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The growth imperative revisited: a rejoinder to Gilányi and Johnson

Abstract: *In Binswanger (2009) it was shown that in a simple circular flow model of a pure credit economy, positive growth rates are necessary in the long run in order to enable firms to make profits in the aggregate. If the growth rate falls below a certain positive threshold level, firms will make losses. Certain aspects of this model are challenged by the papers of Zsolt Gilányi and Reeves Johnson in this issue of the Journal But nevertheless, both papers confirm the existence of a growth imperative in capitalist economies. This may be taken as evidence that the finding of a growth imperative is quite robust with respect to different model assumptions.*

Key words: *bank money, credit, growth, profits*

The main argument put forward in the model presented in Binswanger (2009) concerns firms' aggregate profits. The argument is based on a simple circular flow model of a pure credit economy, where production takes time. In this economy, positive growth rates are necessary in the long run in order to enable firms to make profits in the aggregate. If the growth rate falls below a certain positive threshold level, which is termed zero profit growth rate, w_o, firms will make losses.

Certain aspects of this model are challenged by the papers of Zsolt Gilányi and Reeves Johnson in this issue of the journal.[1]

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[1] Unless otherwise indicated, references to Gilányi or Johnson are to their papers presented in this issue of the journal.

But nevertheless, both papers confirm the existence of a growth imperative in capitalist economies. This may be taken as evidence that the finding of a growth imperative is quite robust with respect to different model assumptions. The papers of Gilányi and Johnson show, the same as Binswanger (2009), that capitalist economies can either grow (at a sufficiently high rate) or shrink if the growth rate falls below a positive threshold level. However, there are some controversies about the exact nature of the growth imperative once we look at their models in more detail. Therefore, I welcome this opportunity to further discuss the rationale behind the growth imperative.

Zsoltan Gilányi's monetary growth imperative

In Binswanger (2009) the zero-profit growth rate, w_o, is the minimal growth rate, at which the economy has to grow in the steady state, in order to avoid losses of firms in the aggregate. Gilányi claims that the zero profit growth rate, derived from the model presented in Binswanger (2009), is not a generally binding constraint. He argues that in fact a higher growth rate is necessary just to guarantee a positive growth rate of the money supply, and therefore, a positive money stock in the long run. According to Gilányi, this is the truly binding constraint, requiring a minimal growth rate, which always exceeds the minimal growth rate established by the condition that firms' aggregate profits will be positive. Only in the case when the depreciation rate of real capital, d, is equal to 1, the two constraints coincide and require the same zero-profit growth rate w_o.

I will briefly restate the important conditions, which are crucial to the debate. The zero profit growth rate, w_o, derived for the steady state in Binswanger (2009, p. 720) is:

$$w_0 = \frac{-c - d + cd + z(1-b) + \sqrt{(c + d - cd - z(1-b))^2 + 4dz(1-b)}}{2}.$$

(1)

The zero-profit growth rate w_o depends on the values of the parameters, $c, d, z,$ and b. The parameter $c(0 \leq c \leq 1)$ indicates the portion of loans, which is used for financing investment and is termed investment ratio. The parameter $d(0 \leq d \leq 1)$ stands for the depreciation rate of real capital. The parameter z denotes the

interest rate. Finally, $b(0 \leq b \leq 1)$ stands for the banks' payout ratio, which determines the portion of banks' income (interest payments) paid out to their employees.

Gilányi focuses on the development of the money supply over time. He derives the equation for the money supply in period t, M_t, by considering the money inflows and outflows during one period. Money inflows are equal to loans provided to business firms in period t, L_t plus banks' spending on wages, bzL_{t-1}. Money outflows are equal to the repayment of loans from the previous period $t-1$ with interest, $(1+z)L_{t-1}$. Therefore, the money supply in period t is:

$$M_t = M_{t-1} + L_t + bzL_{t-1} - (1+z)L_{t-1}. \qquad (2)$$

Using w, the growth rate of loans, the change in the money supply is equal to:

$$\Delta M_t = (1+w)L_{t-1} + bzL_{t-1} - (1+z)L_{t-1} = (w - (1-b)z)L_{t-1}. \qquad (3)$$

If $\Delta M_t \geq 0$, Equation (3) implies:

$$w \geq (1-b)z. \qquad (4)$$

The minimal growth rate that guarantees a positive money stock in the long run w_0^M is therefore:

$$w_0^M = (1-b)z. \qquad (5)$$

Gilányi compares Equation (5) to Equation (1) and shows that w_0^M in Equation (5) will always exceed w_o in condition (1) unless $d=1$.

