

## **Innovation and Distribution in Modelling an Inequality Trap:**

### **Availability of Data**

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#### **Abstract**

Growing literature assesses inequality would drag effective demand in the economy, acting as a main causation factor of the contemporary economic recession cycle. The debate would remain open because such causation would remain hidden within the current macroeconomic representation and underneath the aggregation of the available statistical data. The aim is to investigate an alternative framework intended to contribute in disentangling such hidden dynamics. This considers total factor productivity and the level of inequality as macroeconomic factors of production and demand, rather than capital and labour. The analysis discusses an inequality trap and availability of statistical data appropriate to the modelling proposed. This would provide considerations for extracting inequality data conform to the modelling and show finding certain data for such equations is challenging.

To Mary

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## Introduction

In the last two decades the considerable inequalities and the recurrent crises have been two noticeable economic issues. The question posed is whether high inequality is a causation factor of economic crises.

Atkinson and Morelli (2011) find that establishing whether inequality is a causation factor in generating crises is far from being clarified. Their analysis show inequality was either rising or stable or falling before the crises and the comparison between levels of inequality needs more comparable data. Brown (2004) notes that “Income distribution does play a role in theories of consumption authored by economists affiliated the Cambridge or Post Keynesian school”. Evidence from Brown’s “article suggests that income inequality can exert a significant drag on effective demand”. Hartwig (2014) tests the post-kaleckian Bhaduri-Marglin model (1990) finding that concentration of productivity gains in profits on average lowers demand growth in OECD countries, hampering productivity growth. Brown (2004) also remarks the widening of the credit availabilities that augments “the spending power of moderate and low-income groups” with an effect “comparable to a decrease in income inequality”. Thus “the aggregate propensity to consume can remain stable, or even increase, amidst a sharp increase in income inequality—given a sufficient surge in borrowing”. Dynan, Mian, and Pence (2012) calculate estimates providing evidence that the households who had borrowed large amounts have weak spending compared with other households. Cynamon and Fazzari (2016) indicate that the bottom 95 percent “lost out to rising inequality” and “raised the leverage” masking “the demand drag caused by rising inequality”. This is the group needing deleveraging, who reduces then consumption. This reading remains far from being widely accepted, leaving the debate open.

The paper extends the scope of the paper (Benazzo, 2015) submitted for the 2015 International scientific conference “Economics and Management, ICEM”. The ICEM 2015 paper discusses the modelling of an alternative paradigm. These pages analyse additional aspects related to modelling, to the demand side touching inequality and aspects related to availability of suitable

data. The hypothesis of the modelling is that: a) while the modern standard macroeconomic models are a logical and rational outcome based on the historically available statistical data, such data would aggregate different variables impeding clearer analysis; b) different dynamics would remain aggregate in such data and models and thus would hide causality relations; c) thus only a limited representation of the economic processes would be possible using them. The herewith discussion searches for alternatives and develops a proposal for an alternative paradigm. This i) considers historical macro facts; ii) proposes a framework which explains these macro facts in a coherent way; iii) this representation proposes particular disaggregation of aggregated variables and how aggregating them would hide causality; iv) aggregated inequality dynamics and differences in delocalization between the demand and the supply side would hide economic causation processes. The hypothesis is that disentangling such dynamics would allow a clearer answer to the debate whether inequality is a causation factor of economic crises. Points (i), (ii), (iii) and (iv) have been analysed in previous research (Benazzo, 2010, 2013) within a dual economy framework. Benazzo (2015) proposes options for equations and a geometrical representation for points (iii) and (iv) referred to a closed economy. This discussion analysed main dynamics involved on the supply side and on the demand side. The herewith analysis extends the considerations of the geometrical representation by further discussing variables and how data could be extracted and some dynamics of an inequality trap. It analyses the use of concepts such the inequality possibility frontier (IPF) and extraction ratio (Milanovic, 2009) developed by Milanovic, B., P.H. Lindert, and J.G. Williamson (2007), and how these could provide tools for finding additional suitable extracts from the available data. It also adds considerations about the use of variables on the supply and demand side.

### **Method**

The hypothesis above may be groped in two main points. On the one hand the dynamics involved would entangle different variables together, shuffling rankings and thus comparability among different situations. On the other hand the standard approach of the history of gathering

available economic data poses a constraint for alternative paradigms and theories. The study has thus to be based on a theoretical analysis, framing a rationale that may explain the historically available macro-economic facts. This rationale may then lead to propose alternative paradigms, theories, modelling and then verification with empirical data. This paper uses the framework of an alternative paradigm discussed and theorised in specific dynamics in previous research (Benazzo, 2015, 2013, 2010). It here delves into options for an economic modelling presented at the 2015 International scientific conference "Economics and Management, ICEM" and in its conference paper (Benazzo, 2015).

