A Defense of the Rothbardian Structure of Production
By Patrick Newman

Abstract: This paper offers a defense of the Austrian theory that states the proportion of consumption relative to investment determines the interest rate in society. It analyzes the implications of changes in the demand for present goods on the time market and makes the case that this demand is strictly derivative of the total amount of money spent on consumption. In addition, it investigates how concomitant changes in time preference and the money relation affect the structure of production. Finally, this paper concludes with remarks on the relationship between the interest rate and the length of the structure of production.

Introduction

When most schools of economic thought deal with the macroeconomy, they focus on holistic aggregates relating to investment and national income accounting. Little focus is given to each stage of the economy and how they are related. In addition, all attention concerning the interest rate is concentrated on the loanable funds market and as a stimulus to spending. Few theories in modern macroeconomics investigate how an interest rate coordinates production across time or its manifestation as the general rate of return in the economy. Instead, the interest rate is a tool that central banks can manipulate to achieve desired output goals. The structure of production and the heterogeneity of capital are neglected.

However, throughout the development of modern macroeconomics, the Austrian school has challenged these ideas and remains one of the few groups who take the concept of a structure of production seriously. Although Ludwig von Mises first discussed the Austrian Business Cycle Theory in his A Theory of Money and Credit (1912), explaining how changes in the money relation induced by credit expansion could distort the economy, F.A Hayek was the first Austrian economist to develop a graphical representation of the capital structure in Prices and Production (1931). Advancing Austrian economics further, Murray Rothbard integrated Mises’ interest rate theory with Hayek’s graphical analysis in Man, Economy, and State (1962). As Professor Salerno writes, “One of Rothbard’s greatest accomplishments in production theory was the development of a capital and interest theory that integrated the temporal production-structure analysis of Knut Wicksell and Hayek with the pure-time-preference theory expounded by Frank A. Fetter and Ludwig von Mises”.

Rothbard’s treatise presents the Austrian interest rate framework in its most lucid form, and virtually all Austrian scholars in capital theory have extensively centered their ideas off of his and Hayek’s contributions.

Although initially developed by Mises and Hayek, as stated above, Rothbard presented the relationship between the interest rate, capital structure, and the proportion between consumption and

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2 See books such as Mark Skousen’s The Structure of Production, Huerta De Soto’s Money, Bank Credit, and Economic Cycles, and Roger Garrison’s Time and Money.
savings in the clearest and most logically deduced form. In Man, Economy, and State (from now referred to as MES), Rothbard explains the capital based growth that underlies Austrian macroeconomics. The basic growth scenario entails a fall in time preferences which decreases the proportion of consumption to investment spending. This lengthens the structure of production and leads to a lower interest rate. This time preference induced growth is fundamental to all current Austrian macroeconomics since it provides the basis for the macro generalizations made about the interest rate and the capital structure. According to such generalizations, the above scenario occurs for all decreases in time preference, while the opposite occurs for increases.

However, in a series of recent papers, Professor Jorg Guido Hulsmann criticizes this principle and instead states “the aggregate proportion of consumption to savings is not systematically related to the interest rate” and that a lower interest rate may actually lead to a shorter structure of production. Hulsmann challenges the standard Austrian exposition of growth and presents the case for other types of macroeconomic progress exhibited through changes in time preference. Most of Hulsmann’s analysis is based on the accusation that Austrian economic theory has neglected the demand side of the time market and therefore developed its conclusions prematurely without analyzing all possible changes in time preference.

Hulsmann is right in stating that Austrian economics has explicitly mentioned very little about the demand side of the time market. In MES, Rothbard analyzes its derivation in Chapter 6 of MES and mentions it briefly in Chapter 8, but does not go on much further. Other Austrian literature that mentions the demand side includes Salerno (2000) and Garrison (2001). In addition to the apparent Austrian focus on the supply side of the time market, most Austrian economists have analyzed growth occurring when both savings and consumption change in opposite directions with the money relation remaining constant. Little has been written or expressed graphically on changes in the structure of production when both the interest rate and money demand change.

Hulsmann presents a strong accusation and a well developed case that presents serious challenges for current Austrian macroeconomics to deal with. If correct, Austrian macroeconomics and its theories on time preference, the interest rate, the structure of production, and savings based growth would have to undergo a massive revision, as Hulsmann has attempted to do in his papers. However, Hulsmann is in error when he makes the claim that the proportion of consumption to

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4 These critiques are presented mainly in the papers “The Structure of Production” (2011 forthcoming) and “Time Preference and Investment Expenditure” (2008). Hulsmann also mentions his concepts briefly in “The Demand for Money and the Time-Structure of Production” (2009).

5 This neglect of the demand side of the time market is the basic shortcoming of the conventional [Austrian] theory, as criticized in the present paper. Ibid., p.19.

6 See “Does the Concept of Secular Growth Have a place in Capital Based Macroeconomics” and “Time and Money”, respectively. Although Garrison does not analyze the demand side expressed by the original factors, as critiqued by Salerno (2000), he analyzes the implications of an increase in the demand for loanable funds by both the private sector and government. The present paper will not discuss Garrison’s macroeconomics and instead will focus on Hulsmann’s work.

7 For example, a decrease in time preference when only consumption falls and no new savings are put out on the market. Rothbard mentions this briefly in Chapter 11 of MES, but does not elaborate in detail.
savings is not systematically related to the interest rate. As a result, his theories concerning the interest rate and the length of the structure of production lead to the wrong conclusions. Instead, this paper will defend the Rothbardian assertions that the aggregate proportion between consumption and investment is positively related to the interest rate, the length of the structure of production is negatively related to the interest rate, and that in capital based macroeconomics, the structure of production can only grow through lower time preferences.

**A Brief Review of Time Preference and the Interest Rate**

In order to clearly explain Hulsmann’s critique and the present author’s reservations with it, this paper will start with a quick summary of time preference and its relationship to the interest rate. The Law of Time Preference states that a present “good” is preferred to a future “good”. A present good can be defined as consuming a good “now”, or in the practically immediate future, while a future good is the expectation or embodiment of consuming a good at a later date. All future goods require saving, defined as the postponement of consumption, and investment, defined as the accumulation or construction of factors of production or indirectly serviceable goods. Given a strict means-end relationship, all investment implies relinquishing present consumption, and all saving implies current action that is not directly satisfying a want and thus is indirectly serviceable. Therefore, savings and investment are two ways of describing the same thing. An actor will in invest factors, or future goods, exclusively for the purpose of consuming at a future date.

Actors always discount future goods by some amount since they will consume them at a later date and they must forgo present goods in the meantime. Therefore, present goods always command a premium over future goods, and an actor will only postpone the consumption of present goods for a greater amount of the same good or a different good yielding higher satisfaction in the future. An actor will only give up a present good for the same good in the future if he is to receive a greater amount that compensates him for his time preference premium.

The ultimate factor controlling his decision to invest in future consumption is his time preference and discount on future goods. A higher time preference implies a higher discount of future goods, a greater premium on present goods, and a greater likelihood that an actor will not postpone consumption in favor of a larger future consumption, while a lower time preference means the opposite. The degree to which future goods are discounted is called an actor’s rate of time preference. Another way of stating this is the degree to which present consumption is preferred to future consumption, or the degree to which an actor prefers present goods to future goods. Therefore, using the definitions of present and future goods stated above, an actor’s time preference rate can be described as the degree to which he prefers consumption to investment, or the relative proportion between consumption and investment. In the catallaxy, or the monetary economy, this can be defined as the proportion of money spent on consumer’s goods relative to investment goods in a given “round” of economic activity.

