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Time Preference in Creating Capital to Finance Innovation: Selected Issues

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ABSTRACT

Objective: The main objective of this article is to provide an overview of the Austrian School of Economics on time preference, and to analyse selected determinants of time preference in the creation of capital to finance innovation.

Research Design & Methods: An analysis of the subject literature was conducted and coupled with logical deduction.

Findings: A decline in time preference, expressed in stronger investment activity, belongs – together with technological progress and changes in labour resources – to the main sources of economic growth. Time preference is therefore not limited to long-term growth processes. It also influences shorter-term macroeconomic dynamics, including cyclical fluctuations, changes in economic structure and the way markets operate. In this sense, it becomes one of the factors through which the economic order evolves.

Implications/Recommendations: In a theoretical context, the impact of time preference in creating capital to finance innovation and on the functioning of markets was identified.

Contribution: The economy is moving away from equilibrium, striving to change the structure resulting from the advantage of innovation. Development based on innovation takes place

in conditions of disequilibrium. Observing the determinants of time preference can help to understand the course of economic processes and technological progress in relation to levels of inflation and capital accumulation. This article contributes to the literature by discussions on the true nature of interest and relations to the money market provide a contrast to mainstream economic theories.

Article type: original article.

Keywords: time preference, Austrian School of Economics, capital, interest.

JEL Classification: B13, B25, B53, E22, E21, E43, O10, O43.

1. Introduction

Time preference offers an important analytical framework for explaining both the economic behaviour of individuals and the broader social mechanisms of capitalist economies. In the Austrian School, long-term development is not treated as a linear movement toward equilibrium, but rather as an evolutionary process shaped by repeated waves of innovation. These innovations gradually transform production methods, raise productivity and create conditions for higher living standards.

The innovative activity of enterprises is strongly influenced by supply-side conditions. For this reason, larger firms are often better positioned to introduce new solutions, as they possess greater resources and may seek temporary market dominance as well as above-average returns. In the Austrian perspective, innovation explains both the emergence of such temporary advantages and the continuation of economic change. A firm may gain market power by adopting new technologies earlier than its competitors, but the same process also stimulates further adjustment, imitation and competitive pressure. Thus, innovation is treated as a more dynamic force than price competition alone.

Within this framework, time preference is relevant not only to long-term economic growth, but also to cyclical fluctuations, structural transformation and market coordination. It therefore becomes one of the factors influencing changes in the economic order. The purpose of this article is to examine the role of capital in the creation of innovation and in the course of technological progress. The analysis also considers how capital shortages and insufficient accumulation may restrict the pace and direction of technological change.

2. Literature Review

Capital and Time Preference – a Few Comments

The role of capital in the processes of technological development was presented in a comprehensive manner by economists of the Austrian School, basing their approach on the theory of capital and the concept of time preference.

Every human action contains a category of time preference (von Mises, 1998, p. 293). An acting person is guided by the desire to obtain satisfaction (benefits) from the fulfilment of needs in the future. They will always want to achieve their goals in the near rather than distant future. The realisation of each intention, taking into account time preference, has its consequences in the length of the stages of production and consumption.

In a growing economy, individuals and firms constantly face intertemporal choices concerning the satisfaction of needs. They decide how to divide income between present consumption and accumulation, and whether particular goals should be achieved immediately or deferred. These decisions depend on the expected value of future outcomes, including the degree of satisfaction that may be obtained in later periods.

Von Mises distinguishes two forms of intertemporal choice within the theory of time preference (von Mises, 1998, p. 483). The first refers to ordinary saving, where an economic actor compares the immediate consumption of a given quantity of goods with the consumption of the same quantity at a later date. The second concerns capitalist saving, in which present consumption is given up in exchange for the possibility of consuming a larger quantity of goods in the future, or goods that generate a higher level of satisfaction.

An acting individual seeks to improve his or her situation by choosing alternatives that promise a higher level of satisfaction. This is reflected in a preference for goods that can be obtained sooner rather than later, as well as for goods that offer greater durability compared with those of shorter use.

