THE GLOBALIZATION TYPES MODEL: A NORMATIVE MODEL TO ANALYZE INDUSTRY GLOBALIZATION LOGICS

BRUNO G. RUETTIMANN

Abstract

Present economics trade theory is not giving sufficient practical models to explain recent economic development regarding globalization. Indeed, globalization is not always the same globalization, as it is recognized through the different manifestations of this phenomenon. Based on the four basic business typologies (commodities, standards, specialties, convenience goods) a new comprehensive and normative model defines seven fundamental forms of economic globalization (1a, 1b, 1c, 2a, 2b and 3a, 3b). Globalization type 1 and subtypes are related to physical trade, type 2 is related to the capital and financial world, and type 3 is related to the human factor. This distinction is necessary because each one has its own rational and performs differently from a globalization viewpoint. These basic globalization types help to model the phenotypic aspect of how globalization is happening. They allow us to understanding the competitive constellation and strategic moves of globally active companies as well as the different latent potential for unemployment.

JEL Codes: F100, F200, L100

Key words: Business Types, Globalization Types, Foreign Trade Theory

1. Introduction

Economic globalization on the one hand is often seen as an obscure process that apparently yields more profit for the companies, while increasing unemployment for the working classes on the other hand. Globalization is hardly controllable, since it is not only a process but rather the phenotypic manifestation within the causal systemic world of economy and politico-social behaviour. Companies are facing business globalization every day taking decisions without knowing the theoretical models of globalization. But how can economic globalization be modelled? Many books have been written on globalization but no individual one presents an integrated theory of it. Basic concepts go still mainly back to foreign trade theory with Ricardian comparative cost advantages and Pareto optimality as well as Heckscher-Ohlin resource endowment. The gravity model of Isard shows the geographic view of trade but finally did not encounter the merited success. A new view has been developed by Krugman in his “New Economic Geography” going finally beyond perfect competition. But all these economic models are hardly useful in applied managerial strategy decisions.

My research initiated in 2003 with the presentation of the paper “Globalization and the Effects of the Opening of the East on the Western European Aluminium Semis Industry” [1, 2] at the opening ceremony of the 5th World Congress ALUMINIUM TWO THOUSAND in Rome, as well as the final keynote speech and the Best Paper Award with “The Effects of Globalization on the Aluminum Extrusion Industry” at ET04 World Congress in 2004 in Orlando/Florida [3]. The aim of this new modelling, is to provide economics globalization models applicable to business-strategy and industry value-chain analysis. By structuring the underlying rational of the globalization phenomenon, it becomes useful for managers (and economists) helping to understand the industry logic and helping to take appropriate strategy decisions. The resulting research has been leading to this comprehensive economic globalization model published partly in 2007 [4]. The here presented paper describes the now completed Seven Globalization Types Model.

2. The Determinants for Globalization Type

Different business and globalization patterns are observable in different industries. On the one hand we have the extraction of raw materials in particular geographic regions of the subtropics, or primary aluminium production in distant but low energy cost regions, and on the other hand, semi-fabricated products manufactured near extensively industrialized regions. Cars produced in highly automated factories in urban area and exported worldwide, fast-food chains or franchised fashion stores covering the globe to conquer market share – different concepts, but the same target: the world market. Why do so many different concepts exist? What are the rules governing the economic structure and the competitive system? Is it possible to give a structure to globalization in order to be modelled? Going beyond the usual phenomenological description of globalization let us analyze the intrinsic logic of worldwide competition and the structure of the economic system. Our business system is mainly composed of:

- the transaction object , i.e. the product or service
- the supply and demand structure, with the related transaction scheme, and
- the operating configuration of supply [4].

The product is characterized by its attributes, e.g. heavy or bulky, complex or precious, perishable or durable, and its customisation degree, all this determining the transportability of the product. The transaction scheme describes how supply and demand interact determining the localization degree of the product. The market structures given by the number of market actors and relative concentration curves of supply and demand determines the competitive nature of the business. The operating configuration refers to how products are produced, at one extreme they are produced centrally within a single plant configuration and then

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1 Dr.-Ing., MBA, Lecturer at ETH Zurich, Consultant at Swiss Institute for Systems Engineering, www.brunoruettimann.de, brunoruettimann@bluewin.ch
distributed worldwide, or production facilities are spread around different geographic regions within a multi-plant configuration and products are sold locally. This leads to the induction scheme of figure 1 to classify first the business type and finally the globalization type. Indeed, globalisation is not always the same globalisation, as we will see.