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8This paper will also not discuss criticisms of the theory of time preference. It will only analyze the logical implications of a theory of time preference, and will not defend the theory of time preference per se.
Time preference and the concepts of present consumption versus future consumption are intimately related to the interest rate. Although in present economics the interest rate is commonly thought as the price of present money on the loanable funds market or the opportunity cost of holding money, the interest rate is actually the price of all time and permeates every stage of the production structure. It is the “discount” placed on future goods and determines whether a potential action or investment opportunity should be taken. As stated above, this discount is placed on future goods because present satisfactions must be forgone in the meantime. Therefore, in a world of certainty where an actor knows or expects to get a greater sum of present goods in the future, a certain bare minimum is needed in order for an actor to part with his present goods in return for future goods. This return, or “the premium commanded by present goods over future goods” is known as the interest rate and an actor’s rate of time preference expressed in the market.\(^9\)

It is important to remember that money is only a “present good” or a “future good” when it is being supplied or demanded on the time market. If its availability is not relinquished through exchange on the time market, then money is neither a present nor a future good because it is still accessible. It instead, to put bluntly, is just money, and enters an individual’s cash balance and does not interfere with his stock of present and future goods. Rothbard distinguishes saving and hoarding through availability, stating “If a man wants to “save” money for some future use, he may “hoard” it rather than spent it on a future good, and thus have it always available.”\(^10\)

Since money is a general medium of exchange and can purchase all goods, it aggregates all an actor’s discounts and represents his general premium on present goods versus future goods. In a market economy where there is a general medium of exchange, money spent on investments represents present goods forgone because they could be spent on consumer goods now. The money an actor expects to earn from the investment correspond to future goods, since it is money that is received in the future and will eventually be spent on consumer goods.

It is important to reiterate, as Rothbard and Mises have done, that this interest rate is not limited to the money market and instead extends to all production processes where money is exchanged. In all stages of the economy present goods are supplied by savers, economically labeled as the capitalists, and demanded by factors of production in exchange for future goods. Capitalists supply the present money both to the original factors of production and prior capitalists selling their finished product. In other words, capitalists supply present goods and demand future goods, while the original factors demand present goods and supply future goods. Factors receive this money and work on a production process to produce some future good, whether it is circulating capital or consumer goods. This good is given back to the capitalist and is sold for money. Market participants’ varying “discounts” on future goods and the different monetary returns among the economy will be aggregated to a general interest rate through long run arbitrage.

If the rate of return is higher in one line of production than another, capitalists leave the less attractive industry and head to the sector with the higher one and equalize returns. In the industry

\(^9\) Rothbard Man, Economy, and State p. 353
\(^10\) Ibid., p.386.
with the higher return, capitalists increase their demand for factors and bid up their prices, while the increased supply of goods from higher production lowers revenues among the competing firms. Both of these forces shrink returns in the industry. The decreased demand for factors and smaller supply of goods in the industry that capitalists leave accomplishes the opposite, raising returns. Capitalists continue this process until they have equalized all returns and moved the economy in a long run equilibrium state. This long run equilibrium is known as the Evenly Rotating Economy, an imaginary construct where the market has adjusted to all new data. In each “round” of activity, market participants make the same transactions over and over again. This equilibrium is never reached in the real world because data is always changing, which allows for discrepancy in businesses’ returns. The general interest rate that permeates the economy is the societal premium that present goods forsaken, or money that can be spent on consumption, command over future goods, or money earned from investments, in the catallacy.

All exchanges that occur in the production structure deal with both the present and future and are also part of the time market. The exchanges that occur can be represented like any other price through supply and demand schedules. Since all actors prefer present goods to future goods, the same amount of present goods received in the future will rank lower than that exact amount given up in the present. Only a greater amount of present goods earned in the future will rank higher than the amount forgone, and the exact amount depends on each individual’s particular time preference. For example, below is a simplified value scale on the time market

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\begin{align*}
$104 & \text{ of future money received in 1 year} > \\
2^{nd} \text{ unit of } $100 \text{ of present money forgone} > \\
$103 & \text{ of future money received in 1 year} > \\
1^{st} \text{ unit of } $100 \text{ of present money forgone} > \\
1^{st} \text{ unit of } $100 \text{ of additional present money received} > \\
$102 & \text{ of future money forgone} > \\
2^{nd} \text{ unit of } $100 \text{ of additional present money received} > \\
$101 & \text{ of future money forgone}
\end{align*}
\]

Due to the law of Marginal Utility, additional units of present money forgone command a higher price, while each additional unit of present goods demanded command a lower price. Therefore, in typical fashion, the supply curve slopes upwards while the demand curve slopes downwards. In this hypothetical example, at an interest rate equal to 3%, the actor will forgo one $100 unit of present money. At 4%, the actor will forgo two $100 units. However, at an interest rate of 2%, the actor will demand one $100 unit of present money. At 1%, the actor will demand two $100 units. Like any other price, individual value scales are aggregated to form general market schedules. As stated before, individual market interest rates and price spreads converge to a single, general interest rate, although changing market conditions continually upset the equalization. Rothbard portrays a long run aggregation with the following diagram, which shows that the interest rate is exclusively determined by time preference. 11

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11 Ibid., p.418
It is at this point of the derivation in the implications of time preference and the interest rate that this paper reaches Hulsmann’s central point of contention.

Hulsmann’s critique on the demand for present goods

Concerning the implications of time preference on the supply and demand schedules which determine the interest rate, up to this point Hulsmann has agreed with the logical deductions given by Rothbard. In Chapter 6 of MES, Rothbard briefly analyzes a decrease in savings, and then in Chapter 8 describes a change in savings and consumption more in depth. This typical Austrian growth scenario, elaborated with graphical interpretation provided by Hayek, Rothbard, and others, shows that the way an economy grows through time preference is a decrease in consumption and an increase in saving. On the time market, this is typically represented by a shift in the supply curve along a given demand curve, which always results in a change in the quantity of savings and the interest rate moving in opposite directions. From analysis of the scenario above, Rothbard deduces a law that links the proportion of consumption to investment and the interest rate in a systematic way. Stated by Rothbard:

“Each individual, on the basis of his time-preference schedule, decides between the amount of his money income to be devoted to saving and the amount to be devoted to consumption. The aggregate time-market schedules (determined by time preferences) determine the aggregate social proportions between (gross) savings and consumption. It is clear that the higher the time-preference schedules are, the greater will be the proportion of consumption to savings; while lower time preference schedules will lower this proportion...From this it becomes clear that the time preferences of the individuals on the market determine simultaneously and by themselves both the market equilibrium interest rate and the proportions between consumption and savings (individual and aggregate)...The important consideration, therefore, is time preferences and the resultant proportion between expenditure of consumer’s and producer’s goods (investment).”

Hulsmann criticizes this though, and states that Austrian analysis beyond this point incorrectly asserts that a change in consumption relative to investment is the only way the time market can change. Thus all later laws concerning coordination between spending proportions, the production structure, and the interest rate are prematurely stated and apply only in specific

12 Ibid., pp.400-404
scenarios. This is due to the fact that they apparently neglect demand side considerations of the time market.

Hulsmann’s main contention is that Rothbard failed to consider changes on the demand side of the time market. In his analysis, an increase in the demand for present goods along a given supply curve actually raises both the interest rate and the quantity of savings. Given this immediate change, savings and the interest rate increased while consumption stayed the same. This outcome stands in blatant contradiction with Rothbard’s rule that a lower proportion of consumption to savings results in a lower interest rate. In this example, it is in fact the higher time preference that resulted in a lowering of this proportion and a rise in the interest rate.\(^\text{13}\)

Initially, it might seem that Rothbard did a poor job and failed to investigate all the ways supply and demand on the time market interact. But closer analysis leads to the conclusion that a change in time preference is more complicated than both the example provided by Hulsmann and most typical Austrian writers on capital theory, and that the Austrian analysis provided by Rothbard does in fact take into consideration the demand for present goods.

What in fact is the demand for present goods? Excluding consumer loans, which are not fundamental to an economy, the demand for present goods is composed of the demand by original factors and the derived demand expressed by capitalists. In MES, Rothbard provides an example of an Evenly Rotating Economy’s structure and analyzes its flow of goods and money. In it, capitalists supply present goods and demand future goods while original factors demand present goods and supply future goods.

First, capitalists save present money and supply it to the original factors, who work on creating a capital good in a production process. They exchange it back to the capitalist who sells it to another capitalist for money, who earns just enough to cover his expenses and receive an interest return. The capitalist who bought the circulating capital then pays money to other original factors, who work on the capital good until it is again transformed and sold further down the pipeline, with just enough money to cover the capitalist’s expenses and allow an interest return. The process continues until the circulating capital is transformed into a good that is sold to consumers. The

\(^{13}\) Hulsmann Time Preference and Investment Expenditure pp.19-20
consumers’ money is paid to the capitalist in the last production stage and “fuels” future savings for another round of economic activity as it percolates upward through the economic structure.\textsuperscript{14}

\[D = \text{Demand for Present Goods by Future Goods}
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\[S = \text{Supply of Present Goods for Future Goods}
\]

\textbf{Figure 3: Aggregate Production Structure for all Goods}
\textbf{Source: Rothbard 2009, figure 45, p.391}

A more precise way of describing the capitalists’ time market function would be they supply present goods and demand future goods, or “present goods more distant in the future”, when they sell their product. Although capitalists demand present goods in the future, it is dependent on the amount of present goods capitalists are willing to save beforehand. Capitalists cannot demand present goods when they sell a product unless they have supplied present goods to factors in an earlier time period. Because of this, the demand by capitalists is “strictly derivative and dependent”, and “a capitalist’s activities are guided by his role as a supplier”.\textsuperscript{15} Thus, it is a derived demand, and the only autonomous demanders of present goods and suppliers of future goods are the original factors, which Rothbard calls either the independent or pure demanders of present goods.