The use of investment capital is closely related to time preference (Jevons, 1888, p. 7). More advanced and efficient production methods cannot be introduced without investment, while investment itself requires that part of current income be saved beforehand. In this sense, time preference sets limits to the scale of both saving and investment (von Mises, 1998, p. 487). A positive rate of time preference is therefore one of the conditions under which some economic actors decide to postpone consumption and accumulate savings.

The rate of time preference expresses how strongly individuals value goods available in the present compared with goods obtainable only in the future (Hoppe, 2006, p. 33). For this reason, it influences the scale of both saving and investment. Saving means that economic actors limit current consumption in order to redirect

resources toward capital goods that will serve future production. If postponing consumption is expected to bring higher benefits later, the incentive to save becomes stronger. As a result, intertemporal choices may shift toward a lower time preference and a higher level of investment.

When individuals expect their real income to rise, they usually attach relatively greater value to future monetary resources, which is associated with a decline in the rate of time preference (Hoppe, 2006, p. 36). In such circumstances, they are more willing to postpone current benefits and undertake actions whose results will be obtained only after a longer period. This shift in intertemporal orientation also favours investments based on longer, more complex and more capital-intensive production structures.

Lower time preference and the tendency to undertake increasingly complex processes generate a stronger interest in new knowledge, information, and the use of more advanced methods of production. The willingness to implement new ideas, including solutions that are not yet fully known or tested, creates favourable conditions for technological progress.

The willingness to bear higher uncertainty, which accompanies technological change, is linked to the way individuals value present and future outcomes. Time preference shapes this readiness, but the relationship also operates in the opposite direction: Successful technological change may alter intertemporal choices. When new production methods prove effective and generate prospects of future gains, economic actors become more interested in investment. This, in turn, may increase their willingness to postpone current consumption and allocate a larger part of their income to saving.

An additional dimension of time preference is its close connection with attitudes toward uncertainty. It is revealed not only in declared intentions, but above all in the concrete choices made by individuals when allocating resources to investment projects. Since these choices arise from market participants' own assessment of future gains, risks and expected returns, time preference may support technological advancement more effectively than externally imposed interventionist measures.

This is because intervention may weaken both risk-taking and responsibility for achieving economic goals. Under such conditions, the propensity to save does not necessarily increase, time preference does not decline, and the real assessment of future effects becomes limited. As long as there is no intervention in property relations or in the production process, the downward tendency in the rate of time preference, together with the related process of technological progress, can continue (Faber, 1986, p. 68).

Intervention that modifies time preference may therefore affect technological progress in several ways. It can lead to a situation in which the gains generated by innovation are captured by the intervening actor, while production is redirected

toward objectives that do not necessarily reflect market choices. It may also weaken the disciplining role of risk in entrepreneurial decisions, particularly when responsibility for possible losses is partly or entirely shifted away from producers and investors.

3. Universal Time Preference (Measure)

There are many different methods of tracking "temporal fingerprints" (time--related preferences, norms and behaviours). Temporal preference as a preference for intertemporal tradeoffs is usually measured by the discount rate between present and future payoffs through financial flows and surveys that use time-dated consumption/effort (Cohen *et al*., 2020). The main difficulty in identifying a universal time preference factor is that different methods of measuring time preference vary in the techniques used, scale and number of countries surveyed.

Figure 1 illustrates the distribution of the UP-time variable across 117 regions and countries. The determinants of universal time preference are (Rieger, Wang & Hens, 2021):

– equity risk premium (i.e., the additional return from stocks relative to bonds),

– level of education (measured by the average number of years spent in school),

– overall development of the countries (represented by the Human Development Index),

– credit rating (reflecting the country's risk of default),

– environmental protection (indicated by the average price of gasoline, as it largely reflects taxes imposed for environmental purposes),

– resilience (proxied by the FM Global Resilience index, incorporating 12 factors related to economic conditions: political risk, oil intensity, urbanisation rate, exposure to natural hazards, natural hazard risk quality, fire risk quality, inherent cyber risk, control of corruption, quality of infrastructure, local supplier quality, supply chain visibility, and productivity).

From the map (Fig. 1), a broad pattern can be identified: Anglo-American countries as well as Central and Northern European countries display very high values, which correspond to low time preference, or relatively patient discounting of time. South and East Asian countries tend to record medium-high values, whereas Southern European, South American, and African countries generally show lower values. More heterogeneous results can be observed in Eastern Europe and the Middle East.