### **Definition of a dual economy**

The analysis pivots on a dual economy (Fields, 2007, Gollin, 2014). Fields' (2007) review recalls various definitions of dual economies, which include 'advanced' compared to 'backwards' and 'capitalist' compared to 'subsistence'. There are the food and beverages sector, the estate market sector, the clothing sector, and the health care sector. Their aggregate define the subsistence sector. Part of it covers actual subsistence. The advances of productivity brought by modernization and characterising industrialisation allow continuously developing additional and new products and services, beyond those of the subsistence sector. The same sectors that provide subsistence may provide additional consumption, such as expensive restaurants, additional and pricey clothing, large and expensive housing solutions, aesthetic treatments. The advances in productivity decrease the weight of the subsistence level within the subsistence sector and the weight of the subsistence level and the subsistence sector in the whole economy. Even if advances in productivity occur in both the subsistence sector and the other sectors, industrialization has brought major advances in terms of creation of new goods and services in the other sectors, such as with trains, steam engine, petrol engine, electricity, radio, television, etc. The economy is thus here defined as subdivided in two aggregate sectors, the subsistence sector as defined here above, and the rest, designated as the advanced sector. The characterising difference between the two sectors is that the part allowing subsistence is only

comprised in one of the two, the subsistence sector. This is instrumental in analysing whether price dynamics are different in these two sectors. This subdivision is the basis defining here the dual sectors economy, rather than different access to capital between subsistence sector and capitalist sector (Lewis, 1954) or inequality as difference in the average level of wages between the rural and urban populations (Kuznets, 1955). Similarly to Kuznets (1955) who analyses the rural and urban sectors also upon the difference of their level of inequality, i.e. with a higher inequality within the urban population, the herewith paradigm also considers within sector inequality; however how such difference of level of inequality is related to a subsistence minimum is the fundamental criterion separating the two sectors.

## Discussion

### ***Inequality possibility frontier and Inequality extraction ratio***

With the simplifying assumption of absence of famine and extreme poverty, all would satisfy subsistence needs equally. Given this equality, inequality would need to discount the subsistence level and to be measured in the rest of the economy alone.

Milanovic, Lindert and Williamson (2007), introduce the concepts of inequality possibility frontier and inequality extraction ratio. Milanovic (2009) synthesises it as “the maximum Gini that is achievable at a given level of mean income provided that all population but an infinitesimally small elite live at least at the subsistence minimum”. Milanovic, Lindert and Williamson (2007) derive the following equation:

$$G^*(\mu) = \frac{\alpha - 1}{\alpha} (1 - \varepsilon) \quad (1)$$

Where  $G^*$  denotes the maximum feasible Gini for a given level of mean income  $\mu$ , and  $\varepsilon$  denotes the size of the elite. In this equation,  $\alpha$  expresses the mean income as a multiple of the subsistence minimum, as follows:

$$\alpha = \frac{\mu}{s} \quad (2)$$

Where  $s$  is the subsistence minimum that Milanovic, Lindert and Williamson (2007) take as

consistent with the absolute poverty line. In the extreme case, when all the income above the subsistence minimum line accrues to only one person, then ( $\epsilon \rightarrow 0$ ) and:

$$G^*(\mu) = \frac{(\alpha - 1)}{\alpha} \quad (3)$$

Milanovic, Lindert and Williamson (2011) then define the inequality extraction ratio as "how much of the maximum inequality was actually extracted". They calculate it as the ratio between the actual Gini coefficient and the maximum feasible Gini coefficient for that mean income and subsistence minimum.

$$\text{Inequality extraction ratio} = \frac{G}{G^*(\mu)} \quad (4)$$

They find (Milanovic, Lindert and Williamson, 2011) that the median and mean inequality extraction ratios in the pre-industrial sample are 75.5% and 76.8%, respectively. For 25 contemporary societies, they find that the top income group in Brazil and South Africa, where the contemporary Gini coefficient is very high, have extracted a bit more than 60% of their countries' maximum possible inequality, similar to the less exploitative pre-industrial societies. Milanovic, Lindert and Williamson (2007) highlight that as the mean income  $\mu$  increases, then  $\alpha$  (the mean income as a multiple of the subsistence minimum) increases moving the inequality possibility frontier in the system to a situation with larger maximum possible inequality, in this case larger maximum possible Gini coefficient. Milanovic, Lindert and Williamson (2011) show the IPF (Inequality Possibility Frontier) as a function of the Gini index and the GDI per capita, with the assumption that the subsistence minimum lies near the absolute poverty  $s$  of around \$PPP 365 per annum in 1990 international prices. Only in extremely contemporary poor countries, with GDI per capita lower than \$PPP 600, the maximum possible inequality is much noticeably less than 100, thus the extraction ratio is noticeably higher than the actual Gini coefficient. They note that if recorded inequality is stable and the mean income increases, the extraction ratio falls. This implies also that if the extraction ratio is stable while the mean income increases in time, then the measured inequality has increased, while the part extracted by the

elite stays stable in relative terms.

The extraction ratio is meant as such to measure whether the income above subsistence becomes more or less distributed over time. This makes it a very interesting concept as it takes away a level of subsistence, where inequality is necessarily absent, in order to measure inequality on what remains, which may distributed more unequally. Benazzo (2010) uses this concept and discusses theoretically the limit case whereby the income above subsistence may eventually accrue to only one household or individual, as in the case expressed by equation (3).