As Rothbard describes them, “the pure demanders of present goods on the time market are the various groups of laborers and landowners—the sellers of the services of original productive factors”.\textsuperscript{16} In order to demand present goods, the original factors must supply future goods, and this supply is the original factor’s share of the present value of the good that is sold by the capitalist, also known as their discounted marginal value product. A DMVP is the marginal present value, provided by the sale of the marginal output from a marginal factor of production.

According to the Law of Imputation, the value of factors of production is dependent on the value placed on the consumer good. In the money economy, therefore, all prices for factors of production are strictly derivative of what consumers are willing to pay. Value is imputed backwards

\textsuperscript{14} This is not to imply that saving is autonomous and no sacrifice of present goods is required for capital formation. This analysis only suggests that consumer spending provides money from which capitalists can save from. Capitalists still must restrict their present consumption and not spend it on consumers goods. Rothbard shows that if one capitalist did not save and instead consumed his funds and no one stepped in to take over that particular production process, the production structure would collapse. Rothbard, Man, Economy, and State pp.399-400.

\textsuperscript{15} Ibid., p.407

\textsuperscript{16} Ibid., p.404
to the factors, and not forwards. Ceteris paribus, an increase in demand for a good raises its price and results in higher DMVPs for the factors used to produce it. At each stage, the future money that the factors supply on the time market, or their isolable DMVP, is strictly limited by the amount consumers are willing to pay for the end product of a production process. The total amount of future goods supplied in a given “round” is equal to all of the capitalists’ and original factor’s supplies of future goods.

However, an insight illuminated by Rothbard’s diagram is that capital goods, including both circulating and fixed capital, must analytically resolve themselves into being produced solely by the original factors as they are “‘stored-up’ labor, land and time…[and] capital is not an independent productive factor like [land and labor].”¹⁷ Capital goods earn no pure return, and their DMVPs can be traced back to original factors and interest. Since the same money that is spent by consumers supplies multiple transactions of future goods to capitalists, cancelling out these duplications of payments leaves the net supply of future goods, or net income. This net supply of future goods is equal to original factor income and interest income. Thus, original factor and interest income added together equals total consumption.¹⁸

Aggregated to the economy as a whole, the net income of original factors, or the independent demand for present goods, is limited by the aggregate amount of money spent on consumption in a given “round” of economic activity. If the amount of money spent on consumption determines the amount of future goods original factors supply, and the demand for present goods is limited by the supply of future goods, then the independent demand for present goods is strictly limited by the amount consumer’s spend. Overall, “it is consumption that provides the net income in the equilibrium situation…[and is] the “fund” out of which money prices and incomes are paid to original factors.”¹⁹ The total amount spent on consumption, therefore, is not equal to the total supply of future goods, but only the independent demand for present goods (the net income of original factors) and the net supply of future goods (the net income of capitalists). Consumption provides the fund for which net income is paid out of, and therefore only consumption can change the independent demand for present goods. This means that original factor’s cannot “demand” more present goods unless consumers are willing to increase their spending. For example, consider the chart above, but now with money figures:

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¹⁷Ibid., p.58
¹⁸Ibid., p.396. Commenting on income accounting statistics, Rothbard states “In analyzing the income-expenditure balance sheets of the production structure, writers on economic problems have seen that we may consolidate the various incomes and consider only the net incomes. The temptation has been simply to write off the various intercapitalist transactions as “duplications.” If that is done here, then the total net income in the market is…exactly equal to the total of consumer spending for the period.” Hulsmann also states “that aggregate net revenue…is equal to the aggregate sum spent on consumption, a necessary implication of the evenly rotating economy.” Hulsmann, Jorg. “The Structure of Production” (forthcoming) p.8
¹⁹Rothbard Man, Economy, and State p.524
The figure above illustrates a simple market with only one stage. It shows that an increase in the demand for present goods can only come about through an increase in consumer spending. Initially, $100 of present goods are supplied by capitalists at a 5% interest rate and $105 of future goods at a later date by the original factors. Since these future goods are derivative of the amount of consumption expenditure, the amount of future goods supplied by the original factors equals the total amount of consumer expenditure in a given round. Then, for example, following Hulsmann, the demand for present goods increases with an increase in the labor force and the new equilibrium price rises to 7% with $110 of present goods supplied. With these numbers, the total amount of future goods supplied is roughly $118, and therefore total consumption must be $118. Even with a vertical supply curve, the outcome is still the same: a greater amount of future goods exchanged, which can only occur from an increase in consumption spending. In order for an increase in demand, there must be an increase in the supply of future goods, and that increased availability can only occur through an increase in consumption.

When Hulsmann focuses on the demand side, he gives the example of an increase in the labor supply. Other examples of an increase in the demand for present goods include greater willingness to work, discovery of additional supplies of raw materials, and willingness to incur credit.\textsuperscript{20} Hulsmann says “An increase of the time preference of wage earners and land owners…[who] could have been ready to work at lower wage rates and to sell land services at lower prices; [would increase the demand for present goods] or there might have been an influx of new wage earners due to immigration”.\textsuperscript{21} In a similar vein, Salerno states that “an increase in the labor force in the stationary economy, \textit{ceteris paribus}, will increase the demand for present goods in the form of money savings”.\textsuperscript{22} The position seems to be any increase in the supply of original factors entails an increase in the demand for present goods.

But strictly speaking, without an increase in consumer spending, can this happen? The supply of labor might have increased, but unless consumer’s are willing to spend more, the demand

\textsuperscript{20} Hulsmann The Structure of Production p.13
\textsuperscript{21} Hulsmann Time Preference and Investment Expenditure p.19
\textsuperscript{22}Joseph Salerno, "Does the Concept of Secular Based Growth Have a Place in Modern Macroeconomics?," \textit{Quarterly Journal of Austrian Economics}, 4, no. 3 (2001): 58. Although Salerno later states that new laborers will spend their money on consumer’s goods, his analysis is not similar to ours.
for present goods cannot increase, and with a constant wage fund wage rates will just fall. The same occurs for all other examples Hulsmann provides, additional raw materials or new technologies per se found do not change affect the demand for present goods unless consumption or savings have increased. A simple example relating to any market is that the demand for a good can only increase when the supply of money offered by buyers increases. And without an increase in consumer spending, the supply of money offered by the original factors cannot increase.

One deficiency in Rothbard’s analysis is that he does not integrate his time preference supply and demand schedules with the typical diagram of a factor market. The supply schedule of a capitalist is not adequately juxtaposed with a DMVP demand curve. A key insight into interpreting both is that a movement along a nonunitary DMVP curve implies a change in the time preference schedule of the saver if he does not change the amount he pays to other factors. Following the saving schedule from the value scale provided above, at each rate of interest the saver provides an explicit amount of present goods. Only when the interest rate is higher or lower will the saver provide more or less. Holding the capitalist’s spending on other factors constant, moving along a DMVP schedule, ceteris paribus, the capitalist is willing employ different amounts of savings at the same interest rate (the same discount), which would in fact imply a change in value scales and in time preference if the DMVP is not unitary.

For example, at 3% interest rate a capitalist supplies $50 worth of present goods and $60 at 4%. Given no change in value scale, this is what the capitalist offers. Now, along the DMVP schedule for a factor, at a price of $5 the capitalist buys 10 factors (50) and at a price of $4 purchases 15 ($60). Now suppose there was an increase in the supply of the factor and the capitalist goes from $50 to $60 on the market. The capitalist’s supply schedule must have changed, ceteris paribus, since he now is willing to spend $60 in present goods at an interest rate of 3% (moving along the same DMVP schedule), whereas before he would only supply $60 at 4% interest rate. Bear in mind though when following the demand schedules, a capitalist will only increase the total amount he spends on factors when consumption increases, ignoring changes from a lower interest rate.