This indicates that cross-country differences in time preference may be shaped not only by economic conditions but also by cultural factors (Rieger, Wang & Hens, 2021). Consequently, explanations based on interest rates, income levels, or macroeconomic stability should be supplemented by broader behavioural and cultural determinants.

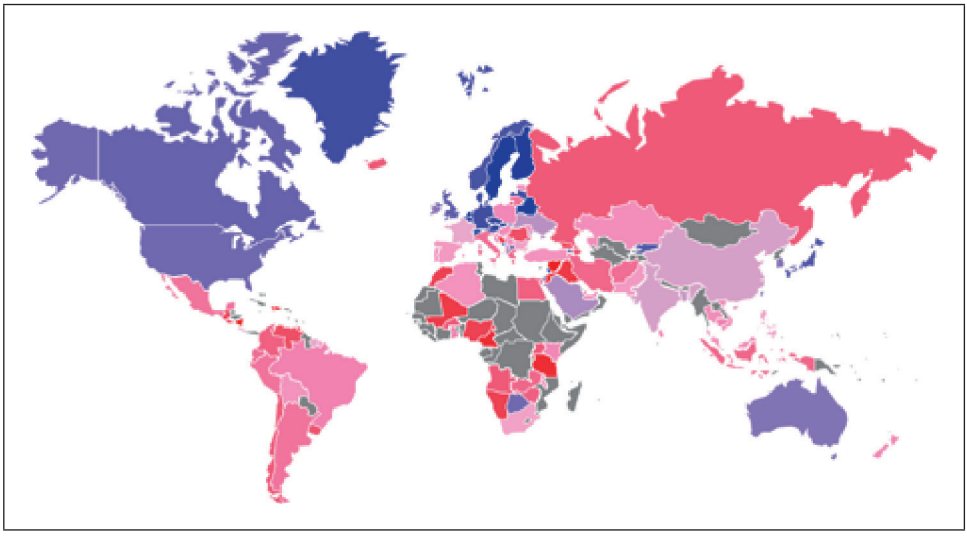

Fig. 1. Global Distribution of Time Preferences

Notes: Countries with high time preference are in red, countries with low time preference are in blue, and grey indicates no data.

Source: Rieger, Wang & Hens (2021, p. 11).

Empirical studies indicate that time preferences may help predict behaviour in situations where individuals or societies face a choice between immediate costs and benefits that appear only in the longer term. At the same time, this relationship may work in both directions. Greater patience can support wealth accumulation, while wealthier countries, benefiting from higher stability and security, may be better able to adopt a more future-oriented perspective.

In view of the growing potential of research and development (R&D) activities and artificial intelligence, it would be worthwhile to expand the UP-time index to include institutional and innovation-related aspects, taking into account, for example, the GII index.

4. Innovation in the Face of Changing Time Preferences

Economic growth may be explained by several interrelated factors: a decline in time preference, which encourages investment, the development of new technologies, and changes in the size of the labour force. If, however, the labour supply is treated as relatively stable and the role of time preference is temporarily set aside, the analysis may concentrate on the impact of technological progress on changes in output.

Technical progress may be interpreted as an improvement in productive capacity, reflected in the ability to generate a larger volume of goods and services within an unchanged temporal structure of production. Such a change is also connected with intertemporal preferences, because higher productivity usually raises average income and may therefore influence the way economic actors value present and future consumption. In the case of "neutral" technical progress, however, neither the interest rate nor the consumption-to-investment ratio is altered (Fillieule, 2005).

When technical progress is investment-oriented, rising income encourages economic actors to allocate a larger part of their resources to saving and investment. This reflects a decline in time preference, since production processes become longer and more capital-intensive. As a consequence, the interest rate tends to fall, while the consumption-to-investment ratio decreases. Economic growth is then generated not only by technical progress itself, but also by the accompanying shift toward lower time preference.

This mechanism is consistent with the endogenous approach to growth, in which internal factors generate subsequent phases of economic expansion. A lower rate of time preference may lead to further declines in later stages, thereby stimulating higher investment and economic growth. However, this process cannot continue indefinitely, since successive reductions in time preference depend on rising production and income. Such a tendency cannot always be sustained in the long run.