Milanovic, Lindert and Williamson's (2007) fix  $s$  at a very low level consistent with the absolute poverty line. Milanovic (2009) illustrates that with such level of subsistence minimum, developed countries have such a mean income that  $\alpha$  is around 60 to 80 ( $\mu$  around 60 to 80 times larger than  $s$ ). The maximum feasible Gini index  $G^*$  arrives thus around 99% with little difference from the measured Gini index  $G$ . Milanovic, Lindert and Williamson's (2011) show that for example the U.S. average income in 2000 was around 78 times the subsistence minimum. There would as such be little difference between the Gini index and the Extraction ratio.

$$\text{for } \alpha \rightarrow \infty \quad \text{then} \quad \text{Inequality extraction ratio} = \frac{G}{G^*(\mu)} \rightarrow \frac{G}{1} = G \quad (5)$$

With the example of a least developed country where the average income  $\mu$  is twice the subsistence  $s$ , then  $\alpha = 2$  and the maximum feasible Gini index will be 50%. With such countries, the extraction ratio becomes noticeably higher for a given inequality, i.e. measured by the Gini index. The inequality extraction ratio may thus reshuffle the inequality rankings compared to those measured by the Gini index in particular when least developed countries are included.

The hypothesis here made is that the subsistence sector, which includes the goods and services consumed for subsistence, provides price dynamics that affect the whole economy. The mere

subsistence level is calculated at a very low basic level, which in developed countries affects a limited part of the economy. There could be a check whether the concept of relative poverty could be a proxy or whether it could help determine the subsistence sector as defined in the paradigm and theory discussed in these pages. While the absolute poverty relates practically only to the subsistence sector goods and services, relative poverty also includes goods and services in the advanced sector, which provide a living that may be considered sufficient. The variable  $s$  would need rather to cover only the subsistence sector, measuring the aggregate of the real estate sector, the food and beverages sector, the clothing sector and the basic health sector. This is quite a challenge with the current data available. To address this, the approach is called to differentiate two analyses. One intends taking away from the inequality calculation a level of living that is considered a minimum, which is intended to be common to all, where inequality should be absent. This may thus be calculated on both sectors together. The other intends to investigate the inflationary dynamics in the subsistence and in the advanced sector. This is bound to consider such two sectors division. Ravallion and Chen (2011) note that by common practice, the relative poverty is measured at a constant proportion – typically 40 to 60% - of the mean or median income ( $M$ ) (when  $M$  is the mean income, it coincides with  $\mu$  used in the equations above). This is at odds with the herewith analysis, as it implies absence of a decreasing marginal utility of consumption, whereby people care only about relative position with respect to others. Ravallion and Chen (2011) propose an interesting approach with a weakly relative poverty, whereby above the minimum of the absolute poverty line, the weakly poverty line increases less proportionally than the increase in mean or median income. They find empirical evidence fits with the following equation:

$$Z = \max(Z^*, \beta + kM_i) \quad \text{with} \quad \beta \geq 0 \quad \text{and} \quad k = 1/3 \quad (6)$$

Where  $Z$  is the weakly relative poverty line,  $Z^*$  is the absolute poverty line,  $M$  is the mean or median income for country  $i$ ,  $\beta$  is the lower bound to social inclusion needs. Ravallion and Chen (2011) provide empirical evidence of its parameters at the 2005 PPP dollars/day for household



consumption.

As this is a relative poverty line, even if less dependent on the average or mean income, it still requires that a part of the economic agents receives less income than the weakly relative poverty level. It thus is incompatible with the concept of a minimum level that would be equal for all economic agents. It is thus insufficiently apt for calculating an extraction ratio. The empirical data taken consider the national poverty lines. Ravallion and Chen (2011) note that these lines are determined by choices that reflect prevailing views of what poverty means in that specific context. These are quite stable. It is quite understandable that these would tend to lag changes in inflation in their basket of goods, in addition to aggregating together the subsistence and advanced sectors goods and services. The weakly relative poverty line is thus rather inadequate for investigating the inflationary dynamics in the subsistence and advanced sectors.

An alternative measure related to subsistence would be the minimum wage in each country. They set a minimum that could be considered of decent subsistence and minimum acceptable consumption. This could be considered a level that society could be called to ensure to everyone whose household has sufficient members who would work full time, if the economy were at full employment and full potential output. This could be considered the level ensured to everyone, either through work, or with the supplement of transfers and various benefits. In addition, the minimum wage has the additional advantage with respect to the relative poverty line that it is actually intended to be implemented in practice.

Like the relative poverty, also the minimum wage aggregates both the subsistence and the advanced sectors. Only the part concerning the subsistence sectors would need to be considered, however, as it is a minimum and it could be considered a minimum for all, then it should achieve the purpose of netting out an egalitarian part for measuring inequality on the rest only.