With the original factor demand for present goods clarified, it is now move on to an elaboration of time preference induced growth and defend the assertion that the proportion of consumption relative to investment is related to the interest rate in a definite fashion.

An Elucidation of Rothbard’s Growth Analysis taking into consideration the Demand for Present Goods

The above section argues praxeologically that consumer spending determines the independent demand for present goods. Although it has been stated that this pure demand by the original factors is derivative of consumption, this paper has not yet analyzed the implications for this in terms of savings based growth and how it can be graphically portrayed. Even in light of this implication, the savings based growth described by Rothbard and Hayek is still correct and that the

\footnote{Labor income can increase without a change in consumption, this will be explained below, but the central point remains that the demand for present goods is limited by the future goods supply}
aggregate proportion of consumption relative to investment is systematically related to the interest rate.

In any economic situation, during a given “round” of market transactions gross income is equal to gross expenditure. Rothbard breaks down this flow of money and income in his presented production structure, and the remainder of the paper will refer to his numbers.24

The total amount of gross income (418) is can be broken down into the gross income of capitalist 1(100), capitalists 2-6(235) and original factors (83). All together, capitalists 1-6 earn a gross income of 335 ounces. Gross Expenditure (418) is determined by the total amount of consumption spending (100) and total investment (318). Breaking down income further, capitalists 1-6 do not reap all 335 ounces of gold but must instead pay for the capital goods they use, made in earlier production stages, and to the original factors. Subtracting the amount paid to original factors (83) reduces the total to 252. Deducting original factor income twice in the analysis accurately traces the flow of money in the economy, with one payment coming from the consumption “fund” and the other coming from money saved by capitalists.

This fund represents the capitalist demand for present goods. From this fund of 252 comes capitalist’s interest income. Interest income in the economy is the rate of interest multiplied by gross investment, and in this case it is 17 ounces. Taking out that total leaves 235 ounces, and this is the amount spent on circulating capital at each stage of the economy. This is the summation of every exchange capitalists make for each other; it is the money that capitalists demand from the prior stage when they sell their good and the money supplied by capitalists from a later stage. Breaking down the numbers by stage reveals clearer numbers, i.e., $20 + 30 + 45 + 60 + 80= 235$. These numbers correspond to the shaded blocks in the figure above.

However, interest income has only been subtracted out of the consumption side, so it is only proper to take it out of the investment side as well. This is because money is spent in two places in

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24 Rothbard Man, Economy, and State p.390-398. All of his numbers and subsequent numbers are slightly imprecise due to rounding. Since Rothbard’s unit of money is gold ounces, the remainder of the paper uses ounces instead of dollars when discussing values of money.
the economy; first in the production structure as investors save money to spend on factors, and second by consumers, when they purchase finished products. However, only 12 ounces of interest are deducted, because the last payment of interest to capitalist 1 (5 ounces) comes purely from the consumption fund. This is because in all of the other stages interest comes from the other capitalists saving, but in the last stage it comes from consumer spending. This leaves us with 223 for the “pure capital fund”. This is only a name for the money saved by capitalists, that when looking at the gross volume of expenditures does not go to either the original factors or interest income. It is not meant to endorse a perpetual source of capital without savings. To reiterate, in the ERE all income can be traced back to original factor and interest income and capital does not earn a net return.

In summation, from these numbers the following identities can be shown:

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\begin{align*}
N.I \text{ of O.F by } S + N.I \text{ of cap. by } S + & \text{ pure capital fund } + N.I \text{ of cap. by } C + N.I \text{ of O.F by } C = TCS + TGI \\
(83) & \quad (12) & \quad (223) & \quad (17) & \quad (83) & \quad (100) & \quad (318) \\
N.I \text{ of O.F by } C + N.I \text{ of cap. by } C = & TCS \\
(83) & \quad (17) & \quad (100) \\
N.I \text{ of O.F by } S + & \text{ pure capital fund } + N.I \text{ of cap. by } S = TGI \\
(83) & \quad (223) & \quad (12) & \quad (318) 
\end{align*}
\]

These three equations clearly illustrate the allocation of money that occurs from the aggregate consumption and investment funds during a round of economic activity in the ERE. In Rothbard’s example, 100 ounces are spent on consumption and 318 are spent on investment. Analyzing the investment side, at each stage capitalists save present goods (the money invested) to purchase factors of production and sell them in a later stage.

Looking at it from the consumption perspective, consumers spend 100 ounces in the final stage; from which capitalist 1 reaps an interest return. With the remaining 95 ounces, capitalist 1 will save again and purchase the capital goods from stage 5 and buy original factors. He will then have the factors work on the fifth stage capital goods again until they are ready to be sold to consumers for 100 ounces. With the 80 ounces capitalist 2 receives from his sale to 1, he is able to earn an interest return as well as sufficient funds to purchase factors of production again. This process continues going backwards, and in an economy with successive rounds of activity is interlocked with the saving done by capitalists. The money supplied by consumption from round t is saved and used to purchase factors in round t+1.

These three equations will provide important tools in analyzing how changes in time preferences exert themselves both on the supply and demand for present goods. The demand for present goods by the original factors has already been proved to be determined by the amount of consumer spending. The demand for present goods by the capitalists, which Rothbard aptly labels as a derived demand, is not independently formed and instead determined by capitalist’s previous saving. When capitalists demand present goods, they are basing this demand off of a previous supply of present goods to original factors and earlier capitalists. When a good is ready to be sold and pushed further down the pipeline, the capitalist then “demands goods that are more distantly future than the product that he supplies…and he is therefore a net supplier of present goods, and a
net demander of future goods. Hence, his activities are guided by his role as a supplier. Therefore, when a capitalist’s supply of present goods changes, ceteris paribus, his demand for present goods also changes.

In addition, following Rothbard’s aggregate time market diagram shown above, curves for both components of the time market, the original factors and capital goods, can be constructed using Rothbard’s numbers. Adding up the quantities of present goods saved in each market for original factors and capital goods gives the three diagrams below. The Original Factors market is where interest and original factor incomes are determined and where consumption exerts its influence on the time market. The Capital Goods market shows the capitalist’s demand for present goods, and is where saving mainly exerts its influence on the time market. The last chart shows Total Gross Savings or Investment and is the summation of the other two charts. In this economy, 318 ounces are saved at a 5.2% rate of interest.

Turning Rothbard’s structure of production (Figure 5) sideways allows for a clearer illustration of the value accruing to capital at each stage. Turning the diagram shows the transformation of capital and the interest rate spreads in a stepping stone fashion. As capital moves from the left to the right, its monetary value increases at each stage until it is sold as a consumer good.

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25 Ibid., p.407
26 The computation for this and all future interest rates discussed are left for a later section.
Then, by combing the amount paid to the original factors with the money paid to capitalists at an earlier stage, the cumulative price spread is shown for a given capital structure. This allows for a smooth interest line instead of a jagged stepping pattern and greater graphical convenience.

The result leads to either the familiar Hayekian triangle, or a “Rothbardian trapezoid”. The present author is in agreement with Hulsmann that the Rothbardian trapezoid is more accurate, because spending at the last stage can never be zero. Most descriptions of Austrian growth are aided by either the changes in the configuration of a modified Hayekian triangle or Rothbardian trapezoid.

The traditional Austrian portrayal of savings based growth is exerted through a fall in time preference via a decrease in consumption and a rise in investment. Individuals in the economy voluntarily lower their time preference rate, or the degree to which they prefer present goods, or consumer goods, to future goods, or future consumption made available through investment. This leads to a lower premium on present goods over future goods and ultimately a smaller price spread and lengthier structure of production. First, individuals decrease their consumption. The decrease in consumption leads to a smaller “consumption fund” that finances interest and original factor income. With a decrease in consumption, this net income fund always declines. With this decrease, there is an absolute decrease in the supply of future goods offered by original factors. According to the Law of Marginal Utility, a decrease in the supply of the good forgone on a demand schedule increases the relative rankings of the good forgone to the good acquired, decreasing the demand.