In the case of technological progress that favours consumption, the mechanism operates in the opposite direction. As consumers become wealthier as a result of technological change, they may decide to allocate a larger share of income to current consumption, which implies an increase in time preference. Production stages then become shorter, while interest rates and the consumption-to-investment ratio rise.

Economic growth generated in this way is neither as strong nor as stable as growth based on investment-oriented progress. It is also more short-term in character and highly dependent on consumer sentiment. This type of technological progress often accompanies government intervention financed through debt. It is usually associated with incremental improvements rather than radically new production solutions, and reflects a growing consumer desire to acquire an increasing number of goods.

At the same time, rising consumer expenditure linked to intervention reduces the incentive for firms to introduce changes aimed at lowering production costs. Since intervention ensures a continuous inflow of funds, enterprises are less pressured to search for more efficient production methods. In the long run, this may lead to a cyclical pattern of technological change and to higher future burdens on consumers. These burdens, in turn, may increase time preference and weaken the propensity to invest.

The conversion of higher-order goods into lower-order goods creates a sequence of cause and effect that necessarily unfolds over time. As the means of production improve, and especially as technological progress advances, the time separating particular stages of this transformation should tend to decrease. Time, therefore, remains an unavoidable element of production, but the overall production process may become shorter and more concentrated.

Higher-order goods obtain economic relevance because they are linked to needs that will arise only after the completion of the production process, rather than to needs satisfied immediately (Menger, 2007, pp. 71–72). Their value, therefore, depends on the ability to anticipate future demand. The more accurately economic actors understand the causal sequence of production and the more effectively they can control its individual elements, the more reliable their expectations concerning the quantity and quality of the final product become.

This is directly related to uncertainty, which shapes both qualitative and quantitative relations. Uncertainty increases when a larger number of production-related elements cannot be fully understood or controlled (Menger, 2007, p. 74). The satisfaction of needs therefore becomes a process aimed at securing the fulfilment of future expectations, that is, ensuring the availability of goods of sufficient quantity and quality within the time horizon specified by the consumer. Achieving this requires appropriate knowledge.

According to Menger (2007, p. 83), it is necessary to know:

– the expectations of a given individual, i.e., the amount of goods necessary to meet the needs in the period covered by his/her plan,

– the amount of goods he/she has, capable of meeting these expectations.

Lack of the first type of knowledge would result in running a business "blindly" because the goal in terms of the type and amount of needs met would be unknown. In the absence of the second type, the means by which the goal could be achieved would be unknown.

Different types of knowledge are used by those actors who control the relevant means and determine the purposes they are to serve, that is, which values should be treated as more or less important. Thus, only individuals can independently formulate and implement plans aimed at satisfying needs, since only they are able to assess properly what quantity and type of goods they require (Hayek, 2005, p. 81).

Technological change is rooted in the activity of individuals who are able to formulate and pursue their own plans under conditions of open competition. Competition reduces the likelihood that new technologies will become a source of lasting monopoly power. In a statist economy, however, the same processes of technological development may strengthen concentration and support the growth of monopolistic arrangements. A liberal economic order offers a different framework: It protects freedom as a form of social organisation that is not completely absorbed by legal or

institutional control. In this context, economic freedom becomes one of its central components (Godłów-Legiędź, 1992, p. 46).

In such an institutional setting, technological progress can be seen as an outcome of purposeful individual action. Innovation develops as economic actors pursue their own objectives, while its intensity depends partly on time preference and partly on the stock of capital available for productive use. The way capital is accumulated and allocated affects labour productivity, the level of real wages and, more broadly, the material conditions of life.

The way in which capital is employed, as well as the scale of its use, has a direct bearing on the pace and direction of technological change. Technological development then translates into a greater availability of goods by increasing productive capacity. As access to goods and services becomes broader, the conditions of economic activity and the quality of life may improve. The same mechanism applies not only to consumer goods, but also to capital goods used in further production.

The accumulation of capital plays a central role in creating the conditions for technological development. Technical progress requires that the capital goods already available in the economy be used not only to maintain existing productive capacity, but also to generate new capital goods for future production. In this sense, a durable process of accumulation depends on saving and on the relationship between capital and income, provided that specific conditions are satisfied (Reisman, 2015, p. 49).