Considering that the minimum wage in developed countries could be in cases between 25 and

50 times the subsistence level, this means that if the  $s$  in equation (2) is 25 to 50 times as much, then  $\alpha$  could be around 1.5 to 2. The Maximum feasible Gini ( $G^*$ ) would then be much lower than 100 and the extraction ratio would provide a much different result than the measured Gini. It would show a situation of much higher inequality. In addition, with different PPP levels of minimum wages among regions or countries and different levels of average (or mean) income, the Gini index rankings of inequality among different regions or countries would be reshuffled considerably. Without such extraction ratio, this reshuffling would remain hidden. It would need to be uncovered in order to contribute in ascertaining whether inequality is a causation factor of the economic crisis.

In Benazzo (2015), the analysis argues that the Gini index should be calculated on the whole economy netted out of the egalitarian level, here above referred to the minimum wage as proxy. In such case, the maximum possible inequality of such a Gini index would always practically be 100 ( $G^* \rightarrow 1$ ). The inequality extraction ratio would thus give the same result. Benazzo (2015, 2013, 2010) uses thus a comparable approach.

There are people who earn below the minimum wage, either because they receive a pay per hour below this level nevertheless, or because they work less than full time, or because they are unemployed. A number of them have the possibility to do it because of transfers received from relatives for example. The household aggregation of incomes would aggregate such transfers within the household. The household level would thus express less incomes lower than the minimum wage, compared to the individual level. The presence of incomes below the minimum wage would generate a challenge in how to consider the minimum wage an even level below which there would be absence of inequality. One option could be to use the minimum wage gap, calculated with the same principle of the poverty gap. In the presence of a minimum wage gap, this would account for a more unequal situation compared to a case where all the population would have at least the minimum wage. Given that the minimum wage gap averages the gap on the whole population, also those who have an income above the minimum wage level, one

option could be to consider the income level corresponding to the minimum wage gap as the minimum provided to all. This measure would overlook the inequality below the minimum wage. In addition, it would consider the actual situation of the labour market as a given passively accepted situation, and it could somehow partially understate the meaning of the social contract behind the minimum wage. Considering the presence of inequality below the minimum wage, inequality could be calculated separately above the minimum wage and below the minimum wage. An option could be to consider the minimum wage headcount ratio, i.e. the population either below on one hand or equal and above the minimum wage on the other hand. Then calculate the Gini index for the population at equal or above the minimum wage, netting out the minimum wage, then the Gini index for the population below the minimum wage level. Then perform a weighted average of the two Gini indexes, using the minimum wage headcount ratio here above identified.

Subsistence may also be considered for discussing about the advancements in productivity, which allow the development of goods and services in addition to those of the mere subsistence level.

### ***Total factor productivity (TFP) growth on the supply side***

Krugman (1994) notes that capital accumulation without increase in productivity shows diminishing returns. He maintains that in the long term, the increase in output for a given input, or decrease in input necessary to obtain a certain output, i.e. the increase in total factor productivity (TFP), provides the increasing returns and economic growth. Capital accumulation spreading a generation of capital stock with a higher TFP than previous capital stock, without further increase in total factor productivity, would provide TFP increase in the economic system as a whole, even if this shows diminishing returns. When such process runs into diminishing returns, further innovation of processes may generate what could be called new generations of capital.

The Solow TFP residual model considers all capital formation as exogenous. Hulten (2001)

highlights output  $Q$  grows by  $S_t$  in equation (7), at constant prices  $p_0$ ,  $w_0$  of labour ( $L$ ) and  $r_0$  of capital ( $K$ ), due to productivity growth. At the start at time=0, the situation is here considered subsistence economy, while at time= $t$  a surplus has generated an advanced sector:

$$p_0 Q_t = S_t(p_0 Q_0) = S_t[w_0 L_t + r_0 K_t]$$

$$\text{where } p_0 Q_0 = 1[w_0 L_0 + r_0 K_0] \text{ with } S_{t+1} > S_t > 1 \quad (7)$$

Hulten (1975) had estimated that U.S. output in the period 1948 to 1966 had grown by 34% within the conventional TFP residual. The TFP residual captures costless improvements due to innovation that provide additional real GDP for a given level of inputs (capital and labour). These may arrive for example by externalities of paid-for research and development projects or by inspiration and ingenuity. In addition to that, paid for technical innovation causes output to increase, increasing investment and by that the stock of capital. Hulten (1975) calculated that such induced capital accumulation effect for the U.S. equates to an additional 30% due to TFP. The rest of capital accumulation is due to propensity to invest at a constant rate of TFP growth. Hulten (2001) notes how the TFP residual provides an empirically testable theory for which the positive aspects outweigh the negative ones.

The herewith paradigm considers directly TFP, without considering capital. TFP is affected in the model (Benazzo, 2015) by the level of inequality. Too high inequality introduces inefficiency due to processes such as what Caselli & Gennaioli (2013) call dynastic management or such as indicated by with Hartwig (2014). Too low inequality introduces inefficiencies due to lack of incentives for increase in productivity. TFP is endogenous for this part. Other determinants of TFP growth are considered exogenous, such as cultural background or human capital flight for example. In the model, the position of the TFP curve relates to the exogenous factors, while the shape is the one that endogenously interrelates with the level of inequality.