27 Ibid., p.521. This graph is modified by taking out the line representing the smaller price spread from an increase in savings.
28 See Hulsmann The Structure of Production p.12 “But this is not quite correct, because spending in the last stage is not zero, even if only original factors are used. Rothbard is therefore correct in modifying the Hayekian figure into a trapezoid of the following form.
29 See Garrison, Hulsmann, De Soto, Rothbard.
curve. With a decrease in consumption spending, this is exactly the case for the original factors as their diminished supply of future goods lowers their demand for present goods, not because of a change in the labor supply, or amount willing to work, etc, but solely due to a smaller consumption fund.\textsuperscript{30}

What happens to both original factor and interest income individually is impossible to say. Since interest income is gross investment times the interest rate, total net income accruing to capitalists may increase or decreases depending on the relative elasticity in the interest rate and changes in investment spending. If time preferences are lowered and interest income increases, then there is a net decrease in the supply of present goods in the original factors market. Conversely, in addition to the increased supply from rising savings, with a decrease in interest income, ceteris paribus, there is an increase in the amount supplied to the original factors. For this analysis, the paper will assume interest income falls, and so there will be a shift in the supply curve for original factors on the time market. Therefore, with a fall in original factor and interest income, there is a decrease in the demand curve and an increase in the supply curve. If interest income decreases so much original factor income can actually increase, i.e. if the rightward shift in the supply curve compensates for the leftward shift in the demand curve.\textsuperscript{31} This depends on an extremely inelastic interest rate, and in most cases, it seems feasible to state that both interest and original factor income will fall.

On the other side of the time market, where the derived demand by capitalists is expressed, both the supply and demand curves increase. On the supply side, consumers have saved additional funds that can be spent on the capital structure. In addition, due to the decline in the consumption fund, capitalists now have to spend less on original factor and interest income. This allows for an additional source of funding for increasing investment in the production structure. On the demand side, due to the increase in investment spending, the demand for present goods also increases. As stated above, this is because a capitalists’ demand for present goods is determined by his supply, and his activities are based on this role. Thus, with a change in the absolute amount of investment spending, or present goods supplied, capitalists’ demand for present goods increases. However, the increased supply of present goods always outstrips the increased demand because there are two sources of funds for the increased supply of present goods (reduced money spent on net income and absolute increase in investment spending) while there is only one source for an increase in demand.

\textsuperscript{30} Rothbard Man, Economy, and State p.524. This analysis by Rothbard provides further evidence that he did not neglect changes in the demand side of the time market. If original factor income (generally) falls, how else can the quantity of present goods supplied to them decrease without a change in the demand side? Illustrations showing only a shift in the supply curve would lead to the conclusion that original factor income always increases, which theoretically is not true.

\textsuperscript{31} Ibid. “On the other hand, if the interest decline is large enough, it is possible that the fall in interest income will outstrip the fall in total net income, so that total factor income actually increases.” Huerta de Soto also states that “It is impossible to determine in advance whether or not the income capitalists receive in the form of interest will rise…it is also impossible to ascertain what will happen to the monetary income received by the owners of the original means of production.” Huerta De Soto, Money, Bank Credit, and Economic Cycles, (Auburn, AL: Mises Institute, 2006), 344.
(the increase in investment spending). Therefore, the supply of present goods increases and the interest rate falls.

Overall, the demand curve remains relatively constant and the supply curve shifts outwards, resulting in a typical illustration of a lowering of time preferences. Although the demand curve has remained constant, the composition of the demand for present goods has drastically changed, and the demand curves for the markets making up the general time market have also changed.

Using Professor Murphy’s numbers given in his Man, Economy, and State Study Guide, a numerical interpretation can be shown. In Professor Murphy’s example, consumption spending decreases by 20 while investment increases by 20. Consequently, the interest rate falls from 5.2% to 3.3%.

\[
\begin{align*}
\text{N.I of O.F by S + N.I of cap. by S + pure capital fund + N.I of cap. by C + N.I of O.F by C} &= \text{TCS + TGI} \\
\text{N.I of O.F by C + N.I of cap. by C} &= \text{TCS} \\
&= (83)(70)(17)(10)(100)(80) \\
\text{N.I of O.F by S + pure capital fund + N.I of cap. by S} &= \text{TGI} \\
\end{align*}
\]

The numbers in black are taken from the previous equations, and the numbers in red represent the calculations for the lengthier production structure. Both interest income and original factor income falls while the amount spent on capital goods increases. Looking at the last equation, the increase in saving provokes a decrease in present goods allocated to original factors and an increase to the “pure capital fund”. Even if original factor income were to increase, the pure capital fund will always increase since the increase in the original factor income must come through a decrease in interest income. With a fall in time preference, the relative size of the pure capital fund to total expenditures in the economy always increases.

As mentioned above, the decrease in time preference provokes a drastic restructuring of the economy according to the new amounts spent on consumption and investment. The decrease in consumption reduces the total revenues of consumer goods industries and leads to a lower demand and prices for their factors of production. Although consumer spending and total revenues for businesses have fallen, the increase in investment funds can be used to lower average costs of

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production and thus maintain or even increase profit margins temporarily. This lowering of costs is achieved by pushing investment outward into more roundabout production processes and the creation of additional capital goods. This increases output relative to costs, and allows businesses to maintain a profit margin even though their revenues have decreased. Roundabout production processes are processes that take more time but are more physically productive and increase total output.33

In addition, if the newly saved money first enters the loanable funds market, the loan market rate of interest drops. The loan market rate of interest is only a subsection of the capital goods market, and therefore is not an independent time market that helps determine the pure rate of interest. The loan market rate of interest, or as Mises calls, the “gross market rate”, is an important calculating device that economic agents use to determine the feasibility of investment projects. Actors discount money earned from investments because of time preference, i.e., the fact that the funds are received in the future and present money must be spent on the project. As stated earlier, this discount is society’s premium that present goods holds over future goods. A higher premium reflects higher time preference and individuals’ desire to consume more in the present compared to the future, while a lower discount reflects lower time preference and greater thriftiness. Consequently, a lower discount increases the profitability of long term projects relative to shorter ones. Due to the nature of present value calculations, at a lower interest rate money received in the long run will be worth relatively more than sums received in the short run future because it is discounted less.

As a result, low interest rates increase the profitability of long term production processes while higher interest rates decrease their viability. This corresponds to individuals’ decreased premium on consumption in the present and their increased desire to consume in the future. Thus the loan market interest rate efficiently coordinates production across time and is an important signal for market participants. Businesses will use any new savings that enters the loan market to embark on longer more productive production processes to decrease their current costs and increase the supply of consumer goods in the future.

The decrease in costs due to the underpriced factors resulting from the increase in investment spending and the release of money from the consumption fund “causes aggregate profits to appear in the economy, concentrated in the new production processes in the higher stages.”34 Because the aggregate profits originate in sectors utilizing longer production processes, entrepreneurs will shift factors of production from the relatively less profitable industries with shorter production processes to the lower cost, more roundabout ones.

33 Mark Skousen gives a counter example to the claim that a decrease in consumer spending will result in a decline in profits and a layoff of workers. Using the automobile industry, Skousen correctly states that “the new savings will increase the pool of investment capital...[allowing] businesses to upgrade their facilities, replace old equipment (such as old computers), and invest in research and development. It may even allow automobile companies to create new, better facilities to build more and cheaper cars for the future. A fall in consumer spending will be offset by a rise in business spending.” Mark Skousen, The Structure of Production, (New York, NY: New York University Press, 2007), xx.

34 Rothbard Man, Economy, and State p.524
Although skillful entrepreneurs have managed to maintain or increase their profit margins by lowering costs, this is a temporary phenomenon. As time goes on, the competition between capitalists in different industries bids up factor prices and increases the supply of goods sold in those sectors. Both of these lead to the elimination of profits by bidding underpriced factors up to their discounted marginal value products and equilibrating all returns to the pure rate, according to society’s time preferences. The ultimate result of this lowering of time preference is a capital structure with longer production processes and a greater output of consumer goods. The increase in supply of consumer goods raises real wages and the standard of living.

The opposite occurs with an increase in time preferences and a constant money relation. People spend more money on consumer goods and save less. The decrease in the supply of savings lowers business investment. The drop in business investment manifests as an abandonment of longer production processes and a rise in costs relative to output, increasing average costs. Savings that are taken out of the loan market raise the interest rate and increase the profitability of shorter production processes, signaling economic agents increased desire to consume in the present. In addition, since the rise in consumer spending means an increase in the net income fund, capitalists must devote an increased amount of money to it relative to capital goods. The rise in costs, the overpriced factors from the decrease in investment spending, and the diversion of savings to the consumption fund cause aggregate losses. Since the decrease in investment and profit loss is concentrated most heavily in the roundabout production processes, factors as well as entrepreneurs shift away from these funds and towards shorter production processes. The decrease of entrepreneurs from these sectors lowers the demand for factors and decreases the supply of goods produced. Both of these lead to a higher nominal rate of return. The ultimate result is a decreased supply of consumer goods and lower real wages, the opposite consequences from a fall in time preference.