The first condition concerns the allocation of output. Part of the goods produced must be used to create capital goods, and this part has to be large enough not only to replace the capital consumed during production, but also to expand the productive base. Its size depends on how resources are divided between the production of capital goods and the production of consumer goods, which is reflected in the relation between gross saving and consumption expenditure. The second condition is connected with the problem of diminishing returns. When the stock of capital goods increases without a corresponding rise in labour input, technological progress is needed to prevent productivity gains from weakening. In this way, continued technical improvement becomes necessary for maintaining a lasting increase in the supply of capital goods.

A growing stock of capital goods, combined with continued capital accumulation, creates a basis for a durable rise in living standards. Economies in which the capital-to-income ratio increases are therefore able to benefit more fully from technological progress. They can also transform savings into productive investment more effectively, especially when these savings are directed toward longer, more advanced and more complex production processes.

Consequently, economies with higher levels of saving and capital accumulation possess greater capacity to benefit from technological progress. Higher capital

intensity makes it possible to introduce more complex, advanced, and radical technological solutions.

Technological progress and capital accumulation should be understood as mutually reinforcing processes. Continued accumulation requires improvements in production methods, since technological change helps counteract diminishing returns that may arise as the stock of capital goods grows. At the same time, the creation and implementation of new technologies depend on the prior accumulation of capital, which provides the resources needed to develop more advanced forms of production.

In mainstream economic analysis, the technology used in production is often treated as a function of the available stock of technical knowledge. The Austrian approach places emphasis elsewhere: Even when various methods of production are already known, the possibility of applying them depends on the capital goods that economic actors actually possess at a given moment (Hayek, 2009, p. 48).

For von Mises, the difficulty of adopting new technologies does not usually stem from the absence of technical knowledge itself. The more important limitation is the shortage of capital needed to modernise an obsolete production structure and adapt it to solutions already functioning in more advanced economies. From this perspective, catching-up processes require prior saving and capital formation. Only then can factors of production be shifted into longer, more roundabout and more capital-intensive methods of production.

"Only then could they successively produce the tools required for the construction of those plants which in the further course were to produce the equipment needed for the construction and operation of modern plants, farms, mines, railroads, telegraph lines, and buildings" (von Mises, 1998, p. 493). Capital constraints can be partly overcome by importing or purchasing already existing capital goods from more advanced economies. Access to such goods reduces the need to build the entire capital base domestically from accumulated savings and allows new technologies to be introduced more quickly.

"Increasing the amount of available capital goods makes it possible to achieve more distant goals without having to limit consumption. Reducing them, on the other hand, makes it necessary to refrain from pursuing certain goals that could have been pursued earlier, or to limit consumption. Having capital goods means that, other things being equal, one gains time" (von Mises, 1998, p. 525). Entrepreneurs who command larger capital resources may gain an advantage over rivals because they are better positioned to finance the early adoption of new technologies. Earlier access to such solutions allows them to improve production before competitors are able to respond. As a result, they may temporarily obtain above-average returns resembling a form of "monopoly rent."

Technical progress, therefore, consists in maintaining and expanding the productive capacity of the economy by increasing the stock of capital goods. This additional capital makes it possible to produce a larger volume of goods and services. The resulting increase in supply tends to put downward pressure on prices, although, as Reisman (2015, p. 56) argues, it does not directly change the rate of profit.

5. Interest as a Condition for Creating Capital That Creates Innovations

Capital is inseparable from the problem of interest, although von Mises rejects the view that interest represents a separate type of income generated by capital goods themselves. From this perspective, the traditional division of income into wages, profit and rent, each attributed respectively to labour, capital and land, is misleading. Interest should instead be explained through the intertemporal valuation of goods rather than as an autonomous return attached to capital as such (Hoppe, 2006, pp. 32–41).

Consumer goods are goods available for present use, while capital goods serve as instruments for producing goods that will become available only in the future. The value of capital, or producer, goods, is therefore derived from the anticipated value of the consumer goods to which they contribute. Since goods available immediately are normally valued more highly than identical goods available later, the present value of capital goods is lower than the value of the future products they are expected to generate. This difference between the value of producer goods and the value of the future consumer goods constitutes interest. Its basis lies in the unequal valuation of present and future goods (von Mises, 1998, p. 530).