Figure 1: Framework of globalization types determinants

From figure 1 it is evident that the typology of globalization is largely determined by the product characteristics. The backward determinants themselves which influence product characteristics, market structure, and determine the business classification, and finally the operating configuration, are:

- value of the product
- transport cost and related range of distribution
- production factors in terms of cost drivers
- demand profile and
- supply structure [4].

3. The Four Basic Business Typologies

These main determinants characterise each business type within an industrial system. Certain combinations of these determinants reveal clear patterns for each business type. Figure 2 shows different businesses within the matrix of product-characteristics and market-structure which are the main drivers for business type classification [3, 4]. The representation of product-characteristics (differentiated or not) as one axis, and market-structure (oligopolistic or fragmented) as another axis within a matrix, leads finally to the following landscape of basic business types:

- commodities
- specialties
- standards
- convenience goods.

Figure 2: Selected businesses within the product-characteristic / market-structure matrix

Figure 3: Basic classification of business types
Figure 3 presents a clear, systematic and structured view with which to classify roughly the businesses in types. It goes without saying that mixed types may exist. The “commodity type of business” (e.g. primary aluminium or petrol) comprises all kinds of goods listed on efficient market places, such as commodities exchanges with world market prices. The “specialty type of business” (e.g. electronics or automobile) embraces those durables and consumables goods with a distinctive brand thus creating imperfect competition. The “standards type of business” (e.g. cement or extrusions) covers the intermediate or semi-finished products with a rather polypolistic supply structure. The “convenience type of business” (e.g. clothing or hotels) embraces most products of our life sold in retail stores or offered as services in a very fragmented market to reach the final demand, representing from the supply side a monopolistic or imperfect competition according to Chamberlin and Robinson.

4. The Economic Globalization Types

Having once classified the business, the question is how globalization is influenced by each business type, or rather how globalization of the business evolves in each business type and according to which pattern. Analysing the business types it emerges that the operating configuration determined by the business is a major determinant for the globalization type. The intrinsic logic reveals two main types [3, 4]:

- type 1 material (or physical trade) globalization for commodities and specialties
- type 2 immaterial (or financial) globalization for standards and convenience.

The difference is substantial. Products of businesses following type 1 globalization could be produced finally within a single plant operating configuration and shipped physically worldwide whereas products of businesses following a type 2 globalization are produced locally for the local market. MNE (Multi National Enterprises) will have in this case a network of local companies by FDI (Foreign Direct Investments) and the business idea is to exploit the know-how in doing business. In this fragmented markets they have to buy or set-up new enterprises to increase market share. But for type 1 globalization we have to distinguish between commodities and specialties due to the different transaction logic (fig.4). Let us call type 1a the “globalization of commodities”; through the listing on efficient market places such as commodity exchanges they are characterized by a world price, this represents the pure example of a globalization of business. Nobody can escape from this type of globalization because its effects are spreading all over the world. For the type 1b “globalization of specialties” the products characteristics are unique and therefore – to some extent - the price can be fixed by the supplier taking into account the value for the customer. This is due to the possibility of product differentiation within the competitive system. For type 2a globalization the distinction into subtypes for standards and convenience is not necessary. Indeed, in markets not accompanied by material trade (physical) flows of products over a certain distance they, according to Chamberlin and Robinson, represent a local monopoly governed by imperfect competition. Therefore we need to have no distinction of globalization patterns between standards and convenience type of products. The localisation of the business leads to a globalization pattern with a market share adding strategy by FDI in order to grow in businesses of such types. Type 2a globalization is a globalization of financial capital.

4. The Economic Globalization Types

Are there any drivers able to upset this apparently stable situation? Yes, there is one. If the difference in price (intended as absolute cost advantage according to Adam Smith) for the same goods in different economies exceeds a certain threshold, exports can temporarily become possible also for products following type 2a globalisation. We may call this “economic arbitrage”. In these cases we can observe also a material flow of products within the type 2a globalisation characterised businesses; let us call this type 1c globalisation “opportunistic or low-cost globalisation” (fig. 5). Typical are the exports of low-cost countries such as China. This Chinese low-cost globalization has caused during the last ten years extensive damage to, e.g., the American extrusion industry [6, 7, 8].

![Figure 4: The natural types of business globalization](image-url)
Figure 5: Seven Globalization Types Matrix [5]

Since 2009, the industry model has been enlarged by the pure financial type 2b globalization. Although, the world of finance is increasingly becoming an independent system with its own “Eigendynamik”, mainly originated by an inflated “financial paper-title” business with no value-add of technological progress for the society, its repercussion on real business economy is enormous as the past crisis has shown. Due to the fact that the effects are repercurred to all businesses, it has been considered within the business type matrix, and it has been placed therefore on the lower left corner of the globalization model.