**Austrian Growth Analysis with a Change in the Money Relation**

In Chapter 8 of MES, Rothbard explored changes in time preferences with a constant money relation, reminding the reader that the analysis has “been making the implicit assumption that the “money relation”—the demand for, and particularly the supply of, money—remains unchanged.” The present author defines the money relation in this context as the amount of money spent during a given “round” of economic activity. Here, it does not refer to the purchasing power of money. Even with a constant money relation and a lowering of time preference, the purchasing power of money rises due to the increased supply of goods exerted through a higher exchange demand for money. In addition, “the demand for money increases to the extent that each gold unit must “turn over” more times in the increased number of stages, thus tending to lower the “general level” of prices.”

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35 Ibid., p.526
36 Joseph Salerno, "An Austrian Taxonomy of Deflation—With Applications to the U.S.,” *The Quarterly Journal of Austrian Economics*, 6, no. 4 (2003): 83, “The aggregate supplies of goods therefore constitutes...the “exchange demand” for money...hence, if supplies of certain goods in the economy increase due, for example, to increased saving and investment in additional capital goods...the exchange value of a dollar will thus be bid up...and a deflation of prices will ensue.”
37 Rothbard Man, Economy, and State p.527
Although he alluded to changes in time preference with a changing money relation, he did not explain its impacts on production and the capital structure in detail. In addition, little analysis is explicitly given on how a change in time preferences and the money relation affect the time market diagrams. Although not plainly described in detail by most writers on capital theory, the effect of a change in time preference and the money relation leads to the same conclusions as described above. These changes can be portrayed on a time market graph utilizing shifts in the demand for present goods. In order to reinforce this paper’s argument that the proportion of consumption to investment determines the interest rate, changes in both time preference and the money relation must be discussed in detail. Below this paper discusses two such changes: a change in consumption with savings held constant and a neutral change in the money relation.

**(1) A change in consumption with savings held constant**

Unlike before, where economic analysis could not give a systematic result for interest income with a change in time preferences, a change only in consumption always provokes a predictable change in interest income. Since a change solely in consumption affects the interest rate and not investment spending, interest income follows a positive relationship with consumption spending. A decrease in consumption spending lowers interest income, while an increase raises it. Similar to above, in the original factor markets a decrease in consumption shifts the demand for present goods to the left and an increase in the supply of present goods offered due to lower interest income. Since the interest income always decreases, the likelihood of original factor income increasing is higher, although the most likely outcome still is both falling.

On the other side of the time market, even though the absolute amount of investment spending remains constant, the supply of present goods offered increases. This is because the consumption fund has declined and the amount going to interest and original factor income decreased. Since capitalists no longer need to devote as much to this fund, they can instead spend more of their savings on capital goods. The supply of savings increases by the amount that the net income fund decreased, and along a constant demand curve the result leads to a lower rate of interest. Unlike before, the demand for present goods has not increased because the absolute supply of present goods offered on the time market has not increased. The ultimate outcome is a decrease in the demand and an increase in the supply of present goods by an equal amount, leading to a lower interest rate and a constant quantity of savings.

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38 If the demand for present goods is assumed to be held constant, then there is no way for a change in the interest rate to occur that does not involve a change in the quantity of present goods supplied.
39 De Soto does briefly discuss the effects of a decrease in consumption and a rise in cash balances and its effects on production in Money, Bank Credit, and Economics Cycles p.448. However, he relies on the “Ricardo Effect”, a phenomenon that the present author does not agree with, and thus his analysis is different than what is described below.
40 If original factor income increases, then the amount that is supplied on the capitalist time market must decrease with constant savings. This effect leads to a decrease in the supply and demand for present goods, with the demand for present goods falling more, resulting in a lower rate of interest and a decreased supply of savings on the capital time market. Overall, the demand and supply of present goods changes by an equal amount with the result being a lower interest rate and no change in the quantity of savings.
Below is a numerical example of decreasing consumption and constant savings. In this example, consumption decreases by 20 while investment remains at 318. The interest rate falls from 5.2% to 3.6%. The pure capital fund has increased, although not as much as before due to the relatively higher time preference.

\[
\frac{C}{I} = \frac{80}{318}
\]

In this example, the decline in consumption has led to the same decline in net income as before. Although interest income has changed slightly from the previous example, due to rounding, the numbers presented here are the same. However, even though investment spending has not absolutely increased, the money allocated to the pure capital fund still increases because capitalists can devote a greater supply of their constant savings to purchasing capital goods instead of spending it on net income. The release of savings from the net income fund enables the economy to embark on the same restructuring of the capital structure when there is a lowering of time preference with a constant money relation.

To reiterate, the decreased consumer lowers business revenues, particularly firms providing consumer goods in short production processes. Although investment spending has not increased, because the DMVPs of the original factors in these industries have fallen, assuming that the supply of savings has not changed, entrepreneurs can devote these released savings to the construction roundabout production processes. These processes increase output and lower average cost, allowing businesses to maintain their return. The excess savings can also be put in the loan market, which lowers the interest rate and increases the profitability of long term projects. Due to the cost cutting and the decline in the net income fund, aggregate profits occur, concentrated in longer production processes. An additional incentive to embark on longer production processes occurs because these industries have not yet experienced a decline in revenue, and entrepreneurs shift factors and bid down returns in these industries, lowering the rate of return in the long run.
The only difference is that the capital structure does not lengthen as much as it would have with an increase in saving. This is because the fall in time preference has coincided with a rise in money demand, preventing the supply of savings to rise. Whereas before there was an absolute increase in savings and a decline in the net income fund that fueled investment spending, with a constant supply of savings there is only a decline in the net income fund. The fall in time preferences is smaller than before due to the fact that the proportion between consumption to investment falls less with only a decrease in consumption than when consumption decreases and investment increases. In the previous example, the interest rate fell from 5.2% to 3.3%. In this example, the interest rate fell only to 3.6%. An additional result is that the PPM of money also rises due to the increased money demand from hoarding. Whether this rise in money demand compensates for the relatively smaller supply of goods produced from the slightly higher time preference cannot be apodictically deduced.

With a rise in consumption and the supply of savings held constant, the opposite effects occur, only to a lesser degree than before when a rise in consumption occurred with a fall in savings. Although the rise in consumption increases the revenues of consumer goods industries and savings remained constant, since the net income fund has increased, capitalists need to divert savings from buying capital goods and instead to original factor and interest income. The savings is “siphoned” off to the net income fund, and the decrease in savings supporting the capital structure leads to higher costs and ultimately aggregate losses. These losses will be concentrated in the longer production processes and will impel a shift in factors and resources to the shorter production processes. Although the farthest stages will be abandoned, the result will not be as pronounced compared to a rise in consumption and decrease in investment because the absolute amount of investment spending has stayed the same.

2) A neutral change in the money relation

Similar to above, a neutral change in time preferences causes a predictable effect on interest income. When consumption and investment both change by equal amounts such that the production structure and the interest rate remain the same in the long run, interest income always falls if there is a rise in money demand, and rises if there is a fall in money demand. In addition, interest income never changes so greatly that original factor income changes in the opposite direction, which was a possibility that could occur in the traditional scenario. This is because the relative proportions in the economy have not changed, and a change in interest income from change in investment spending will always be offset by an equal change in consumption in the same direction.

As in all other scenarios, a decrease in consumption shifts the demand curve by the original factors to the left. The decrease in savings shifts the supply of present goods to the original factors to the left. However, the fall in interest income shifts the supply curve back to the right, but only by such an amount where the new supply curve intersects the new demand curve at the same interest rate but a smaller quantity of savings.