In the TFP models based on the production function, the productivity of the production process

grows; in the measurements between the inputs and outputs. Hulten (2001) remarks that gains from innovation often arrive from better goods and services, i.e. new goods and services, rather than more. The production function increases when there is additional output per input, while it could remain fixed for better quality production output if this has sufficiently additional utility. An approach addresses this by measuring output in units of consumption efficiency, which reflect the marginal rate of substitution between old and new goods. This allows measuring both process and product innovation. Measurements in efficiency units may be achieved by adjusting the capital in capital vintages with different degrees of marginal productivity. Another approach is to adjust the prices for quality changes in the area of CPI, calculating efficiency prices of consumption goods. Hulten notes the assignment of efficiency units by imputation of the relative marginal utility between old and new products is subjective. He remarks the analysis by Domar (1963) and Jorgenson (1966) finds that the failure to measure capital in efficiency units causes measurement errors, i.e. embodiment errors, which affect the residual, one with capital input, the other with investment good output. These cancel out in steady state growth. When utility is considered, this is the domain of consumer choice, involved in the utility function. This latter is an objective of economic growth, while the production function represents rather the supply side constraint of growth.

The alternative paradigm considers rather TFP (of capital and labour) and level of inequality as factors of production. TFP is a supply side constraint on growth, while the level of inequality is both a supply side constraint, when it affects the incentives, and a demand side constraint on production, when it affects the demand side, as discussed further down in the next section.

To investigate deeper granularity of the data by considering the TFP residual on intermediate goods and services entails using the quantity gross output at each production level analysed. This introduces complications as quantities of intermediate goods are counted more than once, e.g. in more than one industry. To calculate the real value added would cancel out double counting of quantities, however collecting and calculating such data is quite unfeasible (Hulten,

2001).

This shows that, compared to the TFP residual approach, the retrieval of even more meaningful data poses challenges. Further research could examine if there would be ways of simplifying further, and given the quality of the research already done, this may be very challenging.

Hulten (2001) notes that in the long-run in the steady-state growth in output of the neoclassical growth models “technical innovation causes output to increase, which increases investment, which thereby induces an expansion in the stock of capital”. Capital is endogenous and driven by the exogenous technical change.

Hence, “all capital accumulation and output growth are due to TFP”. With innovation as exogenous process, investment in R& D, lack a predictable effect on output growth.

The alternative paradigm, considering TFP and the level of inequalities as production factors, rather than capital and labour, proposes an alternative that could allow considering different hypotheses and assumptions that could help disentangle and simplifying. It considers TFP would allow surpluses that would also allow capital accumulation. This process could be traced back such that previous capital would be generated by the use of previous surpluses. Surpluses would occur even when just expanding a generation of capital with a stable TFP, even if with decreasing returns. It would in fact change the ratio of capital to labour, in favour of an increase in productivity.

In the new growth models (Hulten, 2001), the endogenous growth theory of Romer (1986) and Lucas (1988), knowledge and human capital add to conventional fixed capital. The rate of innovation becomes endogenous to the model. Marginal product is constant and it causes continuous induced-accumulation effect. In the models of endogenous growth, productivity gains rather than capital formation are the fundamental cause of growth, while productivity gains may induce capital formation.

As the alternative paradigm considers directly TFP rather than capital, knowledge and human capital would be, in its current model representation, exogenous and determinants of the

position of the TFP curve (Benazzo, 2015). TFP is considered the fundamental cause of growth on the supply side, as mentioned above, while the TFP gains are exogenous at this stage, apart from the effect from the level of inequality. The model is currently rather focused on analysing interrelations between inequalities and effective demand, and through that on economic performance.

New growth models introduce innovation as an endogenous characteristic of capital. They thus require increasing returns to scale rather than diminishing returns to capital in the production function. In a main variant of endogenous growth theory (Hulten, 2001), an increase in capital for some users provides some costless spillover over other users. The residual is thus the increase in capital weighed by the spillover effect. The degree of externality of the spillover may change as well as the growth rate of capital. In trying to use this framework for explaining the productivity slowdown, i.e. the Solow paradox, the evidence goes in a different direction than expected. Investment in R&D has remained quite constant, while its part in terms of industrial R&D has increased, which would imply an increase in productivity. In addition, the available evidence points to different directions than a decrease in externality or spillover effect.

There are thus quite some challenges in finding data measuring TFP with its process and product innovation in readily available ways. Hulten (2001) notes that different approaches entail different results for the empirical research. This is what the alternative paradigm is intended for, with the hypothesis that the results would uncover causality of inequality on effective demand.

Tracing back the innovation in processes and products, this goes back to previous lower and lower levels of productivity, until a pre-industrial level and a level where only subsistence would be allowed for the largest part of the population.

Theories examining the effect of distribution, such as the Cambridge school, consider how inequality may affect effective demand.