Interest should not be treated as a price in the narrow sense. It expresses the relation between goods available in the present and goods obtainable only in the future. In a market economy, this difference in valuation is reflected in the discount applied to future goods. In credit and other financial transactions, the same discount appears as the interest rate.

Originary interest does not arise from the balance between the demand for and supply of money loans on the capital market. In von Mises's view, the loan market performs a different function: It translates the underlying difference in the valuation of present and future goods into money-loan interest rates. Thus, it is this intertemporal valuation gap, rather than conditions on the loan market itself, that determines the level of originary interest (von Mises, 1998, p. 544).

Originary interest influences how entrepreneurs allocate investment across different lines of production. It affects both the time they are willing to wait for returns and the average length of production processes in particular sectors. Through entrepreneurial competition, there is a tendency for this rate to become more uniform across the economy. When the valuation gap between future and

present goods becomes larger in one branch of production, that branch attracts capital and entrepreneurial activity. Sectors in which this gap is narrower become relatively less attractive.

Within the framework of an evenly rotating economy, the movement of capital from one sector to another would tend to eliminate differences in originary interest and lead to a single rate for the whole economy. The interest rate formed in the loan market would, in turn, align with this more fundamental rate. Such convergence, however, can occur only in a theoretical setting that assumes a perfectly regular economy and neutral money. Von Mises questions this assumption, maintaining that money always affects real economic processes and therefore cannot be treated as neutral in practice (von Mises, 2009, p. 311).

When the balance between the supply of money and the demand for money is altered by monetary factors, the effects are transmitted to the prices of goods and services. Monetary expansion, however, does not influence all prices at the same time or in the same way. Its consequences depend on the path by which new money enters the economy and on which groups receive it first. These first recipients increase demand for particular goods according to their own spending patterns, thereby changing relative prices before the effects spread more widely. Thus, an increase in the money supply modifies not only the overall price level but also the structure of prices within the economy. This non-uniform process of monetary transmission is known as the Cantillon effect (von Mises, 1998, p. 544). A related issue can be found in Keynes's analysis of the "diffusion of the price level."

When changes in the money supply affect consumer-goods prices and producer--goods prices to different degrees, they also modify the price relation between present and future goods. This, in turn, may influence the rate of originary interest (von Mises, 2009, p. 323). Monetary changes, therefore, have real consequences. They redistribute income toward the issuer of new money and toward those who receive it first, while later recipients, or those who do not receive it at all, are placed at a disadvantage. Since time preference is linked to individual income and usually falls as income increases, any redistribution of income may change the intertemporal choices of economic actors. In this way, monetary expansion can also affect the overall rate of originary interest in the economy.

According to von Mises, the phenomenon of "forced saving" may contribute to a decline in the rate of originary interest, accompanied by a fall in the purchasing power of money. Forced saving can occur when an additional supply of money first leads to an increase in product prices, while wages rise only after a certain delay. In such a situation, goods prices grow faster than wages, resulting in a redistribution of income in favour of entrepreneurs.

Consumers are then compelled to reduce their purchases because their real wages decline. Since entrepreneurs generally belong to higher-income groups, their

propensity to save is greater, and their time preference is lower, than that of hired workers. Consequently, forced saving may accelerate the process of capital accumulation (von Mises, 1998, p. 547).

Hayek, by contrast, argues that the cause of crisis is not underconsumption, as its proponents maintain, but rather insufficient saving and excessive consumption. In this view, overinvestment is generated by forced saving, while the subsequent collapse occurs because consumption cannot remain at the artificially reduced level produced by that process. The crisis could therefore have been avoided if individuals had not increased their consumption and had instead been encouraged to save more. Under such conditions, extended production processes could have been sustained, since the flow of money and its division between consumption and saving would have corresponded more closely to the structure of production. The only effective solution to cyclical fluctuations is thus the elimination of the elasticity of bank credit and, consequently, the removal of forced saving. In other words, money would have to be neutralised. Neutral money, however, does not imply a stable price level. Rather, it requires a policy of rigid money supply, which may lead both to changes in the general price level and to changes in the structure of relative prices (Garrison, 1986).