In the capital goods market, the decrease in savings shifts the supply and demand curves to the left by equal amounts so they intersects at the previous interest rate. Unlike in the scenario of
rising time preferences due to increased consumption and decreased investment where an extra decrease in savings would occur due to the rising net income fund from the increased consumption, because the net income fund has not increased no such decrease in savings in the capital goods market occurs. Thus the supply and demand curves intersect at the old interest rate, albeit at a smaller quantity of savings. A similar phenomenon occurs in the loan market, which is only a subsection of the capital goods market. As in the case of both the original factor and capital goods time markets, the supply and demand curves shift to the left at the amount which they intersect each other at the same interest rate as before. The exact opposite occurs for a decrease in money demand.

\[
\frac{C}{I} = 90/290
\]

Following the pattern above, a numerical example of a change in the money relation at a constant interest rate is below.

\[
\begin{align*}
\text{N.I of O.F by S + N.I by S + pure capital fund + I by C + N.I of O.F by C= TCS + TGI} & \\
\text{(83) (75) (12) (11) (223) (215) (17) (10) (83) (75) (100)(90) (318)(290)} & \\
\text{N.I of O.F by C + N.I of cap. by C= TCS} & \\
\text{(83) (75) (17) (15) (100) (90)} & \\
\text{N.I of O.F + pure capital fund + N.I of cap. by S=TGI} & \\
\text{(83) (75) (223) (215) (12) (11) (318) (290)} & \\
\end{align*}
\]

In this example, consumption decreases by 10 while investment falls by almost 30. Since the relative proportion between consumption and investment has not changed, the interest rate remains the same at 5.2%. All net incomes and money allocated to the pure capital fund fall.

In terms of the reallocation of factors in the structure of production, assuming a relative equality in timing with the change in consumption and investment spending the structure of production does not change. Although the capital structure reallocates in the short run, and with regards to any changes in the relative proportions of consumer spending, there is no general construction or destruction of the higher order stages of production. In such a scenario, Rothbard is justified in stating that:

“An increased demand for money, then, tends to lower prices all around without changing time preference or the pure rate of interest….If time preferences remain the same, then the proportion of investment to consumption in the society will remain roughly the same…Prices and nominal money values and incomes fall all along the line, and we are left with the same capital structure, the same real income, the same
interest rate, etc. The only things that have changed are nominal prices, which have fallen, and the proportion of total cash balances to money income, which has increased.”

The above scenarios are only two of the many ways that a change in time preference can occur alongside a change in the money relation. Utilizing the change in the demand for present goods on the time market, Rothbard is correct in asserting that “hoarding may reflect either a rise, a fall, or no change in the rate of interest, depending on whether time preferences have concomitantly risen, fallen, or remained the same.” If the proportion between consumption and investment has not changed, then any change in money demand in the long run is completely neutral to time preferences and does not affect the interest rate.

With the above in mind, it is now an appropriate time to comment on one of Hulsmann’s conclusions regarding the relationship between the interest rate and investment spending. Hulsmann states that allowing for changes in the demand for present goods “lead to a surprising conclusion…that virtually any [rate of interest] can go in hand with virtually any volume of gross savings.” Indeed, only through a change in the demand for present goods can the interest rate remain constant with a change in savings or change with a constant savings amount. However, as this paper has tried to defend, Rothbard was fully aware of the demand for present goods and the fact that any rate of interest can coincide with any amount of savings. For example, a rising interest rate can occur with an increased amount of savings provided that consumption increases by an even greater amount, raising the proportion of consumption relative to investment even though investment has increased. If this was not possible, then Rothbard would have no way to assert his above statement that cash balances reflect money demand the proportion between consumption and investment reflect time preferences and the interest rate.

The above analyses have shown that with any decrease in time preference, the interest rate and the proportion between consumption and investment is lowered. Thus, contrary to Hulsmann, there always exists a positive relationship between the interest rate and the proportion between consumption and investment. Going from one spending pattern to another, a rising proportion always raises the interest rate, while a decrease always decreases it. With a fall in time preferences, this relative proportion must decrease in order for the interest rate to fall.

In addition to revising the general ways time preference can affect the capital market, Hulsmann also states that a decreased interest rate may actually lead to a shorter structure of

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41 Ibid., p.775
42 One of the other possible scenarios is an increase in savings with consumption unchanged. Here, Austrian writers on capital theory appear conflicted. Mises though that some increases in savings, provided that they affect the loan market interest rate before affecting the production structure, are self defeating attempts at enhancing the capital structure and would cause a business cycle. Rothbard, on the other hand, said that all increases in saving that did not occur with a drop in consumption would be anticipated by the markets and leads to sustainable growth. This paper will not discuss such changes as the author believes it more suitable for a later topic relating to business cycles. Ludwig von Mises, Human Action: A Treatise on Economics, (Auburn, AL: Mises Institute, 2008), 571-72. and Murray Rothbard, America’s Great Depression, (Auburn, AL: Mises Institute, 2008), 34-36.
43 Rothbard Man, Economy, and State p.789
44 Hulsmann The Structure of Production p.16
The relationship between the interest rate and the roundaboutness of the structure of production taking into consideration the demand for present goods

Traditional Austrian theory asserts that there is a negative relationship between the interest rate and the length of the structure of production. Lower interest rates come only through a decrease in consumption relative to investment, and new stages must be constructed to allow for the increased investment expenditure in capital goods. This underlying principle of Austrian macroeconomics is typically shown through a changing Hayekian triangle or Rothbardian trapezoid. With a typical fall in time preferences, the decreased consumption reduces the height of the figure while the increased investment expenditure adds additional stages, increasing the width. Both of these reduce the slope and consequently lead to a lower interest rate. Lower interest rates and lengthier processes of production go hand in hand.

However, Hulsmann criticizes this theory and says the relationship is actually the reverse and the above scenario works only in select cases. He shows that if savings only increase slightly and the interest rate falls drastically, i.e. the demand curve is highly inelastic, then the number of stages in the new economy will actually be less than before. The below diagrams show an economy with a slight increase in savings of 1 ounce from 452 to 453 and a drastically falling interest rate from 15% to 2%. As a result, contrary to common examples that show a lower interest rate coinciding with a longer structure of production, the opposite occurs here. The drastically falling interest rate reduces the discount between the stages of production so much that additional savings are used in the earlier stages, leaving less for the later stages and consequently producing a shorter structure of production.
Hulsmann then goes on to show that at a constant proportion of consumption to investment, additional stages of production can only occur at higher interest rates. This leads to the astonishing conclusion of a positive relationship between the interest rate and roundaboutness of production, which “squarely contradicts the conventional Austrian theory of interest, according to which an increase of the PRI tends to entail a shortening of the structure of production; whereas a decrease of the PRI tends to entail a lengthening of the structure of production.”

The above mathematical computations cannot be argued against, but the theory behind the different calculations can. As stated earlier, in Hulsmann’s analysis, the demand for present goods can increase independently of consumption for a multitude of reasons, such as an increase in labor hours worked, higher supplies of raw materials, etc. As a result, changes in time preference lead to changes on both sides of the time market equally, affecting only the interest rate and not the quantity of savings. To briefly reiterate, this is different than the present paper’s above analysis, where an increase in general time preference through a decrease in savings and an increase in consumption is shown as a decrease in the supply curve along a constant demand curve. The demand curve is constant and not increasing because with the decrease in savings a decrease in the demand for present goods by capitalists also occurs, offsetting the increased demand for present goods from original factors due to higher consumption. The only way the time markets can conform to Hulsmann’s diagram is through a rise solely in consumption.

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45 Ibid., p.22
As a result of Hulsmann’s reasoning, the interest rate can change independently of consumption and investment spending, the opposite of what this paper argues. Therefore, the interest rate is completely unrelated to the savings rate and the proportion between consumption and investment.

How exactly is the interest rate calculated in a given evenly rotating economy in relation to the proportion between consumption and investment and the roundaboutness of the structure of production? In Rothbard’s derivations, the precise formula is \((C/I)/(\text{# of stages})=\text{Interest Rate}\). The argument can be visualized looking at a general Rothbardian trapezoid or Figure 5 above. The absolute amount of consumption spending determines the height and investment determines the amount of spending in the trapezoid. The stages of production determine the width. At an increased width and/or a decreased height, the slope, known as the interest rate, must decline. Holding \((C/I)\) constant, which from now on will be labeled S for “spending proportion”, Rothbard’s relationship between the number of stages and the interest rate can be juxtaposed with Hulsmann’s below.

