. Such a state will be dynamic. For a constant ratio can be compatible with growth, no-growth, and de-growth, as the case may be. So long as changes in rates for the two types of production remain proportional, there could be a contemporaneous expansion (or contraction) of both the numerator and denominator in  $X = GP_2/GP_1$ . A special case would be if the difference of random variables  $Y = i_2 - m_1$  were to have a mean that was close to zero. In that situation, there would be something approximating a *two-flow static* economy.

Are two-flow static states possible? Historically, it would seem that, to some approximation, they have been obtained in communities where, over extended periods of time, populations remained relatively stable, material circumstances were not changing to any large degree, and where the ethos was mainly on maintaining a particular way of life and culture. (Consider, for example, medieval economies.) Such a state can thus support cultural development without requiring significant changes in total production. But can one put a limit on human creativity? (There is no saying when someone might invent a new type of plough or, for example, as occurred in the lead up to the Industrial Revolution, discover ways to harness the mechanical potential of steam.) As history shows, the implementation of new ideas has repeatedly led to (both large and small) surges in surplus production and consequently in basic production.

It is clear that, in the long run, there should neither be an accumulation of (nor draining of) money in the primary circuit at the expense of (or to the apparent advantage of) the secondary circuit. For if, say, statistically, payments for maintenance and replacement for basic production were to consistently and significantly exceed personal incomes for work in surplus production then, in the long run, basic production chains would be pushed toward bankruptcy and society would suffer the consequences. On the other hand if, statistically, wages for surplus production were to consistently and significantly exceed maintenance and replacement costs for basic production then, eventually, surplus goods used in basic production would be neither maintained nor replaced as needed. Before long, basic production also would begin to fail.

#### **4.2 *Some aspects of future economics of ecological economics***

Basic and surplus production are sub-structurings of human living. If we do not make progress in understanding how basic and surplus production work and, in particular, how they work in the contexts of modern exchange economies, then human wellbeing, ecological sustainability and other goals of ecological economics will have no practical economic basis. Two-flow heuristics provide the needed technical piece of the problem. For that reason, communicating, teaching, and eventually institutionalizing two-flow economics globally will be essential for ecological economics. This will make it possible for

- (a) economists working with two-flow heuristics
- (b) to regularly determine probably feasible timings and combinations of groupings of basic and surplus production and provision
- (c) as well as corresponding monetary flows
- (d) that would probably meet local needs,
- (e) that would be concretely informed,
- (f) that would probably be economically sustainable, and
- (g) that, in collaboration with other fields, would probably be societally and ecologically sustainable.

A question that commonly arises regards how businesses will operate in a two-flow context. We can answer this with a preliminary two-part heuristics.

The first part regards how all businesses operate. Every business potentially contributes to two types of production, and the redistributive zone.

Payments are determined by as many as five monetary functions; and, relative to production chain structures, they can flow in three classes.

The second part regards business ethics. Understanding the operative two-flow structuring of economic process provides a framework within which to plan and guide business practice. That understanding does not impinge on local creativity. In fact, two-flow economics is always locally informed and will depend on such creativity. There is always, however, the total actual context. Locally and more broadly, there will be some movements in the economy that could make sense and others that may not.

A home builder need not understand the chemical periodic table but will make sure that finished homes have detectors for carbon monoxide. Generally, recommendations of chemists and biochemists are taken seriously. In a similar way, two-flow economics will be part of the general ethos, and analyses and recommendations of economists working within the two-flow heuristics also will be taken seriously. Suppose, for example, that expansions on a broad basis are becoming possible but that, according to available two-flow data, such expansions could risk accelerating the economy toward a circuit imbalance. In that case, economists might well advise communities about the possible problem, and business practice could be adjusted accordingly. For all of this to work, we will also need societal shifts. At this time in history then, part (g), above, points to a major challenge. This leads to the last topic of the paper, namely, the future possibility of an implemented ecological economics.