In Austrian theory, gross market interest rates include several components that influence their level. Lending money, credit transactions, and deferred payments are never entirely risk-free. Debtors or guarantors may become insolvent, while collateral and mortgages may lose value. In this sense, the creditor effectively becomes a partner of the debtor or of the owner of the mortgaged property. Changes in market conditions, including changes in the value of collateral, may therefore directly affect the creditor's position.

Capital as such does not generate interest automatically. It must be invested in an appropriate way in order to avoid its depletion. Gross interest is earned only by those borrowers whose activities prove successful. If they obtain net interest, it becomes part of their income, although this income consists of more than net interest alone. All types of loans contain an entrepreneurial element, which appears in the form of a premium. This premium constitutes the "entrepreneurial component" of the gross market interest rate and raises its level (von Mises, 1998, p. 549).

Another component of the gross market interest rate is the "price premium." It arises from the existence of deferred payments. Since loan repayments take place in future periods, both the borrower and the lender take expected changes in the purchasing power of money into account when concluding the contract and determining the interest rate. A borrower who expects prices to rise in the future may be willing to accept a higher gross market interest rate than would otherwise be the case. Conversely, a lender who anticipates an increase in prices will demand a higher interest rate.

The price premium can take either a positive or a negative value. In a situation of pronounced deflation, it may offset the whole rate of originary interest and, in extreme cases, push the gross market rate of interest below zero (von Mises, 1998, p. 549). When credit expansion is considered, the adjustment of the net market rate of interest to the rate of originary interest may be disrupted by the introduction of additional fiduciary media into the loan market. Since the supply of additional loans can be expanded only if they are offered at a lower rate, the monetary rate of interest falls below the natural rate, provided that the price premium is assumed to have no effect.

According to von Mises, the analysis should focus only on the case in which banks reduce the money rate below the natural rate. In his view, if a bank acted in the opposite way, by raising the money rate above the natural rate, it would be driven out by competitors offering cheaper loans and would therefore disappear from the market (von Mises, 2009, pp. 307–308).

In the economy, the assessment of whether people have a low or high time preference is relative. In fact, the level of preference results from the orientation of social groups towards the present, and when it is high, a clear increase in consumption can be observed. People prefer immediate gratification and are therefore less inclined to save and invest. In the long run, this translates into a lower dynamics of capital opportunities, technological development and innovation. Societies based on growing consumption de facto eliminate their capacity for long-term development based on growing productivity.

Present orientation depends on how individuals perceive and evaluate the future. Some people, such as children, may find it difficult to understand the future as a meaningful time horizon. Others, such as elderly people, may attach less importance to future consumption because they expect that their opportunities to benefit from it will be limited.

By contrast, individuals with relatively low time preference are more future-oriented. They are able to delay gratification and possess a clearer vision of future needs and opportunities. Low time preference encourages saving and the accumulation of financial capital. Savings and investment, in turn, become sources of economic growth not only for the individual but also for society as a whole.

Since consumption cannot disappear entirely, an increase in production requires individuals to abstain from part of their current consumption for a certain period, that is, to save. Once sufficient savings have been accumulated, investment can begin. During the investment process, economic actors rely on previously accumulated savings. Thus, economic growth begins with low time preference and develops through saving and investment. As a result, productivity rises, and technological progress proceeds more rapidly.

Low time preference is also an individual success of people (Mischel & Ebbesen, 1970). Delayed gratification is not an inherent part of every person. A person may not be interested in anything except the present and the immediate future. He/she needs immediate or minimal delayed gratification.

On the other hand, another person can create a constantly growing stock of capital and durable consumer goods to ensure an ever-increasing supply of future goods and an ever-increasing period of supply. This creates opportunities for accumulating financial capital.

Many factors contribute to any form of success. Some are external, such as upbringing, environment, culture, and chance. Others are internal and relate to individual capacities, including risk management, social skills, determination, and intelligence. If all external and internal factors are assumed to be constant and equal, success may depend significantly on time preference. A lower time preference strengthens future orientation, self-discipline, and the ability to postpone immediate gratification. This may also foster a higher degree of creativity, which, at the economic level, translates into more dynamic innovation.