Rothbard’s mathematical relationship is directly opposite of Hulsmann’s. In Rothbard’s framework, at a constant proportion of consumption to savings the interest rate is negatively related to the stages of production. In Hulsmann’s work, at a constant gross savings rate the interest rate is

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46 Although never explicitly stated, with this formula each stage will receive a return dependent on the relative proportion between consumption and investment and the number of stages of production. Both Rothbard and Murphy’s precise interest rates conform to this formula, i.e. \((100/318)/6=5.2\%\) and \((80/338)/7=3.3\%\). The interest rate for the other two scenarios are \((80/318)/7=3.6\%\) and \((90/290)/6=5.2\%\)
positively related to the structure of production. This discrepancy appears because in Rothbard’s analysis the proportion between consumption and investment is systematically to the interest rate, while in Hulsmann’s the interest rate is unrelated to the proportion between consumption and investment.\textsuperscript{47} The interest rate can be any number at any level of consumption and investment spending, and thus mathematically scenarios can exist where a lower interest rate coincides with a shorter structure of production. However, as this paper has tried to argue, this reasoning is not correct as the interest rate is systematically related to the proportion between consumption and investment. Lower interest rates must occur through a decrease in consumption relative to investment.

As a result, Rothbard’s equation is preferred. In fact, in Hulsmann’s first example, with Rothbard’s formula when the number of production stages is computed using the given the 2% interest rate and spending proportion the amount is 17, hardly a shortening of the structure of production!\textsuperscript{48} In the above chart, changing Hulsmann’s interest rate to conform to Rothbard’s formula shows that the increased stages of production only occurs at lower interest rates. This is because with the additional stages the economy needs to “spread” out more money over additional stages, resulting in a lower differential.

Furthermore, since increased stages of production in Rothbard’s construct can only occur at increased net investment, an economy never moves along a given curve, and the line is conceptually meaningless since movement along it cannot exist. However, in Hulsmann’s analysis an economy can shift along a given curve. Only through a decline in S will the economy embark on the construction of new stages of production. The function declines, and the economy moves to a point corresponding to a decreased rate of interest and increased lengthiness. The line connecting the points between the curves is more meaningful because all three variables change, and shows how an actual economy undergoes temporal restructuring. The interest rate only changes when the other variables change, resulting in a new curve.

Contrary to Hulsmann, then, the structure of production only shortens when the interest rate barely changes from a huge decline in S, instead of the other way around. For example, if the

\begin{align*}
\text{Ibid., p.26 } & \text{““Because the gross savings rate does not vary, total consumer expenditure is always 158 ounces of gold, and total savings (equal to total investment expenditure) is always 453 tons.””} \\
\text{(158/453)/17} & = 2\%
\end{align*}
fraction changed from 100/318 to 80/338 but the interest rate only fell to 5%, there could be only roughly 5 stages. The crucial question is, does the general interest rate change first, then influencing the length of the production structure, or does the production structure change first, then influencing the overall interest rate? The question can be summed up by looking at the bottom two formulas. Common sense reasoning shows that S is determined exogenously from individual value scales and is not by the stages of production or the interest rate, and does not need a separate function. The causality of the other two variables requires more strenuous thinking.

\[
\frac{(S)}{(# \text{ of P.S})}=LR \text{ or } \frac{(S)}{(LR)}=(# \text{ of P.S)}
\]

The present author believes that what Rothbard was trying to argue is that the first formula is correct in terms of causal reasoning. Using this formula does not deny the interest rate is determined by time preferences or in the time market, but rather that the way the time market changes the interest rate is through the production structure though the number of stages. This is because the relative proportion between consumption and investment and the number of stages are fundamentally related to each other. Whenever there is an intertemporal restructuring of the economy, such as a decrease in time preferences, consumption and investment fall first. Consumption and investment fall first because “the proportion between consumption and investment reflects individual time preferences [as] consumption reflects desires for present goods, and investment reflects desires for future goods.” As a result there is an increase in net investment via a decline in the net income fund and increased savings.

These new savings will then be used for the construction of new stages, increasing the width and consequently the overall length of the production structure. Increased net investment can only occur by “one way—by shifting investment further up the ladder to the higher-order production stages.” The overall length of the production structure increases either by the creation of new stages or by replicating existing production processes. Longer more productive processes clearly lengthen the structure of production since they take longer relative to the older methods used. Replicating existing methods lengthen the production structure because resources are taken from shorter processes to sustain the longer processes, increasing the aggregate length the production structure. In addition, the amount of time that businesses must spend building the new capital goods and repairing both the new and old considerably increases.

Additionally, the profitability of longer production processes is increased with a fall in time preference. If some of the new savings initially enters the loan market, the decline in the loan rate increases the profitability of longer production processes relative to shorter ones. In addition, in the face of declining revenues, entrepreneurs will want to invest in the most productive processes in order to increase output relative to costs the most, and these tend to be the longer processes.

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\(^{49}\) (80/338)/5=5%
\(^{50}\) Rothbard Man, Economy, and State p.788
\(^{51}\) Rothbard Man, Economy, and State p.519
Thus, the new net investment increases the number of stages in the economy, spreading out the investment money and creating a lower interest rate, reinforcing the Austrian statement that there exists a negative relationship between the interest rate and the structure of production. It might seem odd to insist the number of stages in an economy influences the interest rate, when it appears the other way around using the loan rate of interest. The reasoning is that increased savings which enters the loan market first decreases the gross market rate of interest, increasing the profitability of long term investment projects and causing entrepreneurs to undertake them. However, it is important to realize that the pure rate of interest is not determined in the loan market and is only shown in the economy through a long run equilibrilation of all returns in industries. When spending patterns change, the pure rate does not immediately change and then the rest of the economy conforms to the new discount; rather the pure rate of interest is only formulated at the end after the economy has adjusted to the new modifications in consumption and investment.

Therefore there exists a negative relationship between the interest rate and the roundaboutness of production. Time preference exerts its influence on the economy by first changing the spending patterns between consumption and investment, then affecting the roundaboutness of production, and then finally changing the interest rate. Furthermore, in capital based macroeconomics, only through a lowering of the proportion between consumption and investment can the economy grow. Every increase in time preference exerts itself as a rise in consumption relative to investment, siphoning savings off into the net income fund and allowing relatively fewer savings for capital goods, thereby decreasing the number of stages in the economy. And since every rise in time preference leaves relatively less for the higher order stages of the economy, “in real terms the important result is a lowering in the physical productivity of labor (and of land) because of the abandonment of the most productive processes of production—the lengthiest ones. The lower output at every stage, the lower supply of capital goods, and the consequent lower output of consumers’ goods leads to a lowering in the “standard of living.”52 Although a rise in time preference is a voluntary choice made by market agents aimed at increasing social utility, every rise in time preference results in a decrease in the physical standard of living of society. Ceteris paribus, the only way an economy can physically grow is through a decrease in time preference.

This is not to deny the other common and beneficial ways an economy can grow. Examples include a change in technology, a change in the supply of labor that either increases economic manpower or enhances the division of labor, or deregulation of markets. If the proportion between consumption and investment remain relatively constant over a period of time and the standard of living rises, then clearly other mechanisms have induced sustainable growth. However, the important point to remember is that while all of these can increase market growth by changing the way existing savings are used, they would enhance the economy even more if time preference concomitantly lowered. For example, with a decrease in time preference, firms can use additional savings to employ newly discovered technologies that would be unprofitable at a higher interest rate. In addition, firms could increase the number of production processes to better employ an

52 Ibid., p. 531
immigrating labor force, or allow economic agents to more efficiently use resources released from a decrease in the government’s burden on the economy.

And since a lower time preference is the mechanism that allows other improvements to effectively increase growth in an economy, the supply of savings and capital is a limiting factor on the above examples. Even if technological knowledge has not increased and the labor supply remains stable, increased savings can still improve the standard of living by replicating existing production processes or by employing the same labor force in more skilled occupations. But without an increase in savings, many new technological ideas will not be profitable enough for economic use and a larger labor force can only increase output through employment in existing processes.

Conclusion

This paper has attempted to provide a defense of the Rothbardian assertion that the proportion between consumption and investment is systematically related to the interest rate. The demand for present goods by the original factors is derivative and completely dependent on total consumption spending. With a change in time preference, there is a total change in both the demand and supply in the original factor and capital goods time markets. Changes in time preference affect the economy through an alteration in relative spending patterns, which increases the length of the production structure and then lowers the interest rate. Only through a decreased time preference can many other economic catalysts to growth realize their full potential. The above analysis provides a detailed framework that reinforces the systematic relationship between time preference, consumption and investment, the roundaboutness of production, and the interest rate.
References


---. “The Structure of Production” (forthcoming).