Furthermore, also the human factor type globalization has been integrated into the model, extending the horizontal axis with company in-sourced and company out-sourced activities and the vertical axis with company core and company support activities. The globalization bubbles in the model are slightly overlapping, to indicate the non-neat separation between core and support as well as in-sourced and out-sourced. Now briefly, if a difference in different economies exists for the salaries of blue and white collar jobs, then we will have migration flows leading to the type 3a “globalization of migration”. The full rational will be shown in the next chapter. If differences in salary of white collar jobs exists and physical migration presence is not necessary – and the skills are equivalent – then, thanks to today’s efficient telecommunication infrastructure, it is also possible that enterprise functions as R&D, call centres or accounting are outsourced to low-cost countries such as India; let us call this type 3b “globalisation of service”. The globalization type 3 is the “globalisation of human factor”. Figure 5 shows all types of globalisation within a matrix allowing us to identify roughly the type of globalisation and with that the possible evolution or competitive issues to face within a certain business.

Figure 6: Goods export and relative business types
Does any evidence exist for this business and globalization type classification? Figure 6 shows the structure of exported goods for the year 2004. The business type symbols have been added to each product group in order to show the pertinent rough classification according to the business type matrix as well as to the corresponding type of globalization. We see that the majority of the product groups belong to the commodities and specialties. The graph shows also a statistical significant difference (according to 2-sample t-test) between the typical type 1 globalization business types of commodities and specialties compared to the type 2a globalization businesses of standards and convenience. The reason why the type 2 globalization businesses show some trade activity is mainly attributable to the opportunistic low-price globalization type 1c. We have to keep in mind that this classification is a rough but useful model, based on economics considerations, giving practical guidelines to structure the economic globalization phenomenon and is far from being a mathematically exact model according to physic laws.

5. The Intrinsic Rational of Each Globalization Type

The seven globalization types placed within the Globalization Types’ Matrix (fig.5) have not only different globalization forms but are also governed by different driving logics and economic laws. Instead of following neo-classical equilibrium modelling we will apply, let us call it, a post-neoclassical transaction-oriented modelling, i.e. what triggers the evolution of globalization [4]. The here presented functional description is not intended to give an exact mathematical model, but rather to understand the rough components of what is triggering the specific globalization type. These globalization forms can be classified according to the already seen basic typologies of material type 1, financial type 2, and human factor type 3 as well as according to the duration, i.e. in the natural types (they are structurally given by the business and they will always be present), and the transient types (they will last as long as the imperfection of cost difference exists), (fig.7.).

<table>
<thead>
<tr>
<th>Material Type 1 of Globalization</th>
<th>Financial Type 2 of Globalization</th>
<th>Human Factor Type 3 of Globalization</th>
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<tbody>
<tr>
<td>1a</td>
<td>2a</td>
<td>3a</td>
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<tr>
<td>1b</td>
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<td>3b</td>
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<tr>
<td>1c</td>
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Figure 7: Intrinsic nature of the seven globalization types [5]

5.1. Type 1a Globalization

Type 1a, i.e. globalization of commodities, is characterised by global price building in efficient dedicated market places, and they are mainly characterised by unidirectional material flows from countries of origin to the industrialized countries of transformation (fig.7). The foreign trade \( t_{od,r} \) from the country of origin \( o \) to the country of destination \( d \) for the resource \( r \) can be described with the following set of causal variables

\[
t_{od,r} = f \left( V_d \left( a_i, \frac{P_s}{P_r}, P_o(p_r), p_r \left( \frac{V_d}{P_o} \right) \right) \right)
\]
where \( V_d(a_p/p_r) \) is the aggregated volume demand in economies of destination \( d \), driven by the final demand of applications \( a \) and from the price \( p_r \) of the resource \( r \) (if the price of the resource rises, the demand will shrink, as shown by the inverse proportionality), and \( p_s \) is the price of the substitute resource; important for the supply of resource \( r \) is therefore the relative price of resource \( r \) compared to the price of the substitute resource. \( P_d(p_r) \) is the production in the economies of origin \( o \), depending on the price of resource \( r \), and \( p_s(V_d/p_r) \) is the price of the resource, which depends on supply and demand on the commodity exchanges. Generally, \( V_d=p_r \) in the medium and long term. Price \( p_r \) is established according to the level of demand \( V_d \) and supply of production \( P_r \). If \( V_d>p_r \) price \( p_r \) will rise, and if \( V_d<p_r \) the price will fall. The preference for a raw material compared to another depends from the “latent value” of a specific resource compared to another substitute resource [4]. This also takes into consideration the ecological impact or the end-of-cycle aspects. The “latent value of a resource” expresses the value for the customer; it explains why a more expensive resource—such as aluminium versus steel—is chosen.