From a purely formal point of view the argument put forward by Gilányi is correct. If we establish the condition that the growth rate of the money supply must be positive in the long run, (Equation [4]), it leads to a stronger growth imperative as compared to the one established by the condition that firms' aggregate profits must be positive (the minimal growth rate in Equation [1]). The intuition of this result is as follows. If the depreciation rate is below one, investment expenses are spread over several periods, which mitigates the growth imperative to firms, because not all of their expenses in period t also show up as costs in period t. Only in the case, when capital fully depreciates in each period, firms' costs are equal to the money flows, which are paid from firms to the other sectors of the economy (households,

banks). Therefore, in this case, the two conditions lead to the same zero-profit growth rate w_0. Based on the parameter values that I have used for the simulation in my original paper (Binswanger, 2009, p. 721 ff.), where $c = 0.4$, $d = 0.1$, $z = 0.1$, and $b = 0.8$, the zero-profit growth rate is 0.45 percent. However, if $d = 1$, and all other parameter values remain the same as before, the zero-profit growth rate becomes 2 percent, which is the same value we would get from Equation (5) and, in this case, $w_0^M = w_0$.

As explicitly stated by Gilányi, the growth imperative established in Binswanger (2009) is not invalidated by his note. A positive growth rate is necessary in the long run in order to enable firms to make profits in the aggregate. The note just shows that there is an additional condition concerning a positive money supply in the long run, which, in the model of Binswanger (2009), requires even higher growth rates of the economy. However, my original model was explicitly set up to explain the growth imperative from the perspective of firms. In this context the money flows, which matter, are the ones that lead to income and expenses in the business sector (firms in the aggregate). Therefore, the model also represents a simplification of reality from this perspective because other money flows are neglected.

But if we want to explain the growth imperative based on the condition that the growth rate of the money supply must be positive in the long run, the simplifications of this model may no longer be appropriate. In this case we have to take care of all processes that result in the creation or destruction of money. The most important processes in this respect are those bank loans that are not directly linked to financing business activities, such as mortgage loans. In fact, most of the money creation by commercial banks today is due to mortgage loans. A long-run study for seventeen industrial countries (including the United States and the United Kingdom) shows that, on average, the sum of mortgage loans exceeds the sum of all other loans since 1990 and mortgage loans currently account for about 60 percent of all bank loans (Jorda et al., 2014, pp. 5–6). Therefore, these loans should be included in a model that tries to explain the growth imperative based on the condition that the money stock must be positive in the long run. A different modeling approach may be necessary to capture all relevant money flows from this perspective.

Summing up, Gilányi emphasizes another important aspect of the growth imperative that was not explicitly included in my original model. A functioning economy needs to ensure not

only positive aggregate profits of firms but also positive net inflows of money into the economy. In fact without positive net inflows of money firms would never be able to make profits in the aggregate and there is a close link between money creation and profits.

Reeves Johnson's alternative specifications of Binswanger's growth model

Johnson's paper criticizes some assumptions of the model presented in Binswanger (2009) and offers alternative specifications of various equations. Johnson's major concern is the stock-flow consistency (SFC) of the model. This point is emphasized by the "stock-flow-consistent approach to macroeconomic modeling" as, for example, advocated by Lavoie and Godley (2007), which has recently gained some popularity in post Keynesian economics. Of course, stock-flow consistency is an important issue and, I am grateful to Johnson for looking at my model from this perspective. However, I should stress, that my original model is not rooted in the SFC modeling tradition and, therefore, classifying variables as stocks and flows in the same way as is done in SFC-models turns out to be challenging. This will become obvious when discussing Equations (4) and (5) of my original model below.

Specifically, Johnson questions the following equations, where the numbers of the equations refer to the model in Binswanger (2009).

Equation (2)

Johnson observes that in my original model (Binswanger, 2009, p. 714), profits in the consumption-goods sector are calculated not by using the wage bill of the consumption-goods sector in the current period, WC_t, but instead by using last period's wage bill, WC_{t-1}. The original Equation (2) in my model is restated here as Equation (6):

$$\Pi_t = C_t - WC_{t-1} - Z_{t-1} - dK_{t-1}. \tag{6}$$

Johnson suggests using the current wage bill as well as current interest payments in order to calculate current period's profits. He replaces Equation (6) with Equation (6A):

$$\Pi_t = C_t - WC_t - Z_t - dK_{t-1}. \tag{6A}$$

Comparing (6A) to (6), we see that the wage bill WC_t and the interest payments Z_t are moved one period ahead in time.