***Decreasing marginal utility of consumption on the demand side and an inequality trap***

Stockhammer (2015) argues that financial deregulation and rising inequality are root causes of the current crisis. Concerning inequality, he identifies four channels that would have contributed to the imbalances that caused the crisis. a) First, the lower income groups have higher consumption propensity. The fall that occurred in their wage share entails a shortfall in domestic demand. A rising profit share ought to impact positively investment expenditures, at least for a given level of demand. In addition, a falling wage share in any one country would have a positive impact on net exports. This last effect is neutralised because wage shares have fallen in all countries. The Bhaduri and Marglin (1990) post-Kaleckian macro model comprises these three effects. When the demand regime is wage-led, a falling wage share impacts negatively aggregate demand. Stockhammer notes that the Kaleckian hypothesis is that demand is wage led concerning the domestic components. b) The second channel is through reactions to stagnating domestic demand due to rising inequalities. One reaction developed the export-led growth model; another reaction developed the debt-led growth model. With the liberalisation of capital flows after Bretton Woods, capital flows increasingly determine the exchange rates and this has allowed increasing and sustained international imbalances. The export-led growth model is sustainable only if there are countries with net-imports. These have increasingly been based on increase in debt, rather than increase in income fuelling domestic demand and imports. c) The third channel is in the debt-led growth model. In this latter, typically there has been an increase in the household debt, used to sustain consumption expenditure. Kennickell (2009) gives an extensive overview of the debt level from 1989 to 2007. This has remained quite constant. When looking at the debt to income ratio, this ratio has risen and more for the low income groups. For the bottom 50<sup>th</sup> percentile, it increased from 61% in 1989 to 137% in 2007. For the 51-90<sup>th</sup> percentile, it increased from 81% to 148%. Setterfield (2013) expounds “an



unsustainable pattern of debt accumulation by lower and middle income households, seeking to offset weak real income growth caused by the failure of real wages to keep pace with productivity growth.” This entails that lower income groups have been driven into debt by falling wages in real terms and falling social services. d) The fourth channel is in the propensity to speculate. Empirical data (Kennickell, 2009) indicate that rich household hold riskier assets. Concerning non-financial wealth, and in particular principal residences, these have turned out to be risky assets. Lysandrou (2011) argues that this risk was transferred through derivatives on sub-prime loans in high demand by hedge funds, which are mostly hold by super-rich. Thus increase in inequalities would have increased the portion of wealth placed in risky assets. Benazzo (2015, 2013) represents an inequality trap with similar traits, with in addition different macroeconomic dynamics in the two sectors defined above. This addition entails a somehow different view of the dynamics involved: (1) When TFPG accrues in the same percentage to all incomes and wealth groups, it augments the aggregate demand evenly, generating inflation in both sectors. (2) Supply adjusts generating deflation, thus counterbalancing. (3) When TFP gains accrue instead mostly to top income and affluent groups, inequality increases as in the last decades (Atkinson and Piketty, 2007 and 2011). (4) Stake-holders of the TFP gains would have a quite even price elasticity of demand in both the subsistence and the advanced sectors. As Stockhammer (2015) indicates, increasing inequality reduces the aggregate marginal propensity to consume (MPC). This agrees with decreasing marginal utility of consumption. This augments aggregate demand in both sectors less than what TFPG would allow. This provides a scenario of lower inflation of dynamic (1) compared to a scenario with more distributed benefits from TFPG. The affluent secure more TFP growth than this inflation dynamic, thus experiencing a net gain, even if the prices tend to increase at least initially. They would thus increase demand in both sectors. (5) The other economic agents excluded from big part of the benefits of TFP growth, experience prices increases from dynamic (1) that are out of reach to their sluggish nominal income, generating net loss of purchasing power. They have low price elasticity of demand in

the subsistence sector and thus are forced into high price elasticity of demand in the advanced sector, where they reduce demand. (6) In the continuous rebalancing of supply and demand of (1) and (2), skewed due to (3), (4) and (5), the subsistence sector inflates with respect to the advanced sector, while the economy grows less than potential. Amartya Sen (1981) highlights that while in 1943 in Bengal there were trade barriers that determined a very low price elasticity of supply, an increase in income for a small group of the population increased their demand. This dramatically increased prices for basic foodstuff, many of which more than tripled that year, throwing the population into a tragic famine. When supply is more elastic as in the normal cases, the inflation in the subsistence sector would become less dramatic however still present, due to such continuous biased rebalancing. (7) This would tend to decrease demand in the advanced sector, decreasing also economies of scale and allowing the companies to do less deflation of their prices than what would be possible with larger demand. This would allow less of dynamic (2) for counterbalancing the decrease of real purchasing power for those whose nominal income remained behind. (8) Delocalisation allows producing at lower costs, thus allowing more deflation of dynamic (2). Housing forms large part of the subsistence sector in developed economies and is less subject to delocalization. Delocalization may contribute in augmenting real purchasing power rather more in the advanced sector compared to the subsistence sector, thus counterbalancing somehow the biased dynamic (6). This however keeps or pushes down wages and/or generates unemployment, decreasing income for domestic demand. (9) Eventually, the nominal value of the advanced sector reaches such a low level requiring unfeasible acceleration of TFPG and unfeasible delocalization to counterbalance. (10) Decreasing MPC augments the marginal propensity to save (MPS) increasing the part of TFP growth allocated to demand of financial market instruments and thus their valuations. However demand of goods and services, and future prospects, which determine the fundamentals of companies values, decelerates increasing less than potential. The companies' net present value diminishes, thus those market values should rather decrease. A financial bubble generates. (11)