5.2. Type 1b Globalization

Globalization type 1b is characterised by bi-directional flows between different economies of the same products (fig.7). Similar but differentiated products are produced by different competitors in different countries. The preference for one product compared to another depends on the “cost-benefit” perception of the customer which can be translated to the “competitiveness factor” of differentiated products of a producer. This leads to the following causal relation for foreign trade flows between country A and country B

\[
t_{AB} = f \left( V_B, \frac{1}{V_A}, \frac{g_B}{g_A}, \frac{p_{AB}}{p_{aB}}, \frac{p_{\beta B}}{p_{\alpha B}}, \pi_{\alpha\beta} \right)
\]

where the main variables cover the market size and its growth, comparative product prices and product advantages. \( V_A \) and \( V_B \) denote the demand of the product in question in economy A and B respectively, \( g_A \) and \( g_B \) the growth rates of the markets in A and B, i.e. the comparative volume and growth of geographic markets. The fraction \( p_{aB}/p_{\alpha B} \) represents the price ratio of the prices of a product \( \alpha \) produced in economy A and sold in economy B compared to the same product \( \alpha \) produced in A and sold in A. If the price in B is higher than A, then there might be a certain propensity to export. The ratio \( p_{\beta B}/p_{\alpha B} \) is the price ratio of a product \( \beta \) produced and sold in economy B compared to a product \( \alpha \) produced in A but sold in B and shows the price competitiveness of product \( \alpha \) and \( \beta \). Let us now introduce a new variable, the comparative product characteristic \( \pi [4] \). \( \pi_{\alpha\beta} \) is the comparative product or performance advantage of the product \( \alpha \) of economy A as compared to similar products \( \beta \) of economy B, where \( \pi_{\alpha\beta}=\pi_{\beta\alpha} \). The comparative characteristic performance advantage could be production speed, flexibility and functionality of equipment, general product performance, or service of the goods in question. This means that if the underlying structure tends to be polypolistic rather than oligopolistic, we have the so-called imperfect competition or monopolistic competition according to J. Robinson and E. Chamberlin, the two products being slightly different, i.e. the general theory of comparative relative advantages remains, but is extended beyond the cost view in oligopolistic markets or near-monopolistic competition markets. Let us call

\[
\frac{p_{\beta B}}{p_{\alpha B}} \cdot \pi_{\alpha\beta} = k_{\alpha\beta}
\]

the competitiveness factor from the point of view of the supply side or the “cost-benefit” factor from point of view of the demand side [4]. This competitiveness factor describes a comparative competitive advantage allowing us to model the behavior of economic actors for differentiated products. The higher the competitiveness factor the higher the market share of the producer. This can be seen as the modern interpretation of the Heckscher-Ohlin factors proportion theory.

5.3. Type 1c Globalization

Type 1c is based on the price differential of the same product with low differentiation properties between two economies (fig.7). Type 1c globalization is an example par excellence to explain the classic foreign trade theory based on absolute cost advantages. Let us have some additional thoughts to expand on this theory. The trade export from low-cost country Z to high-price country K is

\[
t_{ZK} = \frac{V_K, \Delta p_{ZK}, s_{ZK}, p_K, p_Z}{V_Z, p_{ZK}}
\]