In fact there is no clear reason why we should prefer (6A) to (6) or vice versa. It depends a lot on the exact nature of the business we are looking at. The basic timing assumption of my original model was motivated by the premise that production takes time. In a discrete-time framework, this premise can be built into the model, by assuming that goods, which are produced during period $t-1$, will be sold in period t, as implied by Equation (6). From an accounting standpoint, this means that the previously produced goods show up as inventory in a firm's balance sheet at the end of period $t-1$. Thereafter, in period t, these inventories will be sold but they are valued at the original cost, which is the production cost in period $t-1$. This would speak in favor of using Equation (6) instead of (6A). But in reality many products are also sold in the same period as they are produced. In this case Equation (6A) would be more appropriate. However, it turns out that it does not make a big difference whether we use Equation (6) or (6A) because the growth imperative can be established by using either of these equations (see below)

Equations (4) and (5) and the issue of stock-flow inconsistency

The original Equations (4) and (5) of Binswanger (2009) are restated here as Equations (7) and (8):

$$I_t = r\Pi_{t-1} + cL_t, \tag{7}$$

$$WC_t = (1-c)L_t. \tag{8}$$

These equations explain how investment I_t and the wage bill WC_t are financed. Equation (7) shows that investment is partially financed by retained profits from the previous period, $r\Pi_{t-1}$, and partially by loans, L_t, The wage bill WC_t is also financed by loans, where the parameter $c(0 \leq c \leq 1)$ indicates the portion of loans that is used for financing investment and, therefore, $1-c$ is the portion that finances the wage bill.

Johnson criticizes these equations for not being consistent with respect to the distinction between flows and stocks. He states that the choice of discrete time means that quantity variables in the model have the dimension of stocks, irrespective of their conceptual dimension. "All magnitudes enter equations on the same ground—as stocks—and thus can be specified and operated on *as if* no distinction between stocks and flows existed."

From a purely mathematical point of view, Johnson is certainly correct but this is not really an issue in my original model. There, all variables are implicitly defined with respect to a certain time period. In fact, consumption is consumption per period of time and the same is true for investment, loans and all other variables except for real capital. Loans are used in each period for making payments as indicated by Equations (7) and (8). This is most obvious if we assume that firms always pay back all their loans L_t at the end of each period t and then borrow an amount L_{t+1} in period $t+1$ (Binswanger, 2009, p. 715). In this case, loans are equal to the flow of money that is used for making payments during one period.

A constant amount of bank loans provides the "revolving fund of finance" (Keynes, 1937, p. 247; see also Wray, 1991, p. 956), which allows firms to finance a constant level of spending. In my original model, households, firms, and banks spend their income once, which implies that the income velocity of money is constant and equal to one (Binswanger, 2009, p. 711). From this perspective, there is no stocks of loans or of money in the model because all loans are paid back at the end of the period and, therefore, all money is destroyed again.[2] The only stock variable in the model is the capital stock K, whereas additions to the capital stock (investment) represent a flow variable.

Johnson postulates that in a stock-flow-consistent model, Equations (7) and (8) should be replaced by:

$$I_t = r\Pi_{t-1} + c\Delta L_t, \tag{7A}$$

$$WC_t = (1 - c)\Delta L_t. \tag{8A}$$

In Equations (7A) and (8A), loans L_t have been replaced by their first differences ΔL_t. However, this formulation leads to an inconsistency in my original circular flow model. There, all existing loans, and not only the increase from one period to the next, constantly have to be spent again during a period of time in order to finance a portion of investment and the wage bill. If, however,

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[2] Of course, we could also assume that loans are not paid back at the end of the period and, instead, they are rolled over to the next period. In this case there is a constant increase in loans from one period to the next, insofar as loans grow at a specific growth rate in the steady state. However, even under this assumption, all preexisting loans ("stocks") are spent again together with the additional loans in each period. Therefore, the previous "stock" of loans plus the change in loans is equal to the flow of money in the economy.

only the increase in loans from one period to the next is used for financing a portion of investment and the wage bill, as indicated by Equations (7A) and (8A), it implies that money created by previously granted loans, to a large degree, stops circulating in the economy. Only the fraction of money that is saved by firms (retained earnings, $r\Pi_{t-1}$) is respent during the next period in this case. The larger fraction of loans, and therefore money, disappears from the circular flow of money, which does not make sense.

Johnson is aware of the substantial change that he introduces in my original model by replacing the increase in loans, ΔL_t, for loans, L_t, in Equations (7A) and (8A). He states that in this case both investment and the consumption-goods wage bill are diminished by cL_{t-1} and $(1-c)L_{t-1}$, respectively. And since investment is equal to the investment-goods wage bill by equation and all wages are spent in the model, consumption spending, and therefore profits, is always lower than in Binswanger's model. A lower measure of current profits is part of the reason why the zero-profit growth rate in this [Johnson's] model is more restrictive than in Binswanger's model. He also recognizes the fact that in Binswanger's model loans are a flow, while in the alternative [Johnson's] model loans are a stock. But he insists on the fact that loans have to be treated as a stock, which is inconsistent with the idea of a circular flow model as in Binswanger (2009). This is also the reason that Johnson gets an unrealistically high zero profit growth from his model (see Equation [11]).