As the advanced sector grows less and needs less credit, interest rates decrease and financial deregulation augments the credit availability to households, in order to find additional placements of the additional savings from the affluent. Deregulation would thus be largely consequence of increasing inequality (Benazzo, 2010) rather than a concurrent cause of the crisis. (12) Savings placed in the inflating subsistence sector exhibit comparably better, or less grim, net present value perspectives than in the advanced sector, thus the financial bubble moves to the real estate market. (13) Increased residential housing prices further inflate the subsistence sector, exacerbating the recessionary dynamic into an involution cycle.

Tax cuts are often thought of as instrument for increasing domestic demand. With the above reading though, cuts in redistributive taxes would decrease redistributive private contributions to public social services, provided in larger amount by the higher income groups who have higher taxes, than by the lower income groups. Then these latter would receive a cut in social services larger than the cut in their taxes. The net gain for the lower income groups would thus be negative, while the net gain for the higher income groups would be positive, increasing inequality.

The above reading advocates keeping or achieving moderate levels of inequality. This is as such considered a major determinant of employment and output from the demand side.

Modern macroeconomic policy has labour (employment) as independent variable and employment (labour) as dependent variable expressing the policy objective. The historically available statistical data have contributed in posing such a dilemma of philosophy of science in economics. The herewith paradigm proposes using the level of inequality as macroeconomic production factor, rather than labour as a way of addressing this, while keeping employment as a target of economic policies.

### ***A multiplier effect in an inequality trap***

In Benazzo (2015) there is the graphic representation of the alternative paradigm discussed. As

mentioned above, the income/production is determined through three paths: (i) the TFP level is exogenous, apart from (ii) the effect on TFP in the supply side due to the level of inequality; (iii) the effect of inequality on effective demand from the demand side is exogenous. Inequality is measured in two ways one on the economy as a whole and this is the exogenous variable. The other is netted out of the egalitarian part of the economy, to obtain a proxy of the advanced sector where it is considered to actually occur. This depends endogenously on the level of inequality and the ratio between egalitarian part considered and the rest of the economy.

An increase in inequality inflates the subsistence sector, such that lower purchasing power of the lower income groups decreases their part of demand in the advanced sector compared to the higher income groups. This further increases inequality. There is thus a multiplier effect of inequality.

In the herewith modelling discussed, when the measured Gini increases, then  $s$  enlarges its part in the economy due to the dynamics described above. Then  $\alpha$  decreases, even if the average income remains the same, thus increasing the extraction ratio. In other words, the inequality possibility frontier IPF deceleration becomes larger and its curve becomes flatter, reaching asymptotically a lower maximum. This may be pictured in the mind by looking at Figure 2 in Milanovic, Lindert, & Williamson (2011). Such multiplier effect requires an alternative representation of the IPF, with more than two dimensions. It would be function of the mean income  $\mu$ , and in addition, the minimum wage  $s$ . The minimum wage  $s$  is an institutionally determined figure and as such it requires time to be revised. It is thus considered more rigid than the underlying dynamics. It would be good to investigate the data on the minimum wage and relate its adjustments in the long term with the long term variations in measured inequalities.

Further research could examine possibilities of accounting how competition would increase inequalities as it would allow higher income groups to secure a higher share of the increase of TFP. When the model would account dynamically for the increase in TFP, this would allow

making the level of inequalities dependent endogenously from the increase in TFP. Making taxes more redistributive by taxing the rich at higher rates than the lower income groups would counterbalance the advantage of the rich in securing stakes of TFP growth by providing an advantage for the lower income groups in receiving cooperation transfers after such competition dynamics. Such system could be trimmed by analysing how the free market forces would skew the appropriation of the increase of TFP in favour of certain groups and adapt progressive taxation accordingly. If the two, competition and cooperation counterbalance appropriately to give an appropriate long term level of inequality for contributing to maximising output, this would contribute to long term growth stability and prosperity through generations. Progressive taxation depends from social contracts and would constitute an exogenous variable to the model. Such a social contract would allow sustainability of the competition game whereby competitors would be allowed to continue playing the game in the long term.

Such policy would be in line with those analysed by Cynamon and Fazzari (2016). They advocate the reversal of the inequality trend (i) after-tax wage growth across the income distribution; (ii) a more redistributive tax policy; (iii) the equality of real wage growth with labour productivity growth. Setterfield (2013) identifies the equality in the rates of growth of real wages and of labour productivity as the rule for sustainable growth. Since the end of the seventies instead the wage share of income has increased at a slower pace than productivity growth and within wages, those of production and non-supervisory workers (80% of the workforce in U.S.) have grown at a slower pace than managerial wages. Silos Labini (1981) identifies the optimum rate of wage increase in a closed economy to be equal to the rate of productivity increase, assuming constant prices of raw materials. If prices of raw materials fall, the rate of wage increase may be higher. An open economy may provide more possibilities for that. An open economy may allow the rate of wage increase to be lower than that of productivity increase.