where \( V_K \) is the demand in the high-price country K, \( s_{ZK} \) considers the transaction costs between Z and K, \( p_K \) and \( p_Z \) are the respective prices in the high and low price economies and \( V_Z \) and \( p_Z \) are the demand and production in the low-price economy. It is interesting to note that propensity of type 1c globalization is based not on volume and growth but first on price difference and on capacity utilization. From causal relation we can further assume that if \( p_K/p_Z > 1 \), i.e. absolute price in K is higher than in Z, then the most capacity will be dedicated at first primarily to exports (if the demand side quality and service requirement can be fulfilled), i.e. the company in the low-price economy Z will act according to the rational economic law of maximizing profit. If \( p_K/p_Z < 1 \) (which is unlikely to happen at this stage of economic development), then of course \( t_{ZK} \) will remain zero because most probably no export will materialize. Let us have a look at the capacity situation. When
An export seems to materialize because the capacity is fully absorbed in the short term by domestic demand in Z. The reasons can be that prices in economy K are not attractive, the demand in economy Z has priority, or allocation of capacity is state-controlled. When $P_z/V_Z > 1$, then the remaining capacity $(P_z - V_Z)$ can be filled by exports. When we have a very strong propensity from the supply side to export in order to fill the capacities. In the extreme case, the supply propensity is given only by the price difference $\Delta p_{KZ}$. If the price difference is high enough, or the production cost allow a reasonable margin, production will be converted for export and the price will rise in economy Z; in the medium term, new capacities will become established. In the extreme case of over-capacity, strong export propensity will set in, reducing world price level. If $P_z/V_Z = 1$, then a residual capacity may still be allocated to export. Generally, if the production capacity of economy Z is for profit reasons dedicated to exports rather than the domestic demand, prices in economy Z will rise in order to be supplied and new capacities will be installed. The system will regulate itself. The absolute cost advantage is the most evident driving factor for the type 1c globalization. We may call the resulting driver the “propensity for globalization” [3, 4]. The higher this difference is, the higher the material flows of these products from countries of emerging economies to countries of advanced economies, although - from the intrinsic nature of the business - it would follow a type 2a globalization. The Chinese “type 1c” extrusion exports to America have become an emblematic case, hurting the local American extrusion industry very hard [6, 8].

5.4. Type 2a Globalization

Type 2a globalization products depend on the “intrinsic market fragmentation” of the business (fig.7). This market fragmentation is given by the characteristic of the product and the related transaction mechanism as well as its transportation cost. The fragmentation is determined as follows:

For simplicity, let us assume that all the companies are the same size in the market; due to the fragmentation of the market and the assumption of perfect competition, this approximation is valid for most companies in the market. Let us call $N$ the number of all companies in this fragmented market and try to find the drivers for the fractal market structure. The number $N$ will be according to

$$N = f\left(\lambda, \omega, \pi, D\right)$$

where $\lambda$ represents the logistic cost to transport the product and $\omega$ represents the value of the product under consideration, i.e. the ratio $\lambda/\omega$ is an indication of the intrinsic market fragmentation [4] for the product under investigation (the higher the ratio, the higher the fragmentation) and $\pi$ represents the characteristic of a product (bulky, small, perishable, etc.), i.e. a sort of localization index (as opposed to concentration) for production. $D$ represents the demand, i.e. the number of actors co-determining the fragmentation; the higher the demand, the more supplying companies a fragmented market requires. The market share in a fragmented market is fairly irrelevant, not being possible to exercise market power. The demand is uniformly fragmented in the market and therefore the supply, due to the characteristics of the product, is also uniformly fragmented. The market structure is the driving element within this simplified analytical view. The reason for entering this market, besides the illusive desire to exert control, is to increase one's own market share within the value-chain. Indeed due to the fragmentation it is only possible to increase profit by growing via increasing the number of operations. This market-share-adding-strategy will fuel type 2a globalization. This reasoning is especially valid for the intermediate products (standards). The reason for convenience such as services (hotels) or fast-food is similar, but through the differentiation of the product and the end customers' behaviour, the causal relation has to be reconsidered, taking expressly into account the comparative characteristics of the product or service offered. Indeed, combined with the fragmentation of the final demand, type 2a fragmentation is an indicator for the necessary polypolistic offer structure to reach the next transformation stage of the value-add chain or to be distributed to the final customer. The setting-up of new companies, especially in fast growing low-cost countries Z, corresponds to globalization of capital via FDI (Foreign Direct Investment) and has a direct link to entrepreneurial investment in real business via globalization type 2a.

5.5. Type 2b Globalization

The financial type 2b globalization is the “globalization of the world of finance” (fig.7). This globalization type was added to the model only in 2009. Indeed, not driving directly business strategy, it was left aside. Only with the American subprime crisis, becoming a world finance crisis, and then having mutated subsequently into a world economic crisis, it has been introduced into the model for its effects and repercussion on the real business economy. Indeed, the negative consequence of the financially-originated and the financially-amplified volatility of commodity markets on world supply chain dynamics is huge [9, 10, 7, 11]. The globalization of finance is linked to the amount of investment of capital $i_C$ with entrepreneurial connotation and to pure financial investment $i_F$, which is mainly speculative in character, i.e.

$$i = i_C + i_F$$

The capital investment $i_C$ is directly linked to the globalization type 2a considering FDI. The number $N_z$ of new companies setting-up in country Z is a function of propensity for capital investment $i_C$, market size $V_Z$ and growth rate $g_z$ in Z.
\[ \frac{\partial N_K}{\partial t} = f(i_C, V_Z, g_Z, \ldots) > 0 \]