Equations (9) and (10)

Johnson also challenges the timing assumptions in Equations (9) and (10), which in my model were stated as:

$$Z_t = zL_t, \tag{9}$$

$$WB_t = bZ_{t-1}. \tag{10}$$

Equation (9) denotes the interest payments on loans from firms to banks and Equation (10) shows how banks finance their wage bill by paying a portion b of their interest income to their employees. Johnson argues that, in fact, interest paid in this period is related to loans from the previous period. The correct specification of interest payments in this case would be captured by Equation (9A), which should be used instead of Equation (9):

$$Z_t = zL_{t-1}. \tag{9A}$$

This is a valid argument since we can assume that bank's interest income in the current period is determined by loans granted to customers during the previous period. However, using Equation (9A) instead of Equation (9) leads to a problem, as mentioned by Johnson. If Equation (9A) replaces Equation (9) while keeping Equation (10) unchanged in the model, this implies that the current wage bill of the banking system equals some fraction of interest income received two periods ago, which is difficult to make sense of.

Therefore, Johnson also proposes an alternative specification for Equation (10):

$$WB_t = bZ_t = bzL_{t-1}. \tag{10A}$$

Equation (10A) avoids the problem that the current wage bill of the banking system, WB_t, depends on interest income of banks received in period $t-2$, as would be the case if we combine Equation (9A) with Equation (10). However, the timing assumption of Equation (10A) seems to be rather arbitrary, insofar as, according to this equation, the wage bill of banks in the current period is financed by interest payments, which are received in the current period as well. In the end, it does not make a big difference whether we use Equations (9) and (10) or Equations (9A) and (10A) because in both cases the current wage bill of banks is financed by interest payments coming from loans granted in the previous period.

Calculating zero-profit growth rates in alternatively specified models

In his paper, Johnson derives what he calls a "stock-flow-consistent zero-profit growth rate" by replacing my original Equations (2), (4), (5), (9), and (10) (Equations [6], [7], [8], [9], and [10] in this paper) with Equations (6A), (7A), (8A), (9A), and (10A). Analogously to Binswanger (2009) he establishes the steady-state condition, where profits (and also the other variables) grow at the same rate as loans (see Johnson's Equations [12] to [32]). Then he defines a particular steady state in which profits are always zero, which allows calculating the stock-flow-consistent zero-profit growth rate, w_0·(Johnson's Equation [32]):

$$w_0' = \frac{z(1-b) + \sqrt{(-z(1-b))^2 + 4cdz(1-b)}}{2c}. \tag{11}$$

However, it turns out that Equation (11) requires unrealistically high zero-profit growth rates. Using the same parameter values as in Binswanger ([2009], p. 721) $c = 0.4$, $z = 0.1$, $d = 0.1$, and $b = 0.8$, Johnson gets a stock-flow-consistent zero-profit growth rate, w_0', of 10 percent instead of a zero-profit growth rate, w_0, of 0.45 percent as in Binswanger ([2009], p. 722). This means that the economy has to grow at a growth rate of at least 10 percent in order to enable firms to make positive profits in the aggregate!

However, as mentioned before, this result is caused by the fact that Equations (4A) and (5A) are inconsistent with the setup of my original model. These equations imply that a large fraction of previously created money ("stock of loans") disappears from the circular flow of money after having been spent once. This is clearly at odds with the idea of a circular flow model, where all money is constantly respent during each period.

Therefore, I suggest keeping the original Equations (4) and (5) in Binswanger's ([2009]) model and consider the replacement only of Equations (2), (9), and (10) as a useful respecification of this model. I will show what happens to the zero-profit growth rate, if we use the modified Equations (6A), (9A), and (10A) instead of Equations (2), (9), and (10) in my original model. Proceeding again exactly as in Binswanger ([2009], pp. 717–720), I assume that all variables grow at the same rate w in the steady state and define a particular steady state, where profits are always equal to zero. In this case we can calculate the corresponding zero-profit growth rate, denoted w_0^a, for the alternatively specified model, which is equal to:

$$w_0^a = \frac{-c + z(1-b) + \sqrt{(c - z(1-b))^2 + 4dcz(1-b)}}{2c}. \quad (12)$$