An alternative to redistributive progressive taxation could be to establish a social contract in which the increase in productivity accrues in same percentage proportion to all income groups.

This was mainly followed in U.S. in the years 1945-73 (Setterfield, 2013).

Equal accrual of increase in productivity across all income groups accompanied by sufficiently redistributive taxation could reverse previous excessive inequality, de-multiplying previous inequality multiplier involution cycle.

In an open economy with free movement of capital and labour, taxation is supposed to generate the flee of tax base to regions where taxes are lower. In addition wage growth would have a negative effect on net exports. Further research could delve into the considerations how this could be addressed.

Neoclassical economics tends to defend that with sluggish demand then companies would have to adapt prices to sell. The herewith theory gives a different view: the readjustment of supply and demand while inequality increases would inflate the subsistence sector part in the economy. Thus the advanced sector effective demand would tend to shrink. This would tend to generate unemployment, which would increase the bargaining power of the employers. This would increase the possibility of increasing compensations to the governance, top management and shareholders even more, accelerating the dynamic of involution into the defined inequality trap. The analysis of this mechanism is outside the scope of these pages.

### **Concluding remarks**

An alternative macroeconomic paradigm, represented by Piero Benazzo in a dual sectors economy, separates subsistence sector defined by the products and services that also ensure the subsistence level, from an advanced sector. It substitutes capital and labour with total factor productivity (TFP) and the level of inequality. Income spent in the subsistence sector would have lower price elasticity of demand than in the advanced sector. This would cause augmentation of inequality to inflate the subsistence sector compared to the advanced one, further increasing inequality thus generating an inequality trap in the rebalancing between demand and supply. The measured Gini index is considered to provide an incomplete picture of inequality, as it would include also a part of income that would need to be considered as equally distributed

with practically zero Gini index. Inequality would need to be considered only on the rest of incomes above this part. These pages identify that the model needs to make use of a level of income at the same time sufficiently low to represent an equality level common to all where inequality is practically (or almost) absent, and sufficiently high to represent a determining factor of different inflationary dynamics between the two sectors. Milanovic, Lindert and Williamson correct the Gini index discounting it with a level of income common to all by introducing the inequality possibility frontier (IPF) and inequality extraction ratio. The inequality possibility frontier provides the maximum feasible Gini index at each level of mean income as a multiple of the subsistence minimum consistent with the absolute poverty line. The inequality extraction ratio is then the ratio between the measured Gini index and the maximum feasible Gini index. These pages consider the absolute poverty to be too low to represent the model dynamics. The relative poverty measure is unsuitable for the calculation of the extraction ratio as it is a constant proportion of the mean or median income. The weakly relative poverty analysed by Ravallion and Chen is less than proportional to the mean or median income and thus it is less problematic for calculating an extraction ratio, however it entails anyway people below the relative measure, which contrasts with a minimum. The minimum wage is thus considered as a minimum to be used for the extraction ratio. In addition to the practical inequality possibility frontier and the extraction ratio that use available data, the analysis discusses other options adapted to the model. The minimum wage minus the minimum wage gap would represent a more acceptable minimum. In addition, the Gini index could be calculated using the income levels above the minimum wage. And inequality below the minimum wage could also be calculated. Few options about these are discussed. These pages ascertain that the inequality extraction ratio using the minimum wage as minimum appears to be among the most feasible solutions for the model to use currently available data.

Concerning total factor productivity (TFP), the TFP Solow residual approach is well studied, however its TFP residual measures only the costless improvements due to innovation. Paid for

technical innovation that causes output to increase is embedded in the stock of capital together with the capital issued from propensity to invest at a constant rate of TFP growth. Other approaches introduce complications that tend to be more than the benefits they are intended to give. This brings to note that the availability of data for measuring in simple and synthetic ways process and product innovation poses challenges to finding easily available data for the model. Further research in the development of the modelling could investigate alternative ways for finding readily available data.

These pages point out also how the inequality trap (Benazzo, 2015), with its key mechanism due to different inflationary dynamics between the subsistence and advanced sector, is represented in the model. On the demand side, the inequality level measured on the whole economy is exogenous, while it is endogenously netted out of the equality level by a proportion between the subsistence sector and the advanced sector. On the supply side, TFP is exogenous, except when the inequality level netted out of the equality part affects the incentives when too low or the efficient governance when too high.

As in the inequality trap an increase in inequality inflates the subsistence sector, further increasing inequality with a multiplier effect, decrease of inequalities would de-multiply the effect reversing such mechanism of recessionary economic trend. Further research could devise more or different endogenous variables and the development of the modelling in the open economy. It could consider in which measure the balance of payments would provide readily available useful data.

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