Favouring capital investments in Z can have consequences on the number \( N_K \) of companies in advanced high-cost countries K, which is also linked to other available more attractive investments opportunity \( i_F \) with more speculative character, not needing to deal with management skills and union problems when setting-up a new company, or dealing with globalization type 1c, et cetera

\[ \frac{\partial N_K}{\partial t} = f(i_F, \frac{\partial N_Z}{\partial t}, i_{ZK}, \ldots) < 0 \]

The capital investment \( i_C \) of FDI intended as capital flow \( i_{KZ} \) from country K to country Z is

\[ i_{KZ} = i_C \left( S_K, \frac{E(W_Z)}{E(W_K)} \right) \]

and depends on the available stock of savings \( S_K \) and the comparative expected value \( E(W) \) of future value generation \( W_Z \) and \( W_K \) respectively in country Z and K which corresponds to the expected capital return. The expected value \( E(W_Z) \) of value generation in country Z

\[ E(W_Z) = f(V_Z, g_Z, L_Z) \]

depends on market size \( V_Z \), growth rate \( g_Z \), labour cost \( L_Z \) but also other variables, such as local competition and intrinsic management ability not explicitly shown. The return of investment \( i_C \) is added to the savings stock \( S_K \) with the amount of

\[ \frac{\partial S_K}{\partial t} = \sum_X E(W_X) \]

But let us now enter into the typical globalization of finance, i.e. the type 2b globalization, dealing with \( i_F \), i.e. the pure financial investments with rather speculative connotation. The rational of financial investments generating type 2b globalization can roughly be modelled considering the following variables:

\[ i_F = i_F \left( S, E(\frac{\partial S}{\partial t}), \beta_F(i_F, t), \Omega \right) \]

Here again S is the stock of savings, \( E(\partial S/\partial t) \) are the expected savings increments linked to the financial investment \( i_F \) in the financial market F, i.e. the expected financial returns, \( \beta_F(i_F, t) \) is the Beta-factor summarizing the market volatility of a financial market F, which can be stock or commodity exchange, and depending also on financial investment \( i_F \), i.e. a recursive component amplifying volatility which corresponds to the well known effect of "la hausse amène la hausse". The variable \( \Omega \) summarizes all the financial investment opportunities, such as physical goods, or derivatives, or new ETF, ETC, and so on. The expected value of saving stock increment \( E(\partial S/\partial t) \) for pure financial investments \( i_F \)

\[ E \left( \frac{\partial S}{\partial t} \right) = f \left( i_F, \beta_F(i_F, t) \right) \]

is given by the amount of financial investment \( i_F \) and the Beta-factor. It shows, that the Beta-factor is the key driving factor for financial attractiveness, therefore finance gamblers like volatile markets with high Beta-factors, whereas entrepreneurs and industrialists prefer stability. This leads directly to the consequences that pure speculative finance has on industry dynamics. Indeed, although academics explain business cycles by an imbalance of supply and demand, the last economic crisis was triggered not by physical imbalance but through financial speculation tearing down the whole world economy.

Let us now have a look at the repercussions on the real economy due to highly amplified market volatility, originated by excessive finance speculation. High volatility of commodity markets has negative consequences in both directions: economic upswing and economic down-swing, amplifying business cycles with deleterious consequences for real industry [9, 10, 7, 11]. During a bullish market phase, with increasing volume demand \( V_X \), production capacities \( P_X \) are built-up according to the following logic

\[ \sum_{A, Z} \dot{P}_X = f \left( \beta_F(i_F, t) : \right) > 0 \Rightarrow \frac{\partial^2 U_X}{\partial P_X \partial t} < 0 \]

Here again \( \beta_F(i_F, t) \) is the Beta-factor summarizing the market volatility of a financial market F fuelled by the amount of financial speculation \( i_F \). Speculations at commodity exchanges have direct impact on raw material price increase \( \partial p_Y/\partial t \) and material volume demand \( \partial^2 V_X/\partial p_Y \partial t \). Indeed, increasing volatility leads to increased speculation, increasing again prices which, within a bullish market, leads initially to increased demand \( V_X \) generally fuelled in all countries X as well as increased international trade \( t_{XY} \) amplified by the "pipeline-filling effect" [9]. The production capacity increase derived from trade and local activity may be unpropordionally to price volatility Beta, because volatility is usually irrationally fuelled by autoregressive financial investment \( i_F(t) \). The increased production as well as the possible new invested production capacities will lead to increased employment, i.e. decreasing unemployment \( \partial^2 U_X/\partial p_Y \partial t < 0 \). Whether the production capacity will be available on time or not depends on the delay of production investments, but may also come on-stream during the imminent down-swing of the economy. When the economy becomes overheated or prices have an exaggerated peak, the economy turns. Triggered by bearish financial markets, physical trade \( t_{XY} \) diminishes
\[
\sum_{O,D,A,K,Z} i_{xy} = f \left( \beta_F (i_F, t) : \text{bear} \right) \left( \frac{\partial p_F}{\partial t}, \frac{\partial^2 V_X}{\partial p_F \partial t} < 0, \frac{\partial^2 U_X}{\partial V_X \partial t} > 0 \right) < 0 \Rightarrow P_X > V_X
\]