## 5. Implementing ecological economics

In addition to economic process, there are also ecologies and societies. Broadly speaking, then, the name “ecological economics” is a name for the global effort to make progress both in understanding and in outcomes, in economies, ecologies and societies. Specific goals include preserving the world’s ecologies, assisting economies, and promoting human wellbeing. Naturally enough, then, and irrespective of any particular models, the expression “ecological economics” also can be a name for the totality, globally, of actual economies, societies and ecologies, whatever their mutual dependencies and current state, for better or for worse. In other words, “ecological economics” can also be a name for world process.<sup>65</sup>

The point here is not to get into a debate about naming. It is to recognize that the goals of ecological economics are fully inclusive. In addition to progress in understanding two-flow economics, what is also needed is progress in understanding, and doing what we can to help care for all of world process. As is generally recognized, what is implied is the need for an ecological economics that is, in some sense, “transdisciplinary.” However, while the term is included in contemporary descriptions of the field, as discussed in Section 1, so far, ecological economics is struggling with methodological issues. And so it is that “transdisciplinary” has come to allow for any and all ad hoc combinations of methods and views, including the merely speculative that are remote to actual economies, actual ecologies and actual societies.

Two of the main components of ecological economics are ecology and human wellbeing. However, little attention is given to up-to-date understanding in these areas. This is not to suggest that ecological economics should be reduced to one or more of the already familiar sciences. But if progress in ecological economics is to be relevant, we need to know something about that to which we refer, in instances. Otherwise, whether one speaks of the human or the non-human then (as previously queried about economics)<sup>66</sup> what are we talking about? If we are to make progress toward making implementable assertions about ecologies, societies, economies, and human wellbeing, then it will be crucial to build

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<sup>65</sup> There are contemporary views that will object to this formulation because of it being, in some respects, centered on humanity, or as is sometimes said, “anthropocentric.” That is unavoidable. Any attempt to understand, communicate and implement one’s human understanding of ecologies, society and economies begins with one’s human experience, one’s human understanding and one’s human deliberation. To posit a view of world process that does not include human experience and human wellbeing is, then, a fundamental performance contradiction. If one promotes principles and policies that would support the non-human at the expense of the human then one is a human being who is promoting the elimination of oneself and all other human beings.

<sup>66</sup> See Sec. 1, par. (i).

simultaneously on progress in understanding of actual ecologies, societies, and human beings.<sup>67</sup>

In addition to his work in economics, Bernard Lonergan worked on and made progress with these issues. For decades he brooded over the rapidly expanding range of methods in modern scholarship. In February of 1965, Lonergan made his breakthrough in methodology (of methods) (Lonergan 2022, "discovery page"). He communicated his discovery first in (Lonergan 1969) and then in (Lonergan 2017b).

Evident in all major fields of inquiry is the nascent possibility of an eight-fold cyclic division of labor that will be the key and core dynamics of human progress. Each of eight main tasks will be "functional specialties" that Lonergan named (functional) research, interpretation, history, dialectic, foundations, doctrines, systematics, and communications. These will be fundamental groupings of tasks, a division of labor in the academy constitutive of effective global collaboration. The eighth functional specialty, functional communications, "is a major concern, for it is in this final stage that reflection bears fruit. Without the first seven stages, of course, there is no fruit to be borne. But without the last the first seven are in vain, for they fail to mature" (Lonergan 2017b, 14:326). Eventually, through implementation, the eight specialties will be a "layered," functionally organized, global and collaborative center of reflection and a source of guidance for the academy and cultures. At this time in history, however, the eight tasks are, in the main, only pre-emergent, inadvertently present and thus often mixed in fragmentary and ineffective ways.

It is not feasible here to provide a practical introduction to a fundamental breakthrough in methodology. However, for completeness and historical context, we can report that currently available evidence<sup>68</sup> suggests that functional specialization will be essential to the eventual establishment of "*a normative pattern of recurrent and related operations yielding cumulative and progressive results*" [sic](Lonergan 2017b, 14:9).

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<sup>67</sup> Eventually, what is needed is a control of meaning that will be the fruit of an implemented "generalized empirical method" (Lonergan 1992, 3:96, 268). A later, and more adequate, definition can be found in (Lonergan 2017a, 16:136). An accessible introduction to the method in modern contexts is provided by (Benton and Quinn 2022). For an introduction to a compatible approach to education and economics, see (Benton and Quinn 2025).

<sup>68</sup> See, for example, (Quinn 2023c; 2022; McShane et al. 2022; Duffy 2021; McShane 2019; Quinn 2017; Benton 2008).



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