Even individuals with high salaries, or firms with initially sound financial positions, may become poor if they are characterised by high time preference, that is, if they focus primarily on present consumption. Conversely, individuals from disadvantaged backgrounds may achieve wealth if they have low time preference, appropriate skills, and the ability to postpone current consumption in favour of future gains (Leeds, 2022).

Time preference, therefore, contributes to differences in the level of technological development, which in turn affects the rate of GDP growth. The larger the technological gap, the faster growth may proceed. However, as an economy approaches the technological frontier, the techniques being transferred become increasingly complex, while the costs of imitation rise. This slows down the process of diffusion. The absorption of technological progress depends on absorptive capacity, which is shaped by factors such as R&D activity, education, qualifications, the propensity to save, institutional infrastructure, and the degree of economic openness. Another important determinant is the ability to bear the costs of absorption and to use new technologies effectively in the process of economic development. From the perspective of the problem under consideration, the key issue is to identify the nature of technological change embodied in processes and products that arise from the propensity to save.

Technological advancement depends on an economy's ability to generate and apply new technical solutions, which is closely linked to a more future-oriented pattern of behaviour and, therefore, to lower time preference. Its outcomes can be observed in the scale of implemented innovations and in changes in total factor productivity. The innovation process covers a broad sequence of activities, beginning

with basic research and ending with modifications in production methods, although its course varies across sectors and types of production.

Innovation is aimed at strengthening the development potential of firms, industries and the economy as a whole. Expenditure on research and development creates conditions for both product and process innovations. New production methods often reduce costs and, at the same time, lead to changes in the range and structure of goods produced. Conversely, the introduction of new products frequently requires new machinery, equipment and organisational solutions. The technological and information revolution has also contributed to the rise of sectors based on biotechnology, microprocessors and telecommunications, thereby changing the nature of production and entrepreneurship.

Subsequent waves of innovation have transformed relations between producers and consumers, introduced new models of business activity, reshaped quality--control systems and altered the organisation of work teams. One consequence of these changes has been the gradual movement of economic activity away from traditional industry toward services.

6. Conclusions

Understanding time preferences is crucial to how capital is allocated to innovation. Key determinants of time preference in capital formation to finance innovation include: interest rates, technological progress, income, economic stability (inflation), as well as demographic, cultural and social factors, and so forth. In addition, time preferences in innovation funding refer to the choice of appropriate forms of funding depending on the level of R&D expenditure and the nature of the innovation.

In contemporary Austrian economics, innovation and structural transformation are analysed through the lens of intertemporal choice and the organisation of production over time. A central role is assigned to the tendency of individuals to prefer earlier consumption, as well as to the structure of production composed of successive stages, including higher-order goods and more roundabout methods (Faber, 1986). The Austrian perspective, therefore, treats the economy as a vertically organised temporal process, drawing on Menger's distinction between higher- and lower-order goods. Neoclassical theory, in contrast, usually adopts a more horizontal view of economic time. Innovation-led development is thus understood not as movement within static equilibrium, but as a process unfolding under conditions of disequilibrium.

Currently, many economies are experiencing capital erosion caused by permanent inflation and growing private and public debt. The transfer of capital towards durable consumer goods has caused shortages in productive capital. Inflation has affected the size of profits and their increasing taxation. These processes have

directly limited the industrial sector and reduced the possibilities of creating technical progress.

Private productive capital has been very limited, and the funds taken over by governments have been largely consumed or wasted. Additionally, a number of regulations limit the scope of business activities and increase their operating costs, further reducing available capital. Consumption, in turn, is driven by debt and does not constitute a real reflection of product needs.

The acceleration of innovation processes should therefore result from the growth of capital resources, both productive and human. Greater freedom in the disposal of private resources and fewer regulatory constraints will positively influence technological change and create conditions for long-term economic development.

Authors' Contribution

The authors' individual contribution is as follows: Robert Ciborowski: analysis of the Austrian School's contribution to the time preference in creating capital to finance innovation. Karolina Trzaska: analysis of the determinants of time preference and the issue of universal time preference.

Conflict of Interest

The authors declare no conflict of interest.

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