The obvious effect is on all types of trade volume \( i_{xy} \), namely \( t_{O,D}, t_{A,B}, \) and \( t_{K,Z} \), i.e. all trades of globalization type 1, but as well as on local trade \( t_{x,x} \). This is due to reduced volume demand of \( V_X \) causing accelerated price collapse due to lack of physical end-demand. The possibility to speculate with non covered short-sales further fuels price collapse. Within the value-add chain, during the down-swing, each stage of transformation will reduce its physical inventories, reducing additionally the already low end-demand. The well-known Forrester-Burbidge bullwhip effect confined to customer-supplier relation is now amplified throughout the supply chain on global level developing into the inverse “pipeline-filling” effect [9]. The reduced production will lead to increasing unemployment \( \partial^2 U_X/\partial V_X \partial t > 0 \) due to lower sales. We are now in a market situation where the installed capacity \( P_X \) is larger than the demanded volume \( V_X \). The overcapacity may lead to additional price reduction leading together with reduced sales volume to the bankruptcy of weak companies. The functional modelling of company shake-out is as follows

\[
\sum_{A} \hat{N}_X = f \left( \beta_F (i_F, t) : \text{bear} \right) \left( \frac{\partial^2 V_X}{\partial p_F \partial t} < 0, \frac{\partial^2 (P_X > V_X)}{\partial V_X \partial t} > 0 \right) < 0 \Rightarrow \frac{\partial^2 U_X}{\partial N_X \partial t} > 0
\]

where \( \beta_F (i_F, t) \) again is the Beta-factor summarizing the market volatility of a financial market \( F \) fuelled by the amount of financial speculation \( i_F \), impacting physical trade sales volume \( V_X \). The higher overcapacity increases, shown by \( \partial^2 (P_X > V_X)/\partial V_X \partial t > 0 \), the higher will be the diminishing number of companies \( \partial N_X/\partial t < 0 \). The restructuring of overcapacities will generate additional amplified demand through the whole pipeline-filling of supply chain, may be restructured during the down-swing, causing high social restructuring cost and unemployment. Pipeline-filling dynamic is increasing with increasing volatility [9, 10, 7, 11]. The farer away the stage of transformation is from the end-market, the more pronounced will be the pipeline-filling effect. We have to be aware, that all market operators have a social responsibility. The fact shows, that finance operators are increasing volatility and are one of the causes of unemployment. Financial speculation is adding no technological progress to society whereas entrepreneurs, by investing into real business, industry or services, are giving added-value and employment to society. Although this pure financial type 2b globalization has no direct link to industry, through its effects of amplifying business cycles, mainly via speculative commodity trading, it is destabilizing the real economy.

5.6. Type 3a Globalization

Together with barter trading, migration might be among the first types of observable cross-border activities (fig.7). Migration had different phases after the discovery of the New World. The 18th century was dominated by the migration of Europeans to America. In the mid of the 20th century began the migration of South-European blue collar workers to Central European countries and now we encounter an increasing Pan-European, or even worldwide, white collar migration. Migration originates from finding elsewhere better working and living conditions to guarantee survival. From survival interest it has shifted to better conditions for wealth generation. Although migration has rather a social aspect, the economic dimension cannot be left aside. Today also temporary migration is increasing; low-cost workers are transported to construction sites all over the world. The classic migration can be modelled as follows:

\[
m_{ZK} = f \left( \frac{L_K}{L_Z}, \frac{f_K}{f_Z}, \frac{U_Z}{U_K}, M_{ZK} \right)
\]

where \( m_{ZK} \) is the migration flow from country Z to country K. The variables \( L_K \) and \( L_Z \) are the labour salaries in country K and country Z respectively, \( f_K \) and \( f_Z \) are the perspectives for prosperity in the two countries; the more attractive the conditions in country K are, compared to country Z, the higher the migration will be. Furthermore, migration depends also on \( U_Z \) and \( U_K \), i.e. the unemployment in Z and K as well as \( M_{ZK} \), i.e. the stock of already migrated people forming a local community of people from Z in K, where \( M_{ZK} \) is

\[
M_{ZK} = \int m_{ZK} dt
\]

e.g., the migration flow over time. The migration \( m_{ZK} \) can also be seen as

\[
m_{ZK} = \frac{\partial M_{ZK}}{\partial t}
\]

the variation of migrated people. The migration flow \( m_{ZK} \) has therefore also a functional relationship to the above mentioned driving variables as well as an autoregressive component. Due to the fact that migrated people of country Z living in country K may work for a lower salary than local people, migration could reduce general salary level in country K, improving the competitiveness of country K; but this is another topic of research.