Equation (12) is very similar to Equation (23) in Binswanger ([2009], p. 720). If again we use the parameter values of $c = 0.4$, $z = 0.1$, $d = 0.1$, and $b = 0.8$, we get a zero profit growth rate w_0^a of 0.52 percent instead of a zero-profit growth rate of w_0 of 0.45 percent as in the original model of Binswanger ([2009], p. 722).[3] The magnitude of the zero-profit growth rate is only slightly

[3] As also suggested by Johnson, the zero-profit growth rate in the alternatively specified model is slightly higher (0.52 percent instead of 0.45 percent) because of the higher cost of production in Equation (6A) as compared to Equation (6). Equation (6A) uses the current wage bill, whereas Equation (6) uses last period's wage bill, which, in a growing economy, is lower than the current period's wage bill.

affected by the different timing assumptions of Equations (6A), (9A), and (10A), and the growth imperative can be established again. The result shows that the finding of a growth imperative is quite robust with respect to the exact temporal ordering of income and expenses.[4]

Conclusion

All three papers in this symposium suggest that there is a growth imperative in a circular flow model of a capitalist economy as postulated by Binswanger (2009). This is also true if Binswanger's (2009) model is modified in various ways, as is done in the papers of Gilányi and Johnson. The result is based on some premises that are tacitly accepted by Gilányi and Johnson (with the exception of Premise 2). These premises were stated in Binswanger (2009, p. 712) and may be briefly repeated here:

1. An increase in firms' aggregate spending must be financed by credit expansion of banks (an increase in the money supply) and cannot be financed by additional saving, because in this case the increase in aggregate demand by investment spending is offset by a corresponding decrease in consumption spending.
2. Production takes time. The output of goods produced in the current period is not available for sale until the next period.
3. The aggregate business sector must be able to realize profits, meaning that the sum of profits (after interest) of successful firms must exceed the sum of losses of nonsuccessful firms.
4. Banks have to increase their capital on the liability side of their balance sheet (equity and reserves) along with the increase in loans, as a certain fraction of loans (a risky asset) must be covered by owners' capital. Therefore, a portion of banks' income is not put back into circulation but is used to increase banks' capital, which does not represent money.

The alternatively specified model presented in Equation (12) shows that Premise 2 (production takes time) is not necessary to establish the existence of a growth imperative.

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[4] I will not further discuss Johnson's comments on Gilányi's note. Johnson mainly compares his "stock-flow-consistent zero-profit growth rate" (Equation [11]) to a minimum growth rate that one would get by also respecifying Gilányi's model. However, I have argued that the "stock-flow-consistent zero-profit growth rate" is derived from an inconsistent respecification of my model.

However, the symposium also shows that there can be confusion about details due to different timing assumptions, methods of modeling, and the definition of stocks and flows. Using a discrete-time framework seems to be particularly vulnerable to such confusions (see Johnson). Therefore, it would be interesting to see whether the growth imperative can also be derived by using a continuous-time framework such as in Keen (2009).

Let me also point out why I think that research on the growth imperative is important and merits further research. Establishing the existence of a growth imperative is much more than a purely academic exercise. If, indeed, there is a growth imperative in our capitalist economies, it will challenge our outlook on future economic development in capitalist economies in important ways. This may be illustrated by the following empirical findings:

- There have been declining growth rates in some developed countries more recently, and some economists think that the period of high growth rates are over (see, for example, Gordon, 2012). Therefore, the question arises, whether current economies can function with low growth or no growth at all, if there is a growth imperative.
- Economic growth poses a challenge to concepts of sustainable development because growth is associated with negative effects on the environment and especially with climate change (see, for example, Smith, 2010). However, if there is a growth imperative, we may not be able to stop growing and ideas such as a steady-state economy (Daly, 1996) or degrowth (see, for example, Foster, 2011) may not be feasible in capitalist economies.
- Empirical research shows that growth does not increase average subjective well-being, beyond a certain average level of gross domestic product per capita in developed countries (see, for example, Easterlin et al., 2010). Therefore, economic growth may also be questioned from an economic viewpoint. If growth does not add to people's subjective well-being, it cannot be considered a valid economic goal (Binswanger, 2006). But if there is a growth imperative, we face a major dilemma. On the one hand, growth does not make people any happier (on average), but on the other hand we are forced to grow because otherwise our economies go into a downward spiral.

All of these topics are part of ongoing discussions and I hope that this symposium will stimulate further research on the growth

imperative.[5] We are still at the beginning of understanding this important phenomenon, which seems to characterize capitalist economies.

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[5] Wenzlaff et al. (2014) is a recent German-language example of a discussion of the growth imperative.