5.7. Type 3b Globalization

Type 3b globalization is modelled by the “comparative skill of labour”, i.e. the level of skills available and the respective cost as well as the cost to transfer the service in question to the economy with lower cost (fig.7). The theory of factor allocation, in this particular case labor, follows the same theory valid for economic goods. But let us enlarge on the concept and analyze also the comparative skills of labor. In this context labor is intended rather as white collars. Type 3b globalization deals mainly with the
supporting function within a company. The main driver for the transfer of service functions to low-cost countries Z is the cost of salaries including the social contributions for white collar employees. Of course the transfer is subject to the availability of skilled manpower in economy Z for the service to be outsourced. This relation is formalized in the following causal relation

\[ N_{Si} = f \left( \frac{L_K}{L_Z}, \frac{\sigma_{iZ}}{\sigma_{iK}}, \frac{1}{\xi} \right) \]

where \( N_{Si} \) is the number of companies having outsourced the service \( s_i \) to a low-cost country Z. \( L_Z \) are the white collar salaries in low-cost economies and \( L_K \) in high-cost economies. The \( \sigma_{iZ} \) and \( \sigma_{iK} \) are the levels of skills held by service \( s_i \) in economy Z or K respectively. It is assumed that the necessary infrastructure exists. Variable \( \xi \) represents the transaction cost in relation to the transaction difficulties encountered with the outsourcing operation. Changes in considerations according to experiences made can even overweight the labor cost advantage and lead to outsourcing being reconsidered. This type of globalization is increasing not only for the supporting functions but also for every service based on human skills where the service can be supported by the new telecommunication possibilities.

Each business follows its own globalization type. Nevertheless, mixed types are observable. Especially type 2a globalization is also observable in superposition to 1a and 1b globalization from MNE to increase market share. These imperialistic expansion strategies are often denounced also due to the latent fear of unemployment. But the industry natural types of globalization (i.e. 1a, 1b, 2a) are not responsible for the negative social consequences such as unemployment; the socio-political consequences are mainly caused by the types 1c, 2b, and 3. But this is another story. The here presented phenomenological modelling of economic globalization is further accompanied by a common denominator for the intrinsic reason of macroeconomic globalization evolution. The rationale behind this will lead to: The Central Theorem of Globalization [4].

6. Application to the Aluminium Industry

Before having developed the globalization model, the author conducted several ground-breaking analysis of the aluminium industry to understand the intrinsic logic of this industry [12, 1, 13, 14, 15]. Part of the here presented globalization model has been applied extensively by the author to the aluminium industry showing its validity. It has been able to explain most of the ongoing evolution and changes to the value-add structure of the aluminium industry. In papers [16, 17], and presentations at international congresses [3, 18, 19, 7, 20], and at Dow Jones seminars, as well as at national aluminium associations assemblies, the enlightening globalization insights and results have been presented, receiving large acceptance and interest. With these seven globalization types most of economic globalization effects can be explained, forming therefore a comprehensive unified view of the ongoing changes of our economic system. Several of these concepts have been used to comment on ongoing events as in the title stories of the DOW JONES NF Metals Monitor [15, 11, 8, 21, 22].

7. Associated research work

The Globalization Types Model and the pertinent rational of each globalization type explain how globalization is triggered and how it will evolve; it does not explain why globalization is happening. The intrinsic reason of the Why can be explained by the Central Theorem of Globalization and its corollary [4]. The associated entropy-based inequality risk metric is a genotypic metric measuring the spatial extension of globalization, incorporating the natural law of global evolution of transactions and is therefore able not only to explain the Why but also to measure the degree of globalization of an economic system. The globalization metric has been applied to the WTO international trade figures for the period 2003-2009 showing that world is globalizing but the different economic regions are globalizing differently [23, 24]. Interesting would be to apply this model to measure financial capital type 2a globalization linked to Foreign Direct Investments as well as human type 3 globalization.

8